Department for
Transport

Road Safety Research Report No. 69

Under-reporting of Road Casualties – Phase 1

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June 2006

Department for Transport: London

Although this report was commissioned by the Department for Transport, the findings and recommendations are those of the authors and do not necessarily represent the views of the DfT.

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ISBN 1 904763 69 3

ISBN-13 978 1 904763 69 7

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Printed in Great Britain on paper containing at least 75% recycled fibre.

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EXECUTIVE SUMMARY

There is some concern that the trends in the serious road traffic injuries as recorded in STATS19 may not be an altogether accurate reflection of the true situation. Indeed, there is general recognition and acceptance that the STATS19 record is an underestimation of the actual number of road traffic accident casualties. This has been acknowledged for some time and studies have been undertaken which provide estimates of this shortfall. But the issue is how constant over time are the levels of under-recording, misclassification and under-reporting, especially of serious accidents, to the police. And, if they are not constant, by how much have they changed, so that the implications can be assessed to inform road safety policy and practice to the end of this target period.

Aims and objectives of the Phase 1 research

The aim of this study is to assess the level of under-reporting and misclassification of road traffic casualties, and, in particular, to find out whether there have been any changes in reporting and/or recording practices over the period 1996–2004.

The objectives are:

- to provide a comprehensive review of previous studies of under-reporting;
- to find out what additional sources of health data are available both across Great Britain as a whole (taking account of differences between the data collection systems of, say, England and Scotland) and locally that can be used to investigate the extent of under-reporting of road casualties;
- to see how the available data could be used for the purpose of this study;
- to carry out analysis of the available data to inform our knowledge and understanding of the extent of under-reporting;
- to compare current information with the results of other studies of under-reporting; and
- to make recommendations for further data collection, to be undertaken in Phase 2, in order to address the questions that cannot be answered with the available data.

Previous studies were reviewed as part of this study. They all agree that there is some degree of under-reporting of casualties to the police and some are able to estimate levels of under-recording and misclassification. However, most studies do not describe their methods in sufficient detail for comparisons to be made. Most, it seems, look at the number of casualties in the police record that can also be found in the records of the accident and emergency (A&E) department of the relevant local hospital. In general, these studies do not take into account the casualties the police know about but the hospital do not.

Definition of reporting levels used in this study

The **numerator** in this study is the total number of casualties known to the police and the **denominator** is all known casualties. This is calculated by matching police casualty records with A&E department records. Those that match are '**known to both**' and those that do not are either those '**known only to the police**' (in the police record and not in the hospital record) or '**those known only to the hospital**' (in the hospital record and not in the police record). 'All known casualties' is then the sum of these three numbers.

The use of NHS data

The use of data from the NHS can provide insights into the nature of injuries sustained in road traffic accidents and give a more finely graded assessment of severity than the data in current use by the police. It also provides additional information on those injured who do not appear in the police record.

There are several administrative health datasets or databases which can be used to provide insight into the number of patients injured from road traffic collisions accessing NHS treatments services. These include:

- Ambulance Service data;
- A&E department data;
- hospital inpatient data, Health Episode Statistics (HES) in England, Patient Episode Database for Wales (PEDW) and the Scottish Morbidity Record (SMR); and
- specialised databases such as the Trauma Audit Research Network (TARN).

These administrative datasets vary considerably across the UK, in both being present or not, and also in specific detail. This study makes use of A&E department data and inpatient data, and sample analyses are given. The comparison of the data from these datasets with STATS19 is quite difficult as the operational definitions used by police officers to classify road traffic accidents are not widely used within the NHS. Staff within the NHS will tend to use a lay perspective to classify injuries as being due to a road traffic injury, and may include some injuries which do not meet the STATS19 definition and exclude some which do, particularly cycling related injuries.

The use of A&E data allows estimates to be made of the number of road traffic casualties attending A&E departments. The disposal code, or where the casualty went next, is useful in helping assess the severity of injury. For example, about 10%

of casualties are admitted to a ward and about another 10% are referred to specialist clinics. For the purposes of this study, it has been assumed that injuries requiring referral to a specialist clinic map onto the STATS19 serious category. This is not a perfect match but it is the best estimate given the data available.

There has been a tendency over recent years to admit fewer patients and to treat more at specialist clinics, such as fracture clinics. Data analysed for this study (for one hospital in Wales) indicate a tendency of fewer inpatients but it is impossible to tell whether these trends are due to fewer admissions (i.e. lower severity) or due to changes in medical and health service practices.

The A&E data also indicate that pedestrians are rather more likely to be admitted as a result of their injuries than other road user groups. There are four times as many injured car passengers as pedestrians, but about the same number of each are admitted. At the Welsh hospital, pedal cyclists are less likely to be admitted than pedestrians.

Inpatient data are rather tricky to analyse as they are recorded as finished consultant episodes, which means that records for individuals need first to be traced through the episodes of care to produce one record for each individual. This was done for the English, Welsh and Scottish data. Trends in admissions for the three countries show that for England it is flat and for Wales and Scotland it is falling. Trends for individual road user groups indicate that admissions for pedestrians are falling across all three countries; they are rising steeply for motorcyclists in England but more modestly in Wales and Scotland. Vehicle occupant trends in England and Scotland are fairly flat but are declining in Wales.

Extractions from a specialist database were commissioned. This is the TARN database which is based at the Hope Hospital in Salford. Data from 33 hospitals were used to look at road traffic injuries from 1996 to 2003. The database holds information on the more severely injured casualties where, amongst other inclusion criteria, the length of stay is at least 72 hours. The data show that there has been no decline in the number of severely injured casualties over the period studied. However, the distribution of injured road users has changed over this period, with a marked decline in pedestrian injuries and a marked increase in injured motorcyclists. The number of car drivers has increased since 1998.

Comparisons between inpatient and STATS19 data

STATS19 data shows a reduction in the number of serious injuries in England, Wales and Scotland, although those in England have shown the steepest decline in all but three police forces. Comparison of the serious casualties in STATS19 for England, Wales and Scotland with the inpatient data for the same countries shows that the number of admissions is almost equal to the total number of serious casualties in the STATS19 database, rising steadily from there being fewer admissions in 1999 (by about 3,000) to there being more in 2003 (by about 1,800). On the basis of this and the finding that admissions account for about 50% of seriously injured casualties (defined by an admission, referral to fracture clinic, or other specialised clinics, or planned follow-up at hospital), the immediate interpretation is that the number of serious casualties could be under-reported and/or be misrecorded or misclassified by as much as half, and it is possible that this has risen over recent years.

This assumes that there has been no change in healthcare practices or service provision, which we know there has been, and whilst these cannot be strictly quantified they are unlikely to account for the size of this effect. It is assumed that the coding in the hospital data is uniformly complete and accurate, but it is known that there are issues to do with incorrect or incomplete recording of Chapter 20 (external cause) ICD-10 codes, which describe which category an injury appears in the record. This is exemplified in the comparison of pedal cycle injuries in the inpatient databases, where only 10% of admitted injuries are shown as involving a motor vehicle.

Despite the unknown magnitude of these effects, the inpatient database is showing a similar pattern to the A&E data analyses and the STATS19 where pedestrian and motorcyclist trends are in the expected direction. Vehicle occupants show diverging trends, with there being 3,700 fewer admissions than serious injuries in 1999 but, as a result of falling numbers in the STATS19 database, there are more admissions than STATS19 occupants by 2003. Our tentative conclusion at this point is that the problem is in the reporting/recording/classification of car occupant injuries, by far the largest group, although more work will be needed to confirm this.

Matching A&E data with STATS19

STATS19 and A&E data were analysed for one hospital for the years 1996–2004. The reporting rate to the police was calculated as ranging from 54% in 1996 to about 56% in 2004, although there was no systematic change in this rate. It has been possible to estimate reporting rates for different road user groups, with pedestrians and pedal cycles being well reported at about 70%, two-wheeled motor vehicles at about 60% and vehicle occupants at around 50%, making them the most under-reported group at this hospital. In terms of age, the overall reporting rate was about 60%, but for 20–24-year-olds it was about 45%.

Estimates of reporting rate and misclassification were made using the A&E data which matched the STATS19 data. Reporting was higher for the more serious injuries (61%) compared with only about half of the slightly injured casualties being known to the police.

Using the information in the A&E record, it was possible to estimate that about:

- 38% (126) marked as serious in the police record are not found in the hospital record;
- 41% (135) are matched as serious in both records; and
- 21% (67) are classified by the police as serious but treated and discharged by the hospital (slight).

This indicates that some unknown proportion of the serious injuries found only in the police record are not in fact serious and that about 20% of the serious casualties that could be matched are in fact slight.

The police recorded 2,866 casualties (about 360 each year) as having slight injuries. Of these, about:

- 51% (1,462) are not found in the hospital record;
- 41% (1,173) are matched as slight in both records; and
- 8% (231) are classified by the police as slight and by the hospital as serious.

The hospital recorded a further 2,644 casualties not known to the police. Of these:

- 15% (391) were seriously injured; and
- 85% (2,253) were slightly injured.

It is not surprising that 50% of police slight injuries are not found in the hospital record as some of these injuries are very minor and are treated at home or at a minor injuries centre or by a GP. Whilst 8% of injuries classed by the police as slight and the hospital as serious is not high in percentage terms, it represents a higher number (231) than those classified as serious by the police and slight by the hospital (67).

What is of interest is that about the same number of people appearing in STATS19 as slightly injured people are admitted as those correctly appearing as seriously injured. This probably explains why the number admitted in the inpatient data equals the total number of serious injuries in the STATS19. For the clinics and follow up there are more in the slight category than the serious category. Whilst there is a bit of a grey area around the coding of certain types of injuries, for example whiplash, which is coded as slight in STATS19 has a very variable clinical presentation, the picture is still one of interest and again it will not take much change at the serious slight boundary to change the overall picture of severity.

Conclusions

This study has used NHS and police recorded data to build up a picture of injury on the road. The data analyses were supplemented with interviews with police officers who suggested that it was perhaps more difficult to report an accident at a police station given that many are open for only office hours and there is a lack of trained personnel to take down details correctly.

Not all the conclusions from this study are straightforward to draw out. The identification of trends in under-reporting and misrecording have been particularly difficult to identify. There have been changes in healthcare practice over the period of study, with a reducing tendency to admit casualties if their injuries can be dealt with as outpatients. However, the three admissions databases show very little overall change in admission numbers to hospital. If the changes in healthcare were in some way being reflected in these databases, this effect would be very difficult to distinguish from a change in severity of injury.

The authors conclude from the limited data available that the serious group of casualties could be up to twice as large as indicated by the STATS19 serious category. Whilst this finding is not new (see Simpson, 1996), it does highlight the difficulty in interpreting data from only one source. Not all of the shortfall in the STATS19 serious group of casualties is due to under-reporting because in the slight category are casualties which should be in the serious category and have been misclassified or misrecorded. These could add up to another 25% to the serious category.

Car occupants are the road user group with the largest number of casualties, the largest diversion in trends from the inpatient data and the lowest reporting rate. If there were small but systematic changes in the reporting or recording of these injuries at the serious/slight margin, part of the rapidly reducing trend in English serious casualties might be explained. However, there is insufficient data at present to strongly support this supposition and more work needs to be done.

Recommendations

This and other studies have shown that it is insufficient to rely solely on STATS19 data, or on any one data source for an assessment of trends in serious injury. That different databases show different parts of the picture is useful and it is recommended that greater use be made of all sources. A system of data triangulation should be used to compare and understand trends in road casualties.

As changes in the provision of hospital and health facilities and changes in clinical practice may affect the number of people with a given level of injury severity admitted to hospital, further research is needed to determine whether there is a subset of injury diagnoses always treated as inpatient, which on its own, or expressed as a ratio of all hospital admissions, could serve as an improved indicator for comparison with STATS19 defined serious road casualties on a national or regional basis.

There are difficulties with the use of any database at the very local level, for example one hospital or one police force, since the numbers of serious injury are rather small and variable and there is rarely co-terminosity of operational boundaries between the police and NHS. For these reasons it has been difficult to draw conclusions at the local level in this study.

It would be instructive to compare the locations of incidents recorded by ambulance services with the STATS19 data, particularly in places where these could also be matched to the A&E and inpatient data. One of the unanswered questions is the accuracy of grid references derived from the nearest property to the incident location, particularly in rural areas. These linkage studies would be helpful, especially as the A&E data may become less useful.

In April 2005 a new A&E minimum dataset was introduced into English hospitals. The advantage of the minimum dataset is that all hospitals will collect data to a common format and submit it to a central database. The big disadvantage is that individual road user groups will not be able to be identified as only one category is now used and that is '**RTA**' (road traffic accident). Location will not be identifiable as the only location identifier is '**In a public place**'. It will be up to individual hospitals to decide whether to continue with collecting the data previously collected and which data are really useful. They should be encouraged to do so. The existing dataset that identifies road user type is continuing in Wales. Comparison of road user type with all casualties in the Welsh data with overall numbers attending A&E departments in England and Wales, and with the numbers being admitted to hospitals in England and Wales, would provide very useful information to partially address the deficiency on the new dataset in England.

Outpatient department minimum datasets are being developed and these can provide additional information on specialist follow-up. It is recommended that the progress and form of the final dataset be monitored as to its usefulness in helping understand changes in both hospital healthcare practice and severity of injury.

The analysis of the hospital inpatient data from England (HES), Wales (PEDW) and Scotland (SMR) has been very helpful in understanding the bigger picture. It is recommended that inpatient data be routinely used in this way to compare trends with the STATS19 data. The inpatient data for an individual hospital or group of hospitals will reflect changes in healthcare practices particularly as they relate to treatment and care preferences of individual consultants. At the national or regional level, individual factors should be ironed out and the bigger picture should emerge. Where possible, analyses should be undertaken by road user group and by age group.

In addition to the research reported here, the Department for Transport also conducted a comparison of Hospital Episode Statistics and police data (DfT, 2006), which is available from the Department's web site at http://www.dft.gov.uk/stellent/groups/dft_rdsafety/documents/page/dft_rdsafety_611756.pdf

1 INTRODUCTION

1.1 Context

The first three-year review published by the Government of its progress towards achieving its 2010 casualty reduction targets[1] indicates that (Department for Transport 2004), whilst the trend is downward, there is strong evidence that the number of deaths on the road is no longer following its historical decrease year-on-year in line with the number of serious casualties which are continuing to decline. The Department for Transport has commissioned this study to investigate the levels of under-reporting of serious injuries together with a complementary study to investigate, in-depth, the trends in fatal accidents, both of which are subject to influences such as changes in vehicle and road design, and healthcare practices.

There is some concern that the trends in the serious injuries as recorded in STATS19 may not be an altogether accurate reflection of the true situation. Indeed, there is general recognition and acceptance that the STATS19 record is an underestimation of the actual number of road traffic accident casualties. This has been acknowledged for some time and studies have been undertaken which provide estimates of this shortfall, but the issue is how constant over time are the levels of under-recording, misclassification and under-reporting, especially of serious accidents, to the police. And, if they are not constant, by how much have they changed so that the implications can be assessed to inform road safety policy and practice to the end of this target period.

1.2 Aims and objectives of the Phase 1 research

The aim of this study is to assess the level of under-reporting and misclassification of casualties, and, in particular, to find out whether there have been any changes in reporting and/or recording practices over the period 1996–2004.

The objectives are:

- to provide a comprehensive review of previous studies of under-reporting;
- to find out what additional sources of health data are available both across Great Britain as a whole (taking account of differences between the data collection systems of, say, England and Scotland) and locally that can be used to investigate the extent of under-reporting of road casualties;
- to see how the available data could be used for the purpose of this study;
- to carry out analysis of the available data to inform our knowledge and understanding of the extent of under-reporting;

[1] The target is expressed as a reduction of 40% against the baseline (average of 1994–98) of killed or seriously injured casualties (KSI casualties).

- to compare current information with the results of other studies of under-reporting; and
- to make recommendations for further data collection, to be undertaken in Phase 2, in order to address the questions that cannot be answered with the available data.

1.3 Scope of the report

This report is a Phase 1 or scoping study. Chapter 2 sets out findings from previous studies of under-reporting. Chapter 3 briefly describes a number of health service data sets that are available and how they can be used to build up a picture of road traffic casualty occurrence in an area. Chapter 4 describes sample analyses that have been undertaken using health, STATS19 and other specialised data, and how this can be used to build up a picture of injuries, casualties and severity of injury. Chapter 5 compares, at the national level, hospital admissions data from England, Scotland and Wales with STATS19 data, and, at the local level, matches data from an English accident and emergency (A&E) department with STATS19 data. Chapter 6 reports on interviews with police who have many years' experience with accident reporting in order to try to establish whether there are changing patterns in recording, and the chapter provides estimates of misrecording of severity of injury using an A&E dataset and one from a large-scale study of crashes. Chapter 7 contains conclusions from the study and Chapter 8 provides recommendations for further data collection.

2 REVIEW OF PREVIOUS STUDIES OF UNDER-REPORTING AND UNDER-RECORDING OF CASUALTIES BY THE POLICE

2.1 What is a reportable road traffic accident?

The Road Traffic Act 1988 (Section 170) defines the duty of drivers to stop, report an accident and give information or documents when personal injury is caused to a person other than the driver of that motor vehicle.

The Act states that an offence is committed when the driver of a motor vehicle does not stop and exchange, at the scene, addresses, vehicle registration and insurance details (of both the driver and the owner) or give them to any person ‘having reasonable ground for so requiring’. If the driver does not give their name and address, the accident must be reported to a constable or at a police station within 24 hours of the incident.

The Road Traffic Act 1991 (Section 72 of Schedule 4) amended ‘motor vehicle’ to ‘mechanically propelled vehicle’. This seems to indicate that single vehicle non-pedestrian accidents in which only the driver was injured do not need to be reported. The 1988 Act, until its amendment in 1991, also seems to indicate that only accidents resulting in injury where a motor vehicle is involved need be reported.

The instructions for the completion of the Road Accident Report Form, STATS19, are given in a document called STATS20. The 1999 edition (Department of Environment, Transport and the Regions, 1999) is quite clear that it contained a wider definition of road accidents than that used in the Road Traffic Acts. Accidents to be reported are defined as:

> ‘All road accidents involving human death or personal injury occurring on the Highway and notified to the police within 30 days of occurrence, and in which one or more vehicles are involved, are to be reported.”

STATS20 notes that the 1991 amendment to mechanically propelled vehicles has caused some confusion and confirms that all accidents involving non-motor vehicles, such as pedal cycles and ridden horses on a public road, should be reported, regardless of motor vehicle or pedestrian involvement.

Despite the Road Traffic Act and the instructions for filling out forms, many people do not report road traffic accidents involving injury. This could be because:

- some people are ignorant of the fact that injury accidents should be reported;

- there is a minority of people who do not want contact with the police (e.g. if they are driving unlicensed or under the influence of alcohol or drugs); or
- their injury did not immediately become apparent.

Those accidents that are reported to the police are then recorded and entered onto the local police database before being transferred to the DfT to be added to the national database. The local and national databases are called STATS19 after the recording sheet in common use. Thus the STATS19 record is not a 100% record of all injury accidents in Great Britain.

Several studies have attempted to estimate the level of reporting to the police and these have mainly matched records of those casualties appearing in both the police STATS19 record and the hospital A&E department record. It is important to distinguish between two components of under-reporting: not reporting a road traffic related injury at all, and misclassification of the severity of an injury. However, most studies do not adequately define which component of under-reporting they are investigating. Many studies have attempted to estimate the reporting levels according to different levels of severity of injury. In the STATS19 record, the severity of an accident is classified according to the severity of the most severely injured casualty:

- a fatal injury is one where a casualty dies within 30 days of the accident;
- a serious injury is defined, for the purposes of STATS19 recording, as a casualty with one or more of the following injuries:
  - fracture;
  - internal injury;
  - severe cuts;
  - crushing;
  - burns;
  - concussion;
  - shock requiring hospital treatment;
  - detention in hospital as an inpatient; and
  - injuries to casualties who die 30 or more days after the accident from injuries sustained in the accident;
- a slight injury is defined as minor cuts, bruising or sprains and strains.

2.2 Summary of estimates of under-reporting in the literature

The under-reporting of road traffic accident injuries is not a problem confined to the UK. There is a prevalence of under-reporting in other countries as well. Whilst the international studies provide some interesting information, they will not be reviewed further in this present study because the British definition of a serious accident or casualty is rather different from those used overseas where hospitalisation is often taken as the measure of a serious injury. James (1991) summarised seven British and twenty international studies of under-reporting. Six of the British studies matched police and hospital data (Tunbridge *et al.*, 1988; Bull and Roberts, 1973; Hobbs *et al.*, 1979; Mills, 1989; Nicholl, 1980; Pedder *et al.*, 1981) and one study matched police and GP data (Saunders and Wheeler, 1987). However, the reporting rate is not defined by James for the studies summarised, so it is difficult to assess whether the studies used the same definitions and methodology. What is clear from these studies is that, as severity of injury increased, the more likely that the accident had been reported to the police. Injuries to pedal cyclists where a motor vehicle was involved were found by Mills (1989) to be under-reported by a large margin.

Austin (1992) matched police and hospital records for Hull Royal Infirmary and found a matching rate of 67%. The matching rate was defined as the proportion of the 1593 hospital records that were matched with the police record (in this case 1,067 out of 1,593). The names and addresses of casualties were available for matching.

Tunbridge *et al*. (1988) collected information on road traffic casualties presenting to the John Radcliffe hospital in Oxfordshire for 1983 and 1984. Reporting rates to the police are given but it is not stated how these are calculated. Personal communication with the author revealed that the reporting rate was calculated as the proportion of casualties in the hospital record who are also in the police record.

Hopkin *et al.* (1993) in their study of accidents in Greater Manchester hospitals estimated under-reporting of road accident casualties (a casualty in the hospital record for which there is no corresponding police STATS19 record) and under-recording of casualties (where a casualty states during a follow-up survey that their accident has been reported to the police but no corresponding STATS19 record is found). The study found that the less severe the injury, the higher the likelihood of under-recording. However, 20% of injuries were not recorded when they were reported and 16% of those unrecorded injuries were serious injuries. The group with the highest levels of under-recording was found to be car occupants.

Under-recording is thought to be predominantly a clerical error in the transfer of data from one record format to another, or the exclusion of those in multiple casualty accidents thought to be uninjured at the scene (and therefore not entered on the police database) but who subsequently attended hospital and did not then report the injury to the police. Numerous reasons for under-reporting are given – the accident not fitting legal requirements, an ignorance of the legal requirements, the perception of injuries as being too trivial to report, and not being aware of the injuries sustained until a period of time after the accident.

Simpson (1996) matched police STATS19 records with 20,164 A&E records of road traffic accidents collected in 16 hospitals during 1993 using an extension of the Department of Trade and Industry’s (DTI) Accident Surveillance System. The results are shown in Table 2.1.

Table 2.1: Matched police STATS19 records with A&E records of road traffic accidents collected in 16 hospitals during 1993 (Simpson, 1996)

Treatment outcome in the hospital sample	Per cent of casualties in sample
No further medical attention	46
Examined but not treated or did not wait for treatment	9
Referred to their GP	16
Referred an outpatient clinic	16
Admitted or transferred to another hospital	10
Unknown outcomes	2

Simpson's (1996) estimate of under-recording is about 22%, with slight injuries at 24% being more under-recorded than serious ones (11%). In addition, the hospital data were matched with STATS19 data for accidents occurring within the hospital's catchment area. Names and addresses were not used in either dataset. Of the 20,164 casualties in the hospital record, 9,337 (46%) were matched with the STATS19 record. This is similar to the percentage found in the Manchester study by Hopkin *et al*. (1993).

Simpson estimated the levels of under-reporting and under-recording by using a follow-up interview to ask casualties whether the police had attended the scene of the accident or whether they, or someone else, had given the police details of the accident. About 60% of the casualties in the hospital database considered that they had reported their accident to the police. This level of self-reporting varied by casualty class, with car occupants most likely to report their accidents (70%), followed by pedestrians, motorcyclists and other vehicle occupants (55–60%), with pedal cycles rather unlikely to report their accidents (22%).

Simpson also looked at casualty reporting rates by road type. Not-surprisingly, the highest rate was found on motorways (78%), followed by rural roads (68%) then urban roads (58%). This, in part, reflects the higher reporting rate for car occupants who are in the majority on the non-urban roads. From the analysis it is estimated that the police records contain higher proportions of

- casualties whose vehicles were severely damaged;
- casualties whose injuries were apparent at the accident scene;
- casualties who were transported to hospital by the emergency services;
- casualties who attended hospital shortly after the accident; and
- accidents resulting in more than one casualty.

Cryer *et al*. (2001) produced a linked database between 2,666 hospital admissions records and STATS19 records for Sussex NHS hospitals during the period April 1995 to March 1998. The Abbreviated Injury Scale (AIS) (Association for the Advancement of Automotive Medicine, 1990) is commonly used by hospitals to describe the severity of injury where:

- AIS 1 is a minor injury;
- AIS 2 is a moderate injury;
- AIS 3 is serious;
- AIS 4 is severe;
- AIS 5 is critical; and
- AIS 6 is the maximum injury which is currently unsurvivable.

An AIS of 3 or greater is considered a serious injury. However, this does not map neatly onto the STATS19 classification of serious where some injuries in AIS 2 are considered serious. Cryer distinguishes the STATS19 serious injury in the hospital AIS 2 record as 'non-slight'. It is well known that for minor and moderately severe injuries (AIS 1 and 2), hospital admissions can be influenced by certain factors, such as socio demographic, health service provision and access to the hospital, so hospital data themselves are not always a reliable indicator of the severity of injury (Lyons *et al.*, 2005). For example, children are more likely to be kept in for observation than other age groups. Those with a minor or moderate injury who can get to a hospital easily may be more likely to attend than those who live some distance away. Also bed availability can influence whether a casualty is admitted or referred to an A&E or outpatient clinic. More serious injuries are thought to be less influenced by these factors.

In a study of pedestrians in Northampton, the reporting rate was 76% (Ward *et al*., 1994). In this study the reporting rate was defined as all casualties reported to the police divided by all known casualties. This comprises all those recorded by the hospital plus those known only to the police (i.e. those appearing only in the police record but not present in the hospital record).

The same methodology was used for a study of road traffic casualties in the Gloucester Safer City project for the years 1996 to 2000 (Ward and Robertson, 2002). Casualties recorded by the police and casualties recorded by the Gloucester Royal Infirmary were matched to identify those known only to the police, known only to the hospital and known to both (i.e. matched records). Casualty numbers and reporting rates were analysed. A similar analysis was undertaken for a nearby comparison town for the years 1996, 1998 and 2000. This was to establish whether underlying reporting rates had changed across the region. The rates did increase from about 52% to about 60% in Gloucester but stayed at about 53–54% in the comparison hospital. This study is updated in Section 5.3 of this report.

Ward *et al.* (2005) have also completed a study of the under-reporting of casualties in London. The calculation of the reporting rate was the same but the way the sample was selected differed. Northampton, Cheltenham and Gloucester are free-standing towns, each with one hospital with a 24-hour A&E department to which nearly all casualties would be taken. In London, and other major conurbations, there is a greater density of hospitals and therefore greater choices where a casualty might be taken. The methodology is described in Ward *et al.* but the indications are that the reporting rate as measured by the study for London is higher than elsewhere, and could be as high as 70%.

2.3 Summary

Table 2.2 provides a summary of the results of the published studies of under-reporting. Some studies provided details of the type of road user whereas others provided overall results for all road users combined.

Table 2.2: Summary of previous studies of under-reporting

Author, year	Type of study	Per cent of all reported	Other percentages reported
Bull and Roberts, 1973	Police vs hospital		Fatal 100 Serious 81 Slight 65
Nicholl, 1980	Police vs hospital	50	
Tunbridge *et al.*, 1988	Police vs hospital	61	Fatal 100 Serious 66 Slight 55
Austin, 1992	Police vs hospital		Cyclist 67 Pedestrian 75 Driver 61 Passenger 60
Hopkin *et al.*, 1993	Police vs hospital (no fatal)	64	Slight 69
Simpson, 1996	Police vs hospital	46	Bicycle 22 Car driver 70 Car occupant 53 Pedestrian 60 Motorbike 57 Serious 55 Slight 45
Cryer *et al.*, 2001	Police vs hospital (no fatal)	61	Vehicle 67 Bicycles 31 Motorbikes 69 Pedestrians 72
Broughton *et al.*, 2005	Police vs hospital	61	Cyclist 43 Pedestrian 66 Driver 67 Passenger 57 Motorbike 60
Ward *et al.*, 1994	Police vs hospital		Pedestrians 74
Ward *et al.*, 2005	Police vs hospital	52–60	

3 WHAT HEALTH DATA ARE AVAILABLE AND HOW CAN THEY BE USED TO ESTIMATE THE INCIDENCE AND SEVERITY OF ROAD TRAFFIC INJURIES?

The use of data from the NHS can provide insights into the nature of injuries sustained in road traffic accidents and can give a more finely graded assessment of severity than that data in current use by the police. It also provides additional information on those injured who might not report their injuries to the police.

There are several administrative health datasets or databases which can be used to provide insight into the number of patients injured from road traffic collisions accessing NHS treatments services. These include:

- Ambulance Service data;
- A&E department data;
- hospital inpatient data; and
- specialised databases.

These administrative datasets vary considerably across the UK, both in presence or not, and also in specific detail. Within Great Britain there are separate, comprehensive systems in England, Scotland and Wales for inpatient data. The comparison of the data from these datasets with STATS19 is quite difficult, as the operational definitions used by police officers to classify road traffic accidents are not widely used within the NHS. Staff within the NHS will tend to use a lay perspective to classify injuries as being due to a road traffic injury, and may include some which do not meet the STATS19 definition and exclude some which do, particularly cycling related injuries as will be demonstrated later.

3.1 Ambulance Service data

Emergency ambulances respond to 999 calls. When a call is made a series of questions is asked by the ambulance personnel using a system called MPDS (Medical Priority Dispatch System) or sometimes AMPDS (Advanced Medical Priority Dispatch System). MPDS was developed in the US and its purpose is to assess the seriousness of the situation, whether acute illness or injury, and to prioritise the use of the ambulance fleet in order to attend the most serious calls in preference to the less serious. AMPDS asks the following questions: ‘Tell me what the problem is’, ‘Tell me exactly what happened?’, ‘Is s/he conscious?’ and ‘Is s/he breathing?’.

The MPDS includes a list of 32 chief complaints which are shown in Appendix 1, with number 27 being road traffic accidents.

Ambulance services vary in their ability and procedures to collect data on the location of incidents. Some use an on-board global positioning system (GPS), some use the grid reference to the nearest property and then match this with a system called Addresspoint or Mastermap, and some have no system in place. Addresspoint is now part of an Ordnance Survey product which has grid references for every property with a postal address.

Such a system could be used as another method of monitoring the frequency and severity of road traffic collisions. Data from the system could be linked, in future, to the clinical and situational data collected by the ambulance crew on scene. The on-scene data may vary between ambulance services, but it usually contains a figure of a car and indications of damage to the car, the position of casualties within the car, a description of the injuries and the treatments provided. Whilst not all injured road traffic accident victims are conveyed to hospital by ambulance, a substantial proportion (49%) are and virtually all the most seriously injured.

The London Ambulance Service receives, on average, 29,000 callouts per year in London (Lowdell *et al.*, 2002). It is estimated that about 61% of the casualties in London arrive at A&E by ambulance (Ward *et al.*, 2005). The Metropolitan Police had about 44,500 reported casualties (Lowdell *et al.*, 2002). The difference between these two amounts gives an indication as to the number of injuries not requiring emergency treatment which will result in:

- being taken to hospital by private car;
- not being treated;
- being treated at the hospital at a later time; or
- being treated by a local GP.

The ambulance service only records a fatality when the casualty is pronounced dead at the scene of the accident. They are then usually taken by private ambulance directly to a mortuary. If this is not the case, the casualty is taken by NHS ambulance to hospital where the A&E staff continue to attempt stabilisation and resuscitation. If these attempts are unsuccessful, the casualty is recorded as dying at the hospital.

Anecdotal evidence suggests that, in the case of road traffic accidents, communication between the police and medical practitioners over road casualties has come full circle. Previously, the police would ring/return to hospital to check on a casualty status and then they may make an amendment to their record. However, this ceased to occur because of an increased emphasis on the privacy issues of the casualty. This now may be changing again as paramedics are being encouraged to contact the police to give them more precise information.

3.2 A&E department data

There are a considerable number of computerised A&E systems used in Trusts across Great Britain. The systems do not contain exactly the same variables or variable definitions, but have evolved from a fairly common core. The systems have been developed with considerable input from A&E clinicians and are often modified for local purposes. The purpose of the systems is to facilitate the care and treatment of injured and ill patients rather than to collect precise details on the factors involved in the causation. The systems often contain fields with 'Road Traffic Accident (RTA)' titles, for example the location of the incident in text, the role of the injured person (driver, occupant, pedestrian), and whether seat belts were worn or not. However, those fields are completed from questioning the injured party or from witnesses and are not subject to rigorous definitions. Hence, 'RTA' is used as understood by the general public and not as defined for STATS19 purposes. It is likely that some off-road incidents are recorded as 'RTAs'. In addition, some hospitals have ceased collecting these RTA codes following changes to the method of reimbursing costs of treatment from the insurance industry some years ago.

Appendix 2 shows the field names and type for the A&E dataset for hospitals in the Gwent area of Wales participating in the All Wales Injury Surveillance System (AWISS). Appendix 3 shows the new minimum dataset for the England area.

3.3 Hospital inpatient data

In each country an administrative dataset is collected on every patient admitted to a hospital as an inpatient or day case, and an electronic copy is submitted to a central NHS repository. In England, the system is called HES (Hospital Episode Statistics), in Wales it is PEDW (Patient Episode Database for Wales), and in Scotland it is the SMR (Scottish Morbidity Record).

The data are collected primarily to reimburse hospitals for work completed against contracts. The basis of a record is a period of care under a particular consultant, called a finished consultant episode (FCE). When a patient is transferred to the care of another consultant, another FCE commences. FCEs can be aggregated to hospital spells within a particular hospital. However, this does not take account of patient transfer between hospitals. Data linkage, using unique identifiers, is needed to create person-based records. The standard published hospital activity data are based upon FCEs and not individual patients. In recent years, the number of FCEs for patients has increased. Work carried out in Wales on hip fractures shows that between 1996 and 2002 there was a 30% increase in hip fracture related FCEs but no change in the incidence of hip fractures (Brophy *et al.*, 2006). Analysis of other types of injury has not yet been carried out and the magnitude of the FCE effect is unknown.

Analysing hospital inpatient data is quite a skilled task due to the way the data are structured and captured. The records follow quite a complex structure, with room for up to 14 diagnoses and 12 operative procedures for every FCE. Although the coding manuals dictate that the most important diagnosis or procedure are placed in the principal/main diagnostic or procedural fields, this is not always the case and analysis searching for any mention of specific diagnostic codes is needed to prevent missing cases. In the particular case of injury analysis, the issue is complicated by the fact that an injury should have two International Classifications of Diseases version 10 (ICD-10) codes, one to describe the external cause of the injury (V codes in the case of road traffic injuries), and the second and subsequent to describe the anatomical injuries (S and T codes). It is not always the case that the V codes are in the primary position and the S and T codes in subsequent diagnostic positions, or that each S and T code has an appropriate V code.

The purpose of any injury analysis using inpatient data needs to be clearly considered before specifying the data requirements. Injured patients may receive several bouts of treatment for the injury, or complications arising from the injury itself or from associated treatments. For instance, all injured patients in the inpatient database will have had an acute injurious event. For the vast majority of these patients they will have been admitted as an emergency. They may have subsequent elective admissions for further planned treatment, such as the removal of orthopaedic fixation devices or they may have emergency admissions as a result of later complications of the injury or its treatment, for example wound infections. In most cases emergency injury admissions occur via A&E departments, but in some cases a patient attending A&E might be referred to a specialist clinic in the next day or so, and it is then decided to admit the patient. For analysis designed to measure the incidence of hospitalised injuries, the appropriate metric will relate to emergency admissions. For analysis designed to measure the cost or burden of injuries, it would be appropriate to consider both emergency and elective admissions.

Another issue which arose when using hospital inpatient data to study injury incidence is that the data collected in the routine administrative databases include no real measure of severity. The ICD-10 codes for a laceration are the same irrespective of extent. Whilst it is clear that some injuries are more severe, in terms of threat to life, for example a hip fracture compared with a wrist fracture, there is no general measure of severity. Previous work carried out by one of the authors (Lyons *et al.*, 2006) in the European Commission funded EUROCOST project demonstrated the degree of variability of injury incidence across countries in emergency department (ED) and hospital discharge records (HDR) data. It is clear that factors such as bed availability and a surgeon's propensity to operate influence whether a patient with certain injuries are admitted to hospital (Lyons *et al.*, 2005). Changes in the supply of hospital beds and surgical practice will influence the number of injuries admitted over time. Thus, considerable skill is needed in the interpretation of inpatient data.

The dataset collected in the HES in England is shown in Appendix 4 and the subset of Scottish data needed for injury analyses is shown in Appendix 5. The PEDW dataset is very similar to that in the HES and is not included in the appendices.

3.4 Specialised health databases

There are an increasing number of speciality specific databases across the UK. Most are run by medical specialities for the purpose of measuring the quality of clinical activity and for conducting research and audit into the effectiveness of care.

3.4.1 Trauma Audit and Research Network Data

In the injury field, the Trauma Audit and Research Network (TARN) located at the Hope Hospital in Salford (www.ihs.man.ac.uk/ResearchNetworks/TARN) contains a considerable amount of useful data. TARN covers hospitals in England and Wales, and also some in Ireland. The main purpose of TARN is to carry out research and audit on the effectiveness of trauma services. Currently about 50% of hospitals participate in the network and there is an expectation that all hospitals will participate in the future. A separate system, the Scottish Trauma Audit Group (STAG) operated in Scotland from 1992 until 2004 and contains 52,000 records. TARN collects data on all patients admitted to hospital who fulfil any of the inclusion and exclusion criteria. The inclusion criteria comprises:

- trauma admission with length of stay 72+ hours;
- trauma patients admitted to a High Dependency Area;
- deaths of trauma patients occurring in the hospital, including the ED; and
- trauma patients transferred to another hospital for further care or admitted to a High Dependency Area.

The exclusion criteria comprises:

- isolated fractures of the femoral neck or single pubic rami in patients aged 65+;
- uncomplicated spinal sprains;
- closed facial injuries;
- simple skin injuries, including uncomplicated penetrating injuries; and
- less than 10% superficial or partial thickness burns.

There is also a list of exclusion criteria for less severe injuries to single body areas.

Data are collected on the mechanism of injury and it is possible to group patients into categories of road user, such as drivers, car passengers, pedestrians, motorcycle drivers and passengers, other road traffic accident groups, and non road traffic accident related injuries.

The TARN database codes the severity of injuries using the Abbreviated Injury Scale (AIS) and Glasgow Coma Scale (GCS), and computes several injury severity scores, including the Injury Severity Score (ISS) and the Revised Trauma Score (RTS). By combining information from RTS, ISS, age and method of injury (blunt/penetrating), a TRISS score (Trauma score and ISS) is computed.

TRISS provides a measure of the probability of survival given the severity and type of injury. Using these data, it is possible to calculate a standardised mortality ratio for each participating hospital from the observed and expected (from TRISS) deaths. The system is designed to provide objective feedback on performance, which is then used in the context of audit to improve care and subsequent performance.

As hospitals joined at different time periods, it does not make sense to analyse the overall trend data as larger and more trauma intensive hospitals tended to join earlier. A total of 156 hospitals have supplied data at some point in time. However, there are 33 hospitals which have supplied high-quality data between 1996 and 2003, and it is more sensible to measure trends within this group. Grouping hospitals in relatively large numbers also reduces problems with data confidentiality due to small numbers in some categories and the potential identification of individual doctors and patients.

3.4.2 GP data

In general, minor injuries may not need medical treatment at a hospital and the casualties may treat their own injury at home, visit their GP or attend a minor injuries unit. Casualties with these minor injuries may well report their accident to the police but will not appear in the hospital record. Saunders and Wheeler (1987).in James (1991) did match GP and police data. They found that only 24% of those who went to their GP to have their injury treated also went to the police. However, the sample size of 21 is so small that the accuracy of their results is unclear. The Neighbourhood Road Safety Initiative Evaluation Team interviewed a sample of 2,000 adults as part of the community surveys. They found that 96 people (5%) had been injured in a road traffic accident in the last year and, of these, 50% went to their GP and only 36% went to hospital (Neighbourhood Road Safety Initiative Evaluation Team, 2006). This suggests that minor injuries are the most likely injury of road traffic accidents and the reason why these casualties are often not seen at the hospital.

4 SAMPLE ANALYSES OF AVAILABLE HEALTH DATA

4.1 Ambulance Service data

Table 4.1 shows the percentages of casualties, by road user category, that are conveyed to a Welsh A&E department by ambulance. The data show that pedestrians (62%) are most likely to be taken to hospital by ambulance, whilst car drivers (33%) are the least. There are no obvious trends in the percentage of injured road users conveyed to hospital by ambulance, although the rate for pedestrians is about double that for drivers, suggesting more serious injuries. Ward *et al.*'s (2005) London study indicates a higher rate of about 61% of casualties taken to hospital by ambulance. However, the dense network of hospitals and ambulance stations in London makes it difficult to compare with the rest of the Great Britain.

Table 4.1: Percentage of injured road users conveyed to a Welsh A&E department by ambulance from 2001 to 2004

Road user category	Year			
	2001	2002	2003	2004
Driver	33.3	32.3	34.2	30.5
Passenger	40.0	38.2	45.4	39.9
Motorcyclist	48.4	52.4	49.7	48.1
Pedestrian	62.1	61.9	59.6	64.2
Cyclist	58.5	64.3	67.3	53.2

4.2 Data by road user type from one Welsh A&E department from 2001 to 2004

Data on trends in the severity of injuries by type of road user from 2001 to 2004 for one of the hospitals in Wales have been analysed. Table 4.2 shows trends in the numbers attending over the four-year period, and Table 4.3 shows the percentages admitted to hospital from the A&E department. Drivers include all motor vehicles excluding motorcyclists. Motorcyclists include rider and pillion passengers. Passengers exclude pillion passengers.

Table 4.2: Trends in the numbers of injured road users attending a Welsh A&E department from 2001 to 2004

Road user category	Year			
	2001	2002	2003	2004
Driver	1,404	1,475	1,460	1,582
Passenger	843	846	858	893
Motorcyclist	221	167	191	208
Pedestrian	285	247	240	240
Cyclist	65	56	49	62
All road users	2,818	2,791	2,798	3,543

Table 4.3: Percentage (number) of injured road users admitted to hospital from a Welsh A&E department from 2001 to 2004

Road user category	Year			
	2001	2002	2003	2004
Driver	6.7 (94)	4.7 (72)	5.1 (75)	3.7 (58)
Passenger	6.6 (56)	7.8 (66)	5.5 (47)	5.0 (45)
Motorcyclist	19.5 (43)	22.2 (37)	18.8 (36)	21.2 (44)
Pedestrian	23.5 (67)	24.3 (60)	24.6 (59)	18.8 (45)
Cyclist	7.7 (5)	17.9 (10)	20.4 (10)	9.7 (6)
All road users	9.4 (265)	8.8 (245)	8.1 (227)	5.6 (198)

The numbers show quite a bit of year-to-year variability, particularly as they are low for certain road categories, making it difficult to judge trends. However, at this Welsh hospital the composite numbers show a small downward trend in admissions, with the percentage of those attending A&E who are then admitted ranging from 9% to about 6%. This is comparable with Simpson's 1996 study, where she found that about 10% were admitted.

There is no real change in cyclist and motorcyclist injuries, some reduction in pedestrian injuries, and some increase in injured drivers and passengers attending the A&E department. The admissions and ambulance data are broadly in agreement (Table 4.1), with drivers and passengers showing a low and decreasing likelihood of transference to hospital by ambulance with much higher rates for motorcyclists and pedestrians.

Tables 4.4–4.6 show the actual numbers by road user type who are followed-up at:

- a fracture clinic or hospital outpatient department;
- have planned follow-up at an A&E department; and
- those who have no planned follow-up or are referred back to their GP.

Common sense dictates that these groups could be assumed to have decreasing orders of severity, although this has not been tested empirically. Changing patterns of care can shift patients with the same injury between inpatient and outpatient care and between specialisms.

Table 4.4: Number of injured road users followed-up at a fracture clinic or specialist outpatient department from 2001 to 2004

Road user category	Year			
	2001	2002	2003	2004
Driver	39	36	33	25
Passenger	33	13	18	20
Motorcyclist	33	25	30	36
Pedestrian	22	13	19	24
Cyclist	8	3	10	11
All road users	135	90	110	116

Table 4.5: Number of injured road users with planned follow-up treatment in a Welsh A&E department from 2001 to 2004

Road user category	Year			
	2001	2002	2003	2004
Driver	24	29	40	63
Passenger	14	19	21	30
Motorcyclist	15	13	26	19
Pedestrian	21	16	14	24
Cyclist	8	2	6	3
All road users	82	79	107	139

Table 4.6: Number of injured road users attending a Welsh A&E department with no planned hospital follow-up from 2001 to 2004

Road user category	Year			
	2001	2002	2003	2004
Driver	1,232	1,323	1,315	1,432
Passenger	730	744	761	787
Motorcyclist	124	85	91	103
Pedestrian	170	152	145	137
Cyclist	44	41	22	40
All road users	2,300	2,345	2,334	2,499

The data in these tables show a tendency towards fewer inpatients, fairly constant referrals to fracture/specialised clinics, an increasing trend for follow-up within the A&E department, and the vast majority (over 80%) of cases having no planned hospital follow-up. However, it is impossible to tell whether these trends are due to fewer admissions or due to changes in medical and health service practices.

Table 4.7 shows that the percentages of road traffic accident casualties admitted from an A&E department in an English hospital are broadly similar to the Welsh hospital and Simpson's study, at about 9% of casualties. The admissions are about half of the total of serious injuries. Simpson's 16 hospital study found that about 62% of serious injures were admitted. There has been a small decrease in the level of admission, matched by a small increase in the numbers referred to follow-up at outpatient clinics. The vast majority (over 80%) of people are discharged to no further treatment or to their GP.

Table 4.7: Percentage of people admitted, referred to clinics or discharged at an A&E department at an English hospital following a road traffic accident, 1996–2004

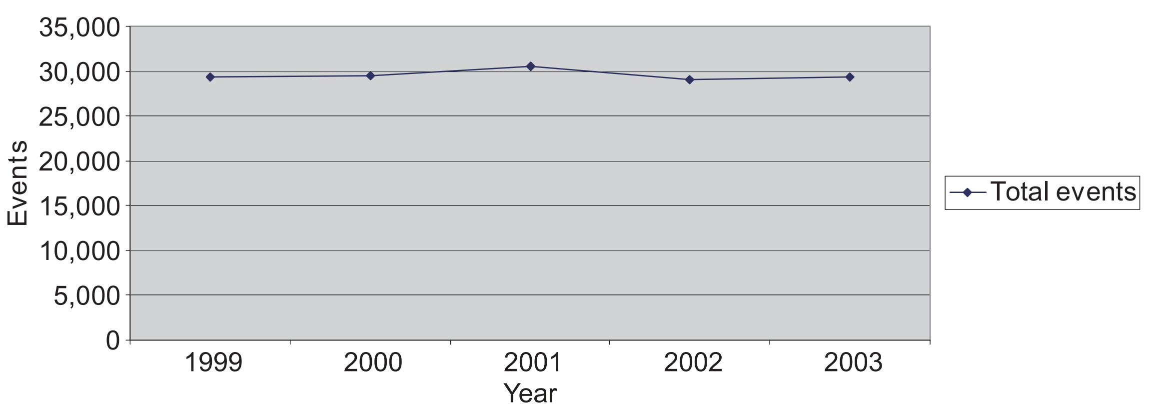
	1996	1998	1999	2000	2001	2002	2003	2004
Admitted/transferred	13.0	9.5	9.8	9.9	9.0	11.7	9.3	8.6
A&E clinics	2.3	2.3	2.3	0.9	1.4	1.7	0.4	0.8
Follow-up/outpatient	4.3	10.1	7.8	7.5	6.9	6.9	3.7	5.0
Discharged/sent to GP/did not wait	80.4	78.1	80.1	81.8	82.7	79.6	86.6	85.7

4.3 Hospital inpatient data

4.3.1 All admissions

An analysis has been made of the HES (Hospital Episode Statistics) data for England, the PEDW (Patient Episode Database for Wales) data for Wales and the SMR (Scottish Morbidity Record) data for Scotland. Figures 4.1–4.3 show the total numbers relating to hospital admissions following a road traffic accident (in the HES data it is referred to as a motor vehicle traffic accident – MVTA). The data represent individuals and not episodes of care.

Figure 4.1: Trends in admissions – HES for England



The trend for admissions following a road traffic injury for England is flat, whilst those for Wales and Scotland are declining slowly.

Figure 4.2: Trends in admissions – PEDW

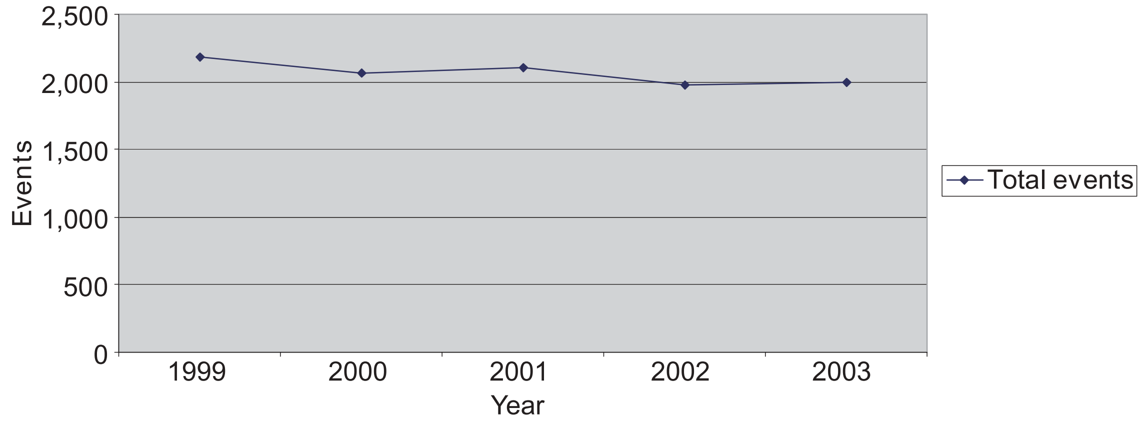
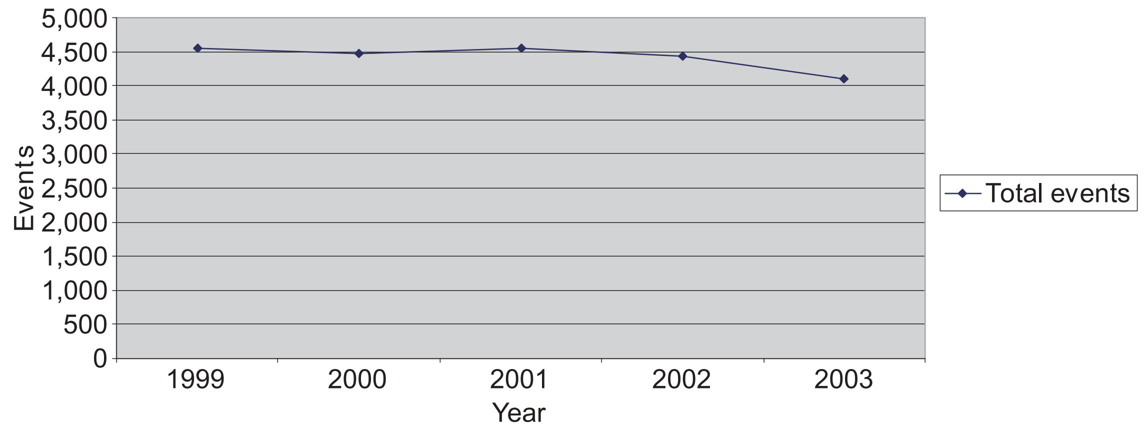


Figure 4.3: Trends in admissions – SMR



4.3.2 Admissions by road user group

The previous section has considered all admissions, but the HES, PEDW and SMR data allow disaggregation by road user group. Figures 4.4–4.6 show the trends in the numbers of people admitted to hospital in England, Wales and Scotland.

Figure 4.4: Trends in admissions by road user group – HES for England

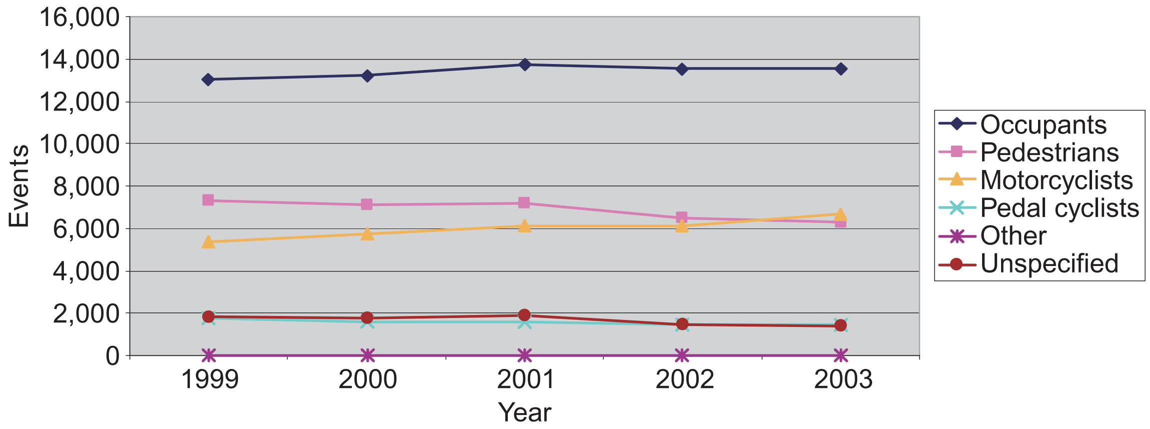


Figure 4.5: Trends in admissions by road user group – PEDW for Wales

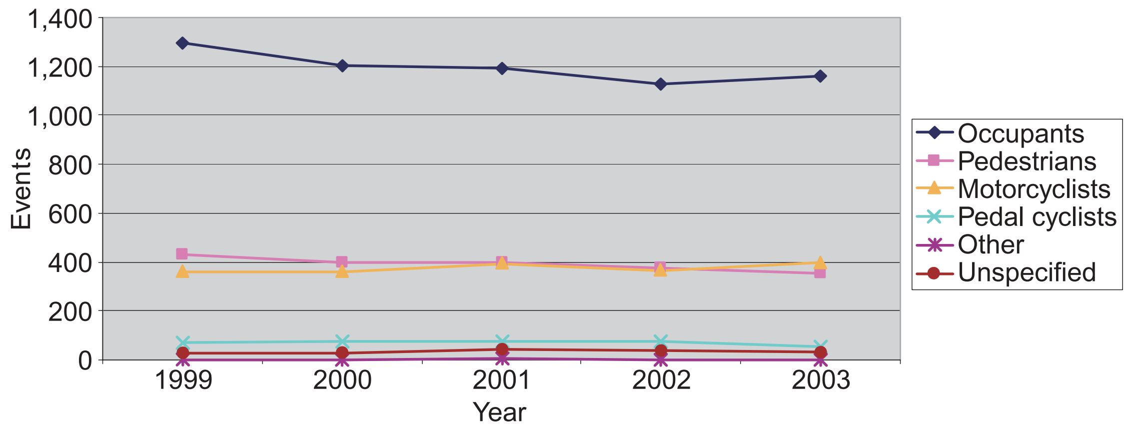
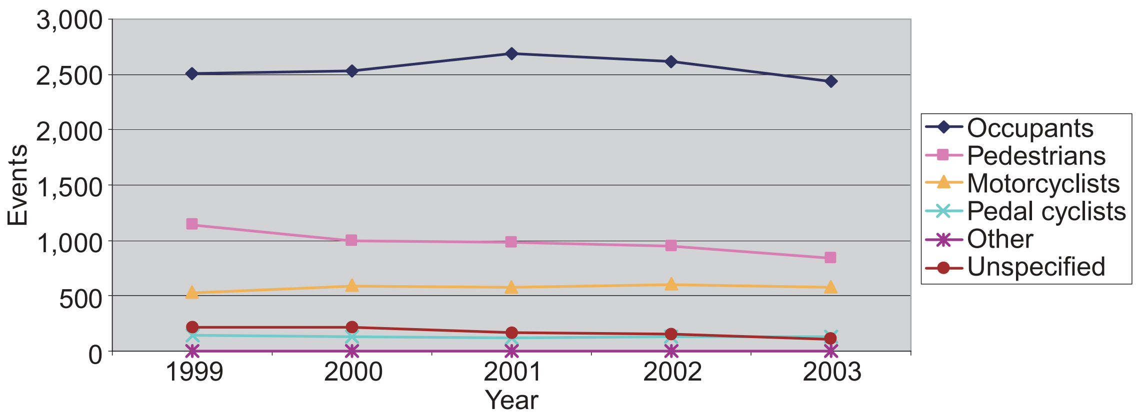


Figure 4.6: Trends in admissions by road user group – SMR for Scotland



The trends in admissions by road user group in the three datasets show differences. Those for England and Scotland show a relatively flat trend for vehicle occupants (the difference between 1999 and 2003 is an increase of 3% for England and a decrease of 3% for Scotland), whilst Wales shows a declining trend (10% difference between 1999 and 2003). There are large reductions for pedestrians in each database, with the reduction for England being about 13%, Wales 17% and Scotland about 25%. England has seen the largest rise in motorcyclist admissions with 25%, Wales and Scotland are more modest with 11% and 9%, respectively.

4.4 Analysis of data from 33 hospitals included in the Trauma Audit Research Network database

Table 4.8 shows that there has been no decline in the number of serious road traffic related injuries admitted to the 33 core hospitals in the Trauma Audit Research Network (TARN) between 1996 and 2003. There is quite a bit of year-to-year variability in the data. There has been an increase in the number of non-road injuries admitted over this period, but it is not possible to determine why this increase has occurred. The data are shown in Figure 4.7.

Table 4.8: Number of road traffic and non-road injuries. Cases from 33 core hospitals. TARN, 1996–2003

Year	Road	Non-road	Total
1996	3,089	6,273	9,362
1997	3,072	6,482	9,554
1998	2,766	6,332	9,098
1999	2,919	7,025	9,944
2000	2,788	7,037	9,825
2001	2,876	7,571	10,447
2002	3,042	7,706	10,748
2003	3,147	7,636	10,783

Figure 4.7: Number of road traffic and non-road injuries. Cases from 33 core hospitals. TARN, 1996–2003

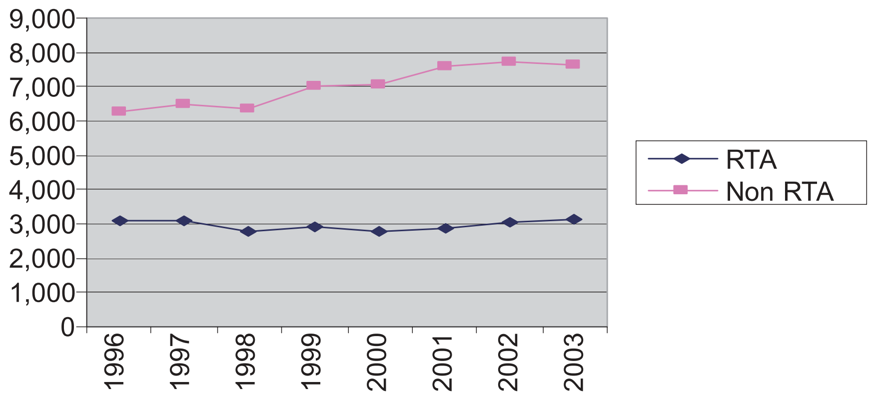


Table 4.9 shows that the distribution of injured road users has changed substantially over the 1997–2003 period. There is quite a bit of year-to-year variability but there are clear trends for pedestrians and motorcyclists, with a reduction in the former and an increase in the latter. Car drivers have increased since 1998. The data are shown in Figure 4.8.

Table 4.9: Number of road traffic injuries (by category of road users. Cases from 33 core hospitals. TARN, 1996–2003

Year	Drivers	Car passengers	Pedestrians	Motorcyclists	Other categories
1996	803	486	926	570	304
1997	786	491	903	593	299
1998	648	394	883	594	247
1999	679	430	842	676	292
2000	672	403	781	683	249
2001	742	395	758	737	244
2002	749	466	712	866	249
2003	833	429	708	900	277

* Other categories include road users where their road user type is unrecorded.

Figure 4.8: Number of road traffic injuries by category of road users. Cases from 33 core hospitals. TARN, 1996–2003

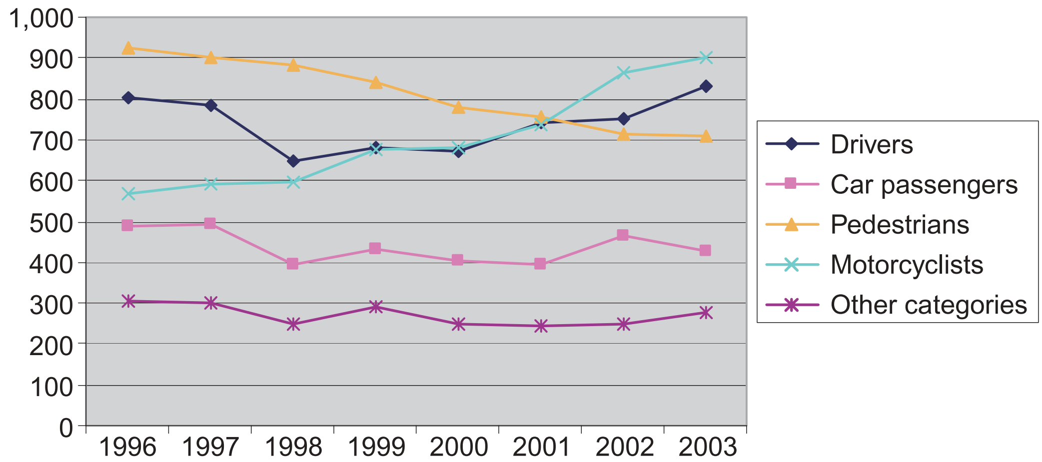


Table 4.10 shows the median injury severity score (ISS) by category of road user over the period 1996–2003. There has been hardly any change, indicating that there has been no trend in the severity of serious road traffic related injuries in the catchment areas of the 33 hospitals over this time period.

The ISS is a scoring method which provides a general severity score for casualties. An ISS score is calculated through Abbreviated Injury Scale (AIS) scores (see Section 2.2). A casualty's three most severe AIS scores are squared and combined to produce the ISS score. The ISS score ranges from 0 to 75. If any injury is given an

AIS of 6, then the ISS score is automatically assigned to 75. The ISS score correlates with mortality, morbidity and hospital stay.

Table 4.10: Trend in median ISS by selected road user categories from 33 core hospitals participating in TARN

Category	1996	1997	1998	1999	2000	2001	2002	2003
Drivers	10	10	10	10	10	10	10	10
Car passengers	10	10	10	10	10	10	10	11
Pedestrians	10	10	10	10	10	10	10	10
Motorcyclists	9	9	9	9	9	9	9	9
Non-road users	9	9	9	9	9	9	9	9

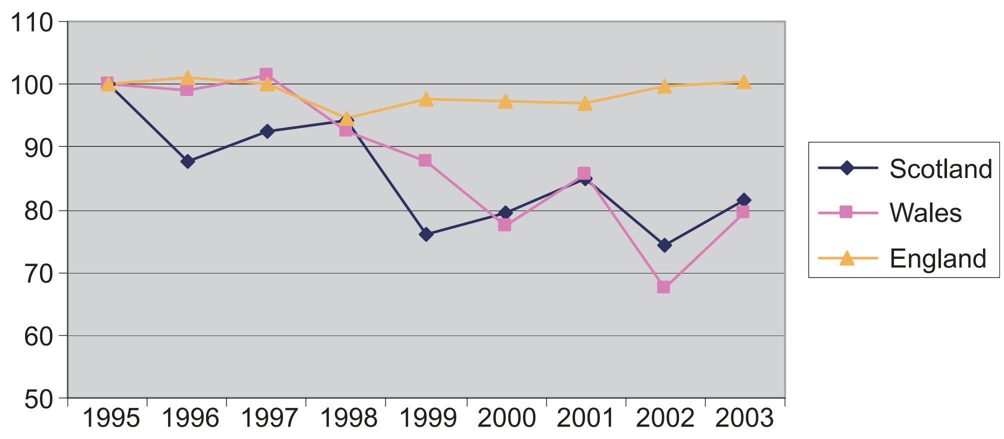
5 NATIONAL COMPARISON BETWEEN HOSPITAL ADMISSIONS DATA AND STATS19 DATA

5.1 Trends in STATS19 data

The following analysis is of casualty data from the STATS19 records from all regions across England, Wales and Scotland from 1995 to 2003. The data are shown as indices, with 1995 as 100 so that the fatal casualties are directly comparable with the serious injuries.

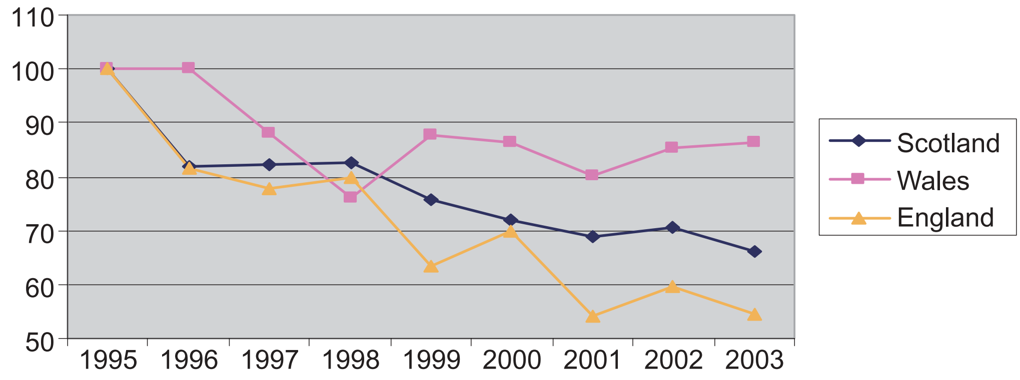
Figure 5.1 shows that fatal casualties are declining steadily in Scotland and Wales but are remaining steady in England. No region in England shows either a clear increase or decrease in fatal casualties. Approximately half the England police force areas have an increasing trend in the number of fatal casualties.

Figure 5.1: Fatal casualties in the STATS19 record for England, Scotland and Wales



STATS19 data show an overall reduction in the number of 'serious' category casualties (Figure 5.2). Serious causalities have reduced in England, Scotland and Wales. England shows the steepest decline. All regions in England show a clear downward trend in serious casualties. Serious casualties have reduced in all police forces with the exception of Thames Valley, Essex and Cleveland.

Figure 5.2: Serious casualties in the STATS19 record for England, Scotland and Wales



5.2 Comparison between hospital admissions data and STATS19 data for Great Britain

The STATS19 definition of serious injury is much broader than the term 'admission' and includes fractures and other injuries that are treated at specialist clinics as outpatients. Table 4.7 indicates that about 20% of road traffic accident casualties attending an A&E department could be considered serious in STATS19 terms (admissions, fracture clinic, planned follow-up), with admissions comprising about half of this category.

Table 5.1: Comparison of hospital admissions and STATS19 casualty numbers for Great Britain for the years 1999 to 2003

	1999	2000	2001	2002	2003
England (HES)	29,294	29,419	30,494	29,067	29,396
Wales (PEDW)	2,182	2,065	2,105	1,981	1,996
Scotland (SMR)	4,558	4,476	4,542	4,443	4,098
Great Britain total	**36,034**	**35,960**	**37,141**	**35,491**	**35,490**
STATS19 Great Britain					
Killed	3,423	3,409	3,450	3,431	3,508
Serious	39,122	38,155	37,110	35,976	33,707
KSI total	**42,545**	**41,564**	**40,560**	**39,407**	**37,215**

Table 5.1 shows a comparison between the admissions data for England, Scotland and Wales and the STATS19 casualty data for Great Britain (*Road Casualties Great Britain: 2004 – Annual Report*, Table 4c (Transport Statistics, 2005)). It can be seen that the trend for the hospital admissions across the three databases together is fairly flat but when taken individually Wales and Scotland are both decreasing slightly. The trends for England, Wales and Scotland, individually, can be seen in Figures 4.1–4.3.

In contrast, the trend for the seriously injured casualties in the STATS19 data is declining. The decline is greater in England than in Wales and Scotland, and this can be seen in Figure 5.2. In 1999 there were more seriously injured casualties in the STATS19 database than in the hospital admissions database, but by 2003 this had reversed.

An analysis of deaths following road traffic injuries in England, Wales and Scotland revealed that about 20% (588 in-hospital deaths in 2003) of deaths occur after admission to hospital. This finding means that the most appropriate STATS19 comparator for hospital admissions is the number of serious injuries rather than killed and serious (KSI) combined. The number of hospital admissions in Table 5.1 is of similar magnitude to the STATS19 serious category over this period, but there is a rising trend for more admissions than serious injuries in the STATS19 database, from 92% in 1999 to 105% in 2003. Some of this change may be due to changes in healthcare practices, but this is unlikely to be a large effect, which at the moment is unquantifiable. This finding, taken together with the finding that admissions account for about 50% of all serious injuries attending A&E departments (serious as defined by an admission, referral to fracture clinic or other specialised clinics, or planned follow-up at hospital), means that the number of serious casualties in STATS19 could be under-reported and/or be under-recorded by as much as a half, and it is possible that this has risen over recent years.

It is useful to disaggregate by road user type because some road users, such as pedestrians, are more likely to be hospitalised as a result of their injuries than other groups. Earlier, the figures in Table 4.3 showed that nearly a quarter of injured pedestrians arriving at an A&E department are admitted. This compares with about 5% of drivers and 20% of motorcyclists. The number of pedal cyclists was very small but the figure could be somewhere between 10 and 20%.

Table 5.2 shows the number of admissions by road user group to hospitals in England, Wales and Scotland combined and the relevant serious injury STATS19 figures from the *Road Casualties Great Britain: 2004 – Annual Report* (Transport Statistics, 2005). A note of caution is that the hospital data will include all pedestrian and pedal cyclist injuries that occur in a public place and can be thought of by a lay person as a road accident. These may include injuries sustained in car parks and for children and adults falling off bicycles in the road but not as a result of a collision with a motorised vehicle. However, it is unlikely that these represent a considerable proportion of injuries. The other feature to note is the high level of unspecified injuries in the hospital database, although there does seem to have been a reduction in these which could be due to an improvement in the classification system at the hospital.

Table 5.2: Comparison of hospital admissions and STATS19 serious casualty numbers by road user group for the years 1999 to 2003						
		1999	**2000**	**2001**	**2002**	**2003**
Pedestrians	Hospital	8,888	8,499	8,573	7,831	7,513
	STATS19	8,955	8,641	8,238	7,856	7,159
Pedal cycles	Hospital	1,998	1,791	1,748	1,622	1,629
	STATS19	3,004	2,643	2,540	2,320	2,297
Motorcycles (riders and passengers)	Hospital	6,216	6,655	7,079	7,091	7,643
	STATS19	6,361	6,769	6,722	6,831	6,959
Occupants of all vehicles (drivers and passengers)*	Hospital	16,854	16,998	17,633	17,278	17,137
	STATS19	20,571	19,880	19,416	18,684	17,089
Other and unspecified	Hospital	2,078	2,017	2,108	1,669	1,569
	STATS19	250	241	216	243	234
All road users	Hospital	36,034	35,960	37,141	35,491	35,490
	STATS19	39,122	38,155	37,110	35,976	33,707

* Includes cars, buses, light and heavy goods vehicles.

Table 5.2 is difficult to interpret as there are many factors at work simultaneously. With the exception of cyclists, the number of road users recorded as hospital admissions or serious injuries in STATS19 is quite similar, indicating that the degree of under-reporting or under-recording is fairly similar across road user types.

STATS19 consistently reports about 50% more serious cycling injuries than the hospital admissions databases. This is because records in the hospital database have been excluded that have the ICD-10 mortality code V18, pedal cyclists in non-collision transport accidents. (Those that have the codes V12 to V14 and V19 are included.) An analysis of the Wales and Scotland data indicates that these included pedal cycle admissions which are about 10% of the total admissions for pedal cycle injuries. If the number presented in the admissions data in Table 5.2 are scaled up, the resulting number would be about 16,000 pedal cycle injuries admitted to hospital, which is about five or six times the STATS19 figure for serious injuries. This is obviously excessive as it is similar to the vehicle occupant admissions figure. As inpatient data do not contain geographic location data, it makes interpretation difficult because many of these will not be on the pubic highway, for example in gardens, parks and off-road tracks, and we cannot distinguish them.

Of course, many cycling injuries meeting the STATS19 definition of serious will be treated and followed up at fracture clinics and outpatient departments and will not be admitted to hospital, but the same argument will extend to other categories of road user.

Vehicle occupants show diverging trends in both databases. There are about 3,700 fewer admissions than serious injuries in 1999 but, as a result of falling numbers in the STATS19 database, there are more admissions in 2003 than injured occupants in STATS19. This suggests some changes in the consistency of coding in STATS19. As slight injuries are about 10 times more common than serious injuries in STATS19, a very small change in judgement about the operational threshold for this categorisation could easily produce this degree of change and might well be imperceptible to those who made the change.

The fact that both databases show a considerable reduction in pedestrian injuries indicates that serious injuries to this group of road user are declining. For motorcyclists the trends are in the opposite direction, with a substantial increase in serious injuries in both databases which is undoubtedly due to the increasing use of this mode of transport. Again, there are more admissions than serious injuries in the STATS19.

5.3 Matching of A&E department data with STATS19 data for two English hospitals

5.3.1 Cheltenham General Hospital

STATS19 and A&E data for one English hospital were collected for the years 1996–2000 as part of the Gloucester Safer City Project, where Cheltenham was used as a comparison town. Data for 1997 are not available because in the original study only alternate years were used and the 1997 data are no longer in the hospital archive. For the purposes of the present study, data were requested for 2001–04 to enable analyses to be undertaken to detect possible trends in reporting.

The hospital data have been reclassified into five categories:

- fatal;
- admitted;
- referred to A&E clinic;
- followed-up or outpatient;
- discharged or sent to GP or did not wait.

The data contained information on diagnostic text (what injuries were) as well as hospital outcome (disposal codes: discharged, inpatient, etc.). The severity and type of injury dictates which disposal code a casualty is placed in. The most common injuries when treated in A&E and discharged or sent to a GP or did not wait were:

- neck sprain/pain/whiplash;
- lacerations;

- back pain/sprain;
- muscular pain;
- musculoskeletal injury;
- chest wall injury;
- grazes;
- sprain;
- abrasions;
- bruising;
- contusion;
- soft tissue injuries; and
- minor head injury.

The most common injuries when referred to an A&E clinic, outpatient department and for follow-up were:

- neck sprain/pain/whiplash;
- lacerations/cuts;
- bruising; and
- fractures.

The most common injuries when referred to an inpatient department and transferred to another hospital were:

- head injury;
- lacerations; and
- fractures.

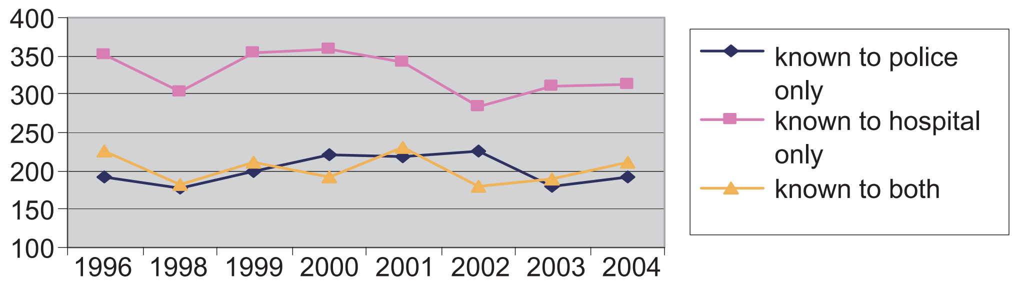
STATS19 data and A&E data were matched and a reporting rate of between 54% and 57% was identified (see Table 5.3). Several previous studies (Cryer *et al*., 2001; Simpson, 1996; Austin, 1992; Broughton *et al.*, 2005) have looked at the different reporting rates by casualty category (for example driver, passenger or pedestrian), however, as the hospital records do not show this level of detail it has not been possible to perform a similar analysis.

Table 5.3: The overall picture of casualties at an English hospital known to police and hospital

	Police records		Hospital records		Police and hospital		
Year	Known only to police	All reported to police	Known only to hospital	All recorded by hospital	Casualties matched and known to both	All known casualties	Percentage reported to police
	(a)	(a + c)	(b)	(b + c)	(c)	(a + b + c)	(a + c)/ (a + b + c)
1996	192	419	352	579	227	771	54
1997	N/A						
1998	178	360	304	486	182	664	54
1999	189	410	351	565	211	764	54
2000	220	412	360	552	192	772	53
2001	219	449	341	571	230	790	57
2002	227	408	284	465	181	692	57
2003	181	370	311	500	189	681	54
2004	192	404	313	525	212	717	56

The number reported to the police ranges from 360 to 449 but there is no pattern across the years. The number recorded by the hospital ranges from 579 to 525 and this does show a small reduction. All known casualties range from 771 to 664 but, again, there is year-to-year variability and no discernable pattern. This is shown in Figure 5.3.

Figure 5.3: The number of casualties recorded by the police and the hospital



5.3.2 *Gloucester Royal Hospital*

Data on road user groups and age of casualty were available for the Gloucester Royal Hospital for the years 1996–2000. The number in each cell is quite small when disaggregated to this extent but the following tables serve to illustrate where reporting rates may be lower. It is not possible to spot trends over time with such a small and variable amount of data.

Table 5.4 shows the percentage of casualties reported to the police in each of the main road users groups for the years 1996–2000. There is a degree of variability in the reporting rates but the message that comes out clearly is that pedestrian and pedal cycles are quite well reported but that vehicle occupants and riders and passengers of two-wheeled motor vehicles are not.

Table 5.4: Reporting rates for casualties of each road user type for the years 1996–2000

Road user type	Percentage of all casualties reported to the police				
	1996	1997	1998	1999	2000
Pedestrian	69	78	71	76	70
Pedal cycle	55	73	85	74	70
Two-wheeled motor vehicle (rider and passenger)	51	59	56	59	68
Car, van and HGV (drivers and passengers	46	49	51	51	51
PCV (driver and passengers	100	75	89	84	96
Unknown/other	60	67	75	43	77
All	52	57	60	59	59

Table 5.5 shows reporting rates by age of casualty. The 20–24-year-olds are least well reported. However, children and older people are quite well represented.

Table 5.5: Reporting rates for casualties by age of casualty, 1996–2000

Age	Percentage of all casualties reported to the police				
	1996	1997	1998	1999	2000
0–4	64	58	57	31	60
5–9	44	61	69	61	50
10–15	63	57	73	67	67
16–19	50	57	48	66	59
20–24	41	47	53	54	45
25–34	47	51	57	57	57
35–44	59	62	63	53	64
45–54	61	67	68	57	57
55–64	46	63	66	67	65
65 and over	65	59	55	78	68
All	52	57	60	59	59

The reporting rates for pedestrians are broadly in line with work using the same methodology that was undertaken by Ward *et al*. (1994) in Northampton where the reporting rate was about 72%, with 16–29-year-old males and females most under-reported.

6 ESTIMATES OF MISRECORDING OF SEVERITY

6.1 Accident recording by the police

From the literature, and anecdotally, there is a suggestion that the way police record road traffic accidents may have changed. This would affect the levels of recording but not the levels of reporting. Police officers are not medically trained so assessing the level of severity of injury of casualties is not straightforward. It has long been recognised that there is a degree of underestimation of severity of serious injuries and some overestimation of slight injuries. To address some of the issues of recording, a series of interviews were undertaken with seven police officers from different police forces around the country.

All the officers had been with the traffic police for a minimum of 10 years so were able to report any changes they had experienced but none could pinpoint any specific changes that had been made to their recording systems that may have affected the way police record accidents or assess severity of injury. However, concerns were raised about four main areas in the way the police are organised as a whole that may have some impact on the way traffic accidents are recorded.

1. **Training**. There were concerns from all the officers interviewed about the quality of the training that the police receive in recording a road traffic accident. There have been changes to the way training is carried out in the last 10 years – some officers say there is no longer sufficient practical training for recording and investigating road traffic accidents.

2. **Downsizing of traffic branches** – the closure of some police stations and office-only hours at others. This has been occurring over the past 6–8 years and has resulted in a perceived loss in specialised skills. Traffic officers are trained to attend road traffic accidents and fill out accident report forms. However, it is becoming more common for non-traffic police to attend road traffic accidents in the normal course of their duty and it is these officers who do not have the specialised skills or experience of the traffic officers.

3. **Crime the priority**. Crime was seen to take priority over traffic at a national level. For example, two officers stated that until recently targets had only been set with regard to crime. This was perceived to be responsible for a lack of resources and money in the traffic divisions within the police. However, this is now starting to change with the introduction of police targets for road safety.

4. **The emergence of a compensation culture**. Most officers perceived a rise in the amount of accidents being reported. They all cited people wanting insurance or other forms of compensation as the reason for this occurring. There is a perceived rise in people attending stations to report accidents. As there are few trained traffic

officers stationed at local stations to record traffic accident details, this may be resulting in information being less accurately recorded.

6.2 Estimation of miscoding using the English hospital data and STATS19

Table 6.1 shows, for an English hospital, the results of matching A&E data with police STATS19 data for severity of injury. Tables for each year can be found in Appendix 6. The shaded area is the region in which the same casualty is found in both datasets. The category of '**casualties known only to the police**' is found in the police record but not in the hospital record and the category '**casualties known only to the hospital**' are only found in the hospital record. It is possible to look at severity in this way for those that match and for those only in the hospital record by mapping the disposal code and the STATS19 definition of severity. The final line in the table is the estimate of the reporting level to the police of casualties of that severity. The fatal casualties are not included in these tables as their numbers are very small.

In Table 6.1 and in the tables in Appendix 6, the reporting rate for serious casualties is greater than that for slight casualties. In Table 6.1 it is 61% for serious casualties and 49% for slight casualties. This is in accordance with the findings of previous studies where the more severe injuries are more likely to be reported. However, this needs to be considered further because some of the slight casualties in the police record appear as serious in the hospital record (as denoted by the disposal code) and some serious casualties appear as slight. We are referring to the extent to which this mismatch occurs as miscoding by the police. In this instance we are making the assumption (which may not be correct) that the hospital disposal codes are correctly recorded and that they reflect the outcome of trained medical assessment. It must also be stressed that the police are not medically trained and cannot be expected to make the correct diagnosis of severity even after asking the ambulance crews, who also are not able to judge severity accurately.

Table 6.1: Composite data for 1996 and 1998–2004 after matching casualties for an English hospital and STATS19

1996, 1998–2004		**Severity of casualties as recorded by the police**			
		Serious	**Slight**	**All police**	**All casualties**
	Casualties known only to the police	126	1,462	1,588	1,588
	Casualties only known to the hospital				
Admitted/transferred	198	111	110	221	419
Clinic/follow-up	193	24	121	145	338
Discharged/sent to GP/did not wait	2,253	67	1,173	1,240	3,493
All hospital	2,644	202	1,404	1,606	4,250
All casualties	2,644	328	2,866	398	5,838
Reporting rate		**61**	**49**		

The total for the eight years of police-recorded serious casualty data in an English hospital is 328 casualties (about 40 per year). Of these:

- 38% (126) are not found in the hospital record;
- 41% (135) are matched as serious in both records; and
- 21% (67) are classified by the police as serious but treated and discharged by the hospital (slight).

This indicates that some unknown proportion of the serious injuries found only in the police record are not in fact serious and that about 20% of the serious casualties that could be matched are in fact slight.

The police recorded 2,866 casualties (about 360 each year) as having slight injuries. Of these:

- 51% (1,462) are not found in the hospital record;
- 41% (1,173) are matched as slight in both records; and
- 8% (231) are classified by the police as slight and by the hospital as serious.

The hospital recorded a further 2,644 casualties not known to the police. Of these:

- 15% (391) were seriously injured; and
- 85% (2,253) were slightly injured.

It is not surprising that 50% of police-recorded slight injuries are not found in the hospital record as some of these injuries are very minor and are treated at home, at a minor injuries centre or by a GP. Whilst 8% of the injuries classed by the police as slight and the hospital as serious is not high in percentage terms, it represents a higher number (231) than those classified as serious by the police and slight by the hospital (67). What is of interest is that about the same number of people appearing in STATS19 as slightly injured people are admitted as those correctly appearing as seriously injured. This probably explains why the number admitted equals the total number of serious injuries in the STATS19. For the clinics and follow-up there are more in the slight category than the serious category. Whilst there is a bit of a grey area around the more minor clinic referrals, such as for whiplash, which are slight in STATS19, the picture is still one of interest and again it will not take much change at the serious/slight boundary to change the overall picture of severity.

From Table 6.1 it can be seen that about 50% (198 out of 419) of all people known to be admitted to hospital are known only to the hospital. Only a further quarter (111/419) are in the correct category of serious and the final quarter (110/419) are in the slight category and should be in the serious category. Possibly up to half the problem is under-reporting and half is misrecording. The unknown police data would need to be added to give a more accurate picture.

Hopkin *et al.* (1993) found in their casualty follow-up study that about 20% of casualties said they reported their injuries to the police but there was no record of this. 16% of these unrecorded injuries were serious. In this study we cannot say anything about under-recording (i.e. those completely missing from the record).

Unfortunately the numbers in the hospital data are too small and too variable to detect any definite trends across the years studied. Any miscoding at the lower level may not be perceived by the police and the interviews with the police officers indicated that something may have been changing slowly over time. This tentative finding would lend support to the conclusion that the greatest part of the misrecording is coming from the slight category and that should be in the serious category.

6.3 Estimation of misrecording of casualties in Co-operative Crash Injury Study data

Data from the Co-operative Crash Injury Study (CCIS) was available for analysis. CCIS is an ongoing database of road traffic accidents from around the UK. It is one of the world's largest studies, investigating over 1,000 crashes each year. Using this dataset it was possible to investigate how casualties were recorded by the hospitals and the police for the years 1994 and 2004 combined.

Table 6.2 provides insights into the extent of possible mis-coding by the police in this database. The category 'outpatient' is so large it must include all treatment at A&E as well as at specialist clinics so only a partial picture can be seen.

Of the police data classed as serious, 96% attended hospital either as an outpatient or inpatient. How many of the outpatients were treated at A&E and discharged to home or to their GP is not known, so it is not possible to estimate how many people were miscoded as seriously injured but in fact were slightly injured.

Table 6.2: Numbers (and percentages) of police severity classifications by hospital code

Hospital code	Police severity code				
	Fatal	Serious	Slight	Uninjured	Unknown
Did not attend hospital	12 (1)	130 (3)	1,254 (13)	223 (2)	147 (37)
Outpatient	2 (-)	1,617 (32)	7,151 (76)	265 (51)	139 (35)
Inpatient	96 (10)	3,202 (64)	802 (9)	12 (2)	41 (10)
Dead on arrival	693 (71)	1 (-)			
Dead before admission	164 (17)	2 (-)			
Other		2 (-)	11 (-)	6 (-)	1 (-)
Unknown	5 (-)	74 (1)	174 (1)	17 (-)	65 (-)
Total	972	5028	9392	523	393

Of those classed by the police as slight injuries, it can be seen that 9% were admitted and 76% were treated as outpatients, but we do not know how many were treated at specialist clinics (i.e. serious injuries). 13% of the police slight category did not attend hospital but this does not mean that they were uninjured as they could have treated themselves, attended a minor injuries unit or gone to their GP. Of the apparently uninjured people, 53% attended hospital and 2% were admitted.

7 CONCLUSIONS

7.1 The overall picture

The conclusions of this study are difficult to draw out. Both the health databases and the police databases have their weaknesses as no perfect database exists. However, the STATS19 database is cross-checked and validated to a certain extent both at local and at national level, whereas the health databases are essentially a descriptive record for health audit purposes and are not internally validated as such.

There have been changes in healthcare practice over the period of study, with a reducing tendency to admit casualties if their injuries can be dealt with as outpatients. However, the three admissions databases show very little overall change in admission numbers to hospital. If the changes in healthcare were in some way being reflected in these databases, this effect would be very difficult to distinguish from a change in severity of injury. The Trauma Audit Research Network (TARN) database is some help here as it only records the much more seriously injured patients. This database shows a flat trend across the period of study leading to a tentative conclusion that the observed reduction in serious injuries in the STATS19 record has not come from a reduction in the more serious injuries. These are mirroring the fatal trends. This, in itself, is not too surprising as the line between death and serious injury is a fine one. As the TARN database is not complete across all hospitals in Britain, it is not possible at this stage to say what proportion of these more serious injuries are represented.

The analysis of the A&E data indicates that about 10% of all those reporting at A&E departments across Britain are admitted. Of the serious injuries about half (as classed by STATS19) are admitted. Analyses indicate that the proportions being admitted are not changing very much.

The findings from the analysis of the admissions data and the STATS19 data reported in *Road Casualties Great Britain: 2004 – Annual Report* (Transport Statistics, 2005) are important. They reveal that there are as many admissions to hospitals in England, Wales and Scotland as there are serious injuries in the STATS19 database for Great Britain. The picture has changed since 1999, when there were fewer admissions than STATS19 serious injuries, to 2003, when there were more. If we take the flatness of the admissions trend with the decline in serious injuries in STATS19, we may conclude that fewer serious injuries are being reported to the police and/or that the police are not recording as many injuries as serious as before. The data indicate that there are twice as many serious injuries occurring on the road as are recorded in the STATS19 database. Some of this is due to underreporting and some due to misrecording. Whilst this finding is not new (see Simpson, 1996) it does highlight the difficulty in interpreting data from only one source and quite how much is due to under-reporting or misrecording is difficult to assess because we cannot make assumptions about the severity of the unmatched police data whether it be serious or slight.

Table 6.1 is helpful in showing that, of the casualties that were matched in both datasets, somewhere in the region of 20% of casualties classed as serious by the police were treated and discharged by the hospital (i.e. slight injuries). In actual numbers, of the eight years in the data from the English hospital studied, this amounts to 67 casualties.

On the other hand, those treated by the hospital as serious but appearing in the police record as slight accounts for about 8% across the whole eight-year period, dropping gradually from 10% in 1996 to about 5% in 2004. In actual numbers, the incorrect classification of serious as slight involved 231 casualties over the years studied.

For the A&E data, where we know how many admissions have been registered and which have been matched, plus the unmatched hospital data but about which we know severity, we could hypothesise that nearly half are not reported to the police and a further quarter are misrecorded as slight. Of the outpatient clinic data, 57% are not known to the police and a further 36% are classed as slight. However, as already stressed, these do not reflect the whole picture as we do not know how many in the unmatched police record are in each severity category.

The evidence suggests some changes in the consistency of coding in STATS19 especially amongst the vehicle occupants. As slight injuries are about 10 times more common than serious injuries in STATS19, a very small change in judgement about the operational threshold for this categorisation could easily produce this degree of change and might well be imperceptible to those who made the change.

7.2 Individual road user groups

The data available relate to different periods, some include all road users groups and others do not. In this section, conclusions are drawn, where possible, regarding road user group.

7.2.1 Pedestrians

Of all road user groups attending A&E departments after a road traffic accident, pedestrians are the most likely to be admitted, with about 23% of those attending being admitted. This evidence comes from the Welsh A&E data in Table 4.3. As far as can be ascertained, there has been a real decline in serious pedestrian injuries. Table 4.3 (albeit with small numbers) shows a downward trend in admissions from 67 people in 2001 to 45 in 2004. The trend is fairly flat for pedestrians whose injuries can also be classified as serious according to the STATS19 definition. These are the casualties referred to specialist clinics, such as fracture clinics.

This is corroborated in Table 5.2 by the inpatient data for England (HES), Wales (PEDW) and Scotland (SMR), which shows that there has been an overall reduction in admissions from 8,888 in 1999 to 7,513 in 2003. The difference between 2003 and 1999 in the hospital data amounts to a 15% reduction, and in the STATS19 data it is similar, with a 19% reduction.

In addition to this, Table 4.9 contains TARN data which contains records of the most severely injured casualties and shows a decrease across 33 hospitals from 926 in 1996 to 708 in 2003 (a reduction of 23%). It is unlikely that changes in healthcare practices would have affected these severely injured people as they would all have been admitted. The English hospital data which includes road user groups is variable so a time series for reporting rates for pedestrians is not possible.

In general, the reporting rate for pedestrian injuries is considered to be fairly accurate since this road user group tends to be the most severely injured. This is backed up by all the studies reviewed where pedestrians are the best reported group.

7.2.2 Pedal cyclists

The number of pedal cyclist casualties in the Welsh data is small but what is interesting is that pedal cyclists are rather unlikely to be admitted to hospital as a result of their injuries. Table 4.3 shows that the percentage of all pedal cyclists admitted is somewhere between about 10% and 20%. Tables 4.4 and 4.5, which contain information on referrals to specialist clinics, also show small numbers.

Table 5.2 shows a reduction of about 18% in the hospital data and 24% in the STATS19 data. But Table 5.2 indicates that the STATS19 for Great Britain has about 50% more records of pedal cyclists who have been seriously injured than do the combined inpatient data. This has been identified as a coding problem in the inpatient data where the vast majority (up to 90%) of all pedal cycle injuries are classed as not involving a motor vehicle. This means that any conclusions about pedal cycles need to be treated with great caution.

There is evidence that hospitals have difficulties distinguishing pedal and motor cycles, and the TARN data do not show pedal cyclists as a separate group. In Ward *et al.*'s (2005) London study, one of the hospitals was unable to distinguish pedal cycles and motorcycles and ended up by miscoding both. It is therefore not possible to make any conclusions about the under-reporting of pedal cycle injuries except that there appears to be something not quite right in the coding of the hospital data and we do know that under-reporting exists for this road user group.

7.2.3 Motorcyclists

Motorcycle riders and their passengers have been taken together. In Table 4.3 the Welsh A&E data shows that about 20% of injured motorcyclists are admitted to hospital but at this hospital the numbers are not increasing as they are nationally. Table 5.4 shows a rising trend both in the hospital (23%) and STATS19 data (11%).

That the trend in the hospital data is steeper than that in the STATS19 data is interesting and could be due to a change in recording at the hospital (see above regarding miscoding) or by the police.

The TARN data in Table 4.9 show an increase of over 50%. This indicates that besides more motorcyclists being injured their injuries within the serious category may be becoming more severe. How much can be attributed to each cause is unknown.

7.2.4 Vehicle occupants

The Welsh A&E department data allows drivers and passengers to be separated but the inpatient data do not. About half of all injured road users attending a Welsh A&E department are drivers, with passengers accounting for another 30% (Table 4.2). The severity of injury of the vehicle occupants is generally lower than the more vulnerable groups, with only about 5% of drivers and 6% of passengers being admitted (Table 4.3), with the number of passengers being admitted being similar to the number of pedestrians despite nearly four times as many passengers attending A&E than pedestrians.

The inpatient data in Table 5.2 shows a flat trend across the years (1% change), whilst the STATS19 data shows a 15% fall. The result is that the number of vehicle occupants in both databases is very similar.

The TARN database (Table 4.9) shows a fairly flat trend for vehicle drivers (+4%) but a slightly larger decreasing one for passengers (-11%). This indicates that the severity distribution of drivers' injuries might be increasing whilst that for passengers is decreasing.

Our tentative conclusion is that reporting rates for drivers may be changing and, as these are numerically the largest group but proportionality the least severely injured as well as being the least well reported, small changes here will be reflected in larger changes in the STATS19 database.

8 RECOMMENDATIONS FOR FURTHER DATA COLLECTION

This and other studies have shown that it is insufficient to rely solely on STATS19 data, or on any one data source for an assessment of trends in serious injury. That different databases are showing different parts of the picture is useful and it is recommended that greater use be made of all sources. A system of data triangulation should be used to compare and understand trends in road casualties.

As changes in the provision of hospital and health facilities, as well as changes in clinical practice, may affect the number of people with a given level of injury severity admitted to hospital, further research is needed to determine whether there is a subset of injury diagnoses always treated as inpatient, which on its own, or expressed as a ratio of all hospital admissions, could serve as an improved indicator for comparison with STATS19 defined serious road casualties on a national or regional basis.

There are difficulties with the use of any database at the local level, for example one hospital or one police force, since the numbers of serious injuries are rather small and variable. For these reasons it has been difficult to draw conclusions at the local level in this study.

It would be instructive to compare the locations of incidents recorded by ambulance services with the STATS19 data, particularly in places where these could also be matched to the A&E and inpatient data. One of the unanswered questions is the accuracy of grid references derived from the nearest property to the incident location, particularly in rural areas. These linkage studies would be helpful, especially as the A&E data may become less useful.

In April 2005 a new A&E minimum dataset was introduced into English hospitals. One of the reasons for this database is to track waiting times at A&E departments and this data is collected in detail. The advantage of the minimum dataset is that all hospitals will collect data to a common format and submit it to a central database. The big disadvantage is that individual road user groups will not be able to be identified (see Appendix 3 for details), as only one category is now used and that is '**RTA**'. Location will not be identifiable as hoped – the only location identifier is '**In a public place**'. It will be up to individual hospitals to decide whether to collect this extra data. The early indications from two London hospitals that previously collected it is that they will no longer do so. The existing dataset which identifies road user type is continuing in Wales. The comparison of road user type with all casualties in the Welsh data with overall numbers attending A&E departments in England and Wales, and with the numbers being admitted to hospitals in England and Wales, would provide very useful information to partially address the deficiency on the new dataset in England. Also, Welsh A&E department data availability is increasing through the All Wales Injury Surveillance System (AWISS) (with more than one road user category) and can be individually linked to hospital admissions data as well as to the STATS19 data.

Outpatient department minimum datasets are being developed and these can provide additional information on specialist follow-up. It is recommended that the progress and form of the final dataset be monitored as to its usefulness in helping to understand changes in both hospital healthcare practice and severity of injury.

The analysis of the hospital in-patient data from England (HES), Wales (PEDW) and Scotland (SMR) has been very helpful in understanding the bigger picture. It is recommended that inpatient data be routinely used in this way to compare trends with the STATS19 data. The inpatient data for an individual hospital or group of hospitals will reflect changes in healthcare practices particularly as they relate to treatment and the care preferences of individual consultants. At the national or regional level, individual factors should be ironed out and the bigger picture should emerge. Where possible, analyses should be undertaken by road user groups and by age group.

In this study the hospital inpatient data have not been linked to the A&E data nor to the STATS19 data. It would be useful to undertake this exercise, even though it is a large and complex undertaking. A better understanding of the inpatient data is needed by road safety professionals before its long-term usefulness can be assessed. One of the unanswered questions is the reliability of coding, especially of the ICD-10 codes:

> ‘The lack of accuracy and completeness of hospital inpatient data limits its usefulness. Information on the accuracy of clinical and external cause coding is particularly important.’
> (Measuring and Monitoring Injury Working Group, 2002; page 45)

This study has not undertaken analysis by age group. This would be useful to provide trends in injuries to, for example, young motorcyclists, pedestrians and young drivers.

9 ACKNOWLEDGEMENTS

Maralyn Woodford, Executive Director and Omar Bouamra, Statistician, Trauma Audit Research Network, who carried out the analysis of the TARN database, and Steven Macey, Health Information Research Analyst, Swansea University, who carried out the analyses of the HES, PEDW and SMR databases.

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APPENDIX 1

List of Medical Priority Dispatch System (MPDS) chief complaint codes used by the Welsh Ambulance Service NHS Trust

Table A1.1: MPDS chief complaint codes used by the Welsh Ambulance Service NHS Trust

	MPDS chief complaint
1	Abdominal pain/problems
2	Allergies/rash/medical reaction/stings
3	Assault/rape
4	Animal bites/attacks
5	Breathing problems
6	Burns/explosion
7	Carbon monoxide/inhalation
8	Cardiac/respiratory arrest
9	Chest pain
10	Choking
11	Convulsions/fitting
12	Diabetic problems
13	Drowning/diving accident
14	Electrocution
15	Eye problems/injuries
16	Haemorrhage/lacerations
17	Headache
18	Heart problems
19	Heat/cold exposure
20	Industrial/machinery accidents
21	Overdose/ingestion/poisoning
22	Pregnancy/childbirth/miscarriage
23	Psychiatric/suicide attempt
24	SICK PERSON – specific diagnosis
25	Stab/gunshot wound
26	Stroke – Cerebro-vascular accident
27	Road traffic accidents (RTAs)
28	Traumatic injuries, specific
29	Unconscious/passing out
30	UNKNOWN
31	Unknown problem – collapse – third party
32	Upgrades AS2

APPENDIX 2

List of fields collected in the All Wales Injury Surveillance System (AWISS)

AWISS is subsumed within the emergency care/A&E activity minimum dataset (MDS) specified in Table A2.1. The data are sent electronically and securely to Health Solutions Wales (HSW; the NHS information organisation in Wales) where checks for duplicates and data quality are performed. HSW then effectively anonymise the data which is still capable of linkage to inpatient and death records. AWISS staff only has access to anonymised records.

Table A2.1: Record type 2 – A&E activity MDS record layout

Size	Contents	Category	Validate	Format
1	Record ID		1	An1
5	Organisation code (code of Provider)	Contract details	1	An5
12	A&E number	Patient details	1	An12
10	NHS number	Patient details	2	N10
2	NHS number status indicator	Patient details	2	N2
8	GP code	Patient details	2	An8
30	School attended	Patient details	2	An30
30	Occupation	Patient details	2	An30
2	Ethnic group	Patient details	2	N2
35	Surname	Patient details	2	An35
35	Forename	Patient details	2	An35
8	Date of birth	Patient details	2	Ccyymmdd
3	Age	Patient details	2	N3
1	Sex	Patient details	1	An1
35	Patient's usual address Line 1	Patient details	2	An35
35	Patient's usual address Line 2	Patient details	2	An35
35	Patient's usual address Line 3	Patient details	2	An35
35	Patient's usual address Line 4	Patient details	2	An35
35	Patient's usual address Line 5	Patient details	2	An35

Size	Contents	Category	Validate	Format
8	Postcode of usual address	Patient details	1	An8
2	Referrer	Referrer details	2	An2
2	Arrival mode	Referrer details	2	N2
10	Ambulance no.	Referrer details	2	A10
40	Date of attendance	Attendance details	1	An40
8	Time of attendance	Attendance details	1	An8
20	Date of incident	Attendance details	2	An20
20	Time of incident	Attendance details	2	An20
3	Incident type	Attendance details	1	An3
30	RTA place	Attendance details	2	An30
30	RTA location	Attendance details	2	An30
30	RTA road user	Attendance details	2	An30
30	RTA safety device	Attendance details	2	An30
2	Patient group	Attendance details	1	An2
750	Initial complaint 1	Attendance details	2	750
750	Initial complaint 2	Attendance details	2	750
750	Additional incident details	Attendance details	2	750
750	Additional where	Attendance details	2	750
750	Additional what	Attendance details	2	750
750	Additional how	Attendance details	2	750
2	Follow-up indicator	Attendance details	2	A2
	Date seen – triage	Attendance details	2	Datetime
	Time seen – triage			
2	Triage priority score	Attendance details	2	A2
	Date seen – Dr/practitioner	Attendance details	2	Datetime
	Time seen – Dr/practitioner			
2	Investigation 1	Attendance details	2	An2
2	Investigation 2	Attendance details	2	An2
2	Investigation 3	Attendance details	2	An2

Size	Contents	Category	Validate	Format
2	Investigation 4	Attendance details	2	An2
2	Investigation 5	Attendance details	2	An2
2	Investigation 6	Attendance details	2	An2
3	Diagnosis 1	Attendance details	2	An3
3	Diagnosis 2	Attendance details	2	An3
3	Diagnosis 3	Attendance details	2	An3
3	Diagnosis 4	Attendance details	2	An3
3	Diagnosis 5	Attendance details	2	An3
3	Diagnosis 6	Attendance details	2	An3
3	Anatomical site 1	Attendance details	2	An3
3	Anatomical site 2	Attendance details	2	An3
3	Anatomical site 3	Attendance details	2	An3
3	Anatomical site 4	Attendance details	2	An3
3	Anatomical site 5	Attendance details	2	An3
3	Anatomical site 6	Attendance details	2	An3
1	Side of body 1	Attendance details	2	An1
1	Side of body 2	Attendance details	2	An1
1	Side of body 3	Attendance details	2	An1
1	Side of body 4	Attendance details	2	An1
1	Side of body 5	Attendance details	2	An1
1	Side of body 6	Attendance details	2	An1
2	Procedure 1	Attendance details	2	An2
2	Procedure 2	Attendance details	2	An2
2	Procedure 3	Attendance details	2	An2
2	Procedure 4	Attendance details	2	An2
2	Procedure 5	Attendance details	2	An2
2	Procedure 6	Attendance details	2	An2
30	Medication 1	Attendance details	2	An30
30	Medication 2	Attendance details	2	An30

Size	Contents	Category	Validate	Format
30	Medication 3	Attendance details	2	An30
30	Medication 4	Attendance details	2	An30
30	Medication 5	Attendance details	2	An30
30	Medication 6	Attendance details	2	An30
3	Injury group	Attendance details	2	An3
2	Disposal	Attendance details	2	An2
40	Date left department	Attendance details	2	
8	Time left department	Attendance details	2	
1	Attendance type	Attendance details	1	A1
8	Attending Dr GMC	Attendance details	2	8

APPENDIX 3

The new accident and emergency minimum dataset

Accident and emergency attendance CDS data items (as at 22nd April 2004)

For those data items marked * details of the codes used are given at the end of this document

Personal details of the patient

- Local patient identifier
- Organisation code (local patient identifier)
- Organisation code type
- NHS number
- Birth date
- Carer support indicator
- Ethnic category
- Marital status (psychiatric patients only)
- NHS number status indicator
- Sex
- Name format code
- Patient name
- Address format code
- Patient usual address
- Postcode of usual address
- Organisation code (pct of residence)
- Organisation code type

Details of the patient's registered GMP

- GMP (code of registered or referring GMP)
- Code of GP practice (registered GMP)
- Organisation code type

Details of the A&E attendance

- A&E attendance number
- A&E arrival mode
- A&E attendance category
- A&E attendance disposal
- A&E incident location type*
- A&E patient group*
- Source of referral for A&E

- Arrival date
- A&E attendance conclusion time
- A&E departure time
- A&E initial assessment time (first and unplanned follow-up attendances only)
- A&E time seen for treatment
- Arrival time

Details of the Service Agreement for the A&E attendance

- Commissioning serial number
- NHS service agreement line number
- Provider reference number
- Commissioner reference number
- Organisation code (code of provider)
- Organisation code type
- Organisation code (code of commissioner)
- Organisation code type

Details of the responsible clinician

- A&E staff member code

Details of the coded diagnosis scheme and the diagnoses

- Diagnosis scheme in use*
- A&E diagnosis – first
- A&E diagnosis – second

Details of the coded investigation activities undertaken

- Investigation scheme in use
- A&E investigation – first
- A&E investigation – second

Details of the coded treatment activities undertaken

- Procedure scheme in use
- A&E treatment – first
- A&E treatment – second

Details of the Healthcare Resource Group (HRG)

- HRG code
- HRG code – version number

Details of the HRG dominant grouping variable procedure (note that this will not apply when no operation was carried out)

- Procedure scheme in use
- HRG dominant grouping variable procedure

*Codes used for data items marked**

A&E incident location type:
10 Home
40 Work
50 Educational establishment
60 Public place
91 Other

A&E patient group:
10 Road traffic accident
20 Assault
30 Deliberate self-harm
40 Sports injury
50 Firework injury
60 Other accident
70 Brought in dead
80 Other than above

Diagnosis scheme in use:
A&E diagnosis
* ICD-10
* Read version 1 (Read 4)
* Read version 2 (Read 5)
* Read version 3.0

APPENDIX 4

List of fields collected in the Health Episode Statistics

List of fields collected in the Health Episode Statistics (HES) – many of these are not needed for injury analysis of anonymised data but have been included as the data will also be used for other non injury studies.

HES extract specification form

(Please either type or write in black ink, as this form will be photocopied)

Data years (please tick): ☑

1989/90 ☐ 1990/91 ☐ 1991/92 ☐ 1992/93 ☐ 1993/94 ☐ 1994/95 ☐
1995/96 ☐ 1996/97 ☐ 1997/98 ☑ 1998/99 ☑ 1999/00 ☑ 2000/01 ☑
2001/02 ☑ 2002/03 ☑ 2003/04 ☑

Filter details *(See 2.3.1 to 2.4.2)*
CLASSPAT < 6

Patient

☑ Administrative & legal status of patient (category)[7]
☑ Administrative category (admincat)[5]
☑ Age at end of episode (endage)
☑ Age at start of episode (startage)
☑ Baby's age in days (neodur)
☐ Date of birth - patient (dob)
☐ Month and year of birth (mydob)
☐ Date of birth check flag – patient (dob_cfl)
☐ Ethnic category (ethnos)[1]
☐ Legal category of patient (leglcat)[5]
☐ Legal group of patient (legalgpa)[8]
☐ Legal status classification (leglstat)
☐ Local patient identifier (lopatid)[4]
☐ Neonatal level of care (neocare)[3]
☐ NHS number (newnhsno)[4]
☐ NHS number indicator (nhsnoind)[4]
☐ Patient identifier – HES generated (hesid)[4]
☐ Patient identifier (HES generated) – basis of match (matchid)[4]
☐ Sex of patient (sex)[13]
☐ Well baby flag (wellbaby)[20]

Admission and discharge

☐ Admission date check flag (adm_cfl)
☐ Date of admission (admidate)
☐ Date of decision to admit (elecdate)
☐ Date of decision to admit check flag (elec_cfl)
☐ Date of discharge (disdate)
☐ Destination on discharge (disdest)
☐ Discharge date check flag (dis_cfl)
☐ Method of admission (admimeth)
☐ Method of discharge (dismeth)
☐ Source of admission (admisorc)
☑ Waiting time (elecdur)

Episodes and spells

☑ Bed days within the year (bedyear)
☑ Beginning of spell (spelbgin)
☑ Date episode ended (epiend)
☑ Date episode started (epistart)
☑ Duration of spell (speldur)
☑ End of spell (spelend)
☑ Episode duration (epidur)
☑ Episode order (epiorder)
☑ Episode end date check flag (epie_cfl)
☑ Episode start date check flag (epis_cfl)
☑ First regular day or night admission (ftregad)
☑ Hospital provider spell number (provspno)(4)
☑ Intended management (intmanig)(4)
☑ Main specialty (mainspef)
☑ Patient classification (classpat)
☑ Status of episode (epistat)
☑ Treatment specialty (tretspef)
☑ Type of episode (epitype)
☑ Ward type at start of episode (wardstrt)(6)

Diagnoses (all unless specified)

☑ Diagnosis (diag_nn)
☑ Diagnosis (primary) – first 3 characters (diag3)
☑ Diagnosis (primary) – first 4 characters (diag4)
☑ External cause code – first 3 characters (cause3)
☑ External cause code – first 4 characters (cause4)
☑ External cause of injury or poisoning (cause)

Operative procedures

☐ Date of operation (opdte_nn)
☐ Operation (main) – first 3 characters (oper3)
☐ Operation status code (operstat)
☐ Operation codes (oper_nn)
☐ Post-operation duration (posopdur)
☐ Pre-operation duration (preopdur)

Organisations

☐ Commissioner code (purcode)(14)
☐ Commisioner code status (purval)(1)
☐ Commisioner's Regional Office (purro)
☐ Commissioner's Strategic Health Authority (purstha)
☐ Commissioning serial number (csnum)(5)
☐ Health authority area where patient's GP was registered (gppracha)(5)
☐ Primary care group (pcgcode)(9)
☐ Primary care group origin indicator (pcgorig)(9)
☐ Primary Care Trust of responsibility (pctcode)(10)
☐ Primary Care Trust of responsibility origin indicator (pctorig)(10)
☐ Primary Care Trust area where patient's GP was registered (gpprpct)(12)
☐ Provider code – 3 and 5 character (procode)(15)
☐ Provider type (protype)(15)(19)
☐ Referring organisation code (referorg)
☐ Regional office area where patient's GP was registered (gppracro)(5)
☐ Site code of treatment (sitetret)(4)
☐ Strategic Health Authority area where patient's GP was registered (gpprstha)(12)

Geographical (derived)

☐ County of residence (rescty)
☐ Current electoral ward (currward & resladst)
☐ Government office region of residence (resgor)
☐ Government office region of treatment (gortreat)
☐ Health authority of residence (resha)
☐ Health authority of treatment (hatreat)
☐ Local authority district (resladst)
☐ Patient's Census Output Area (oacode)(19)
☑ Output area – first 6 characters (oaward)(19)
☑ Patient's electoral ward in 1981 (ward81)
☑ Patient's electoral ward in 1991 (ward91)(3)
☑ Patient's health authority of residence provided by NHS (har)
☑ Patient's Primary Care Trust of residence (respct)(11)
☑ Patient's Strategic Health Authority of residence (resstha)(11)
☑ Postcode district of patient's residence (postdist)

☐ Postcode of patient (homeadd)
☐ Primary Care Trust area of treatment (pcttreat)(12)
☐ Regional Office of residence (resro)
☐ Region of treatment (rotreat)
☐ Strategic Health Authority area of treatment (sthatret)(12)

Practitioner

☐ Consultant code (consult)(4)
☐ GP practice code (gpprac)(4)
☐ Patient's general medical practitioner (reggmp)(4)
☐ Person referring patient (referrer)(4)

Augmented care (up to 9 per record)(4)

☑ Augmented care location (acploc)
☑ Augmented care period data quality indicator (acpdqind)(8)
☑ Augmented care period disposal (acpdisp)
☑ Augmented care period end date (acpend)
☑ Augmented care period planned indicator (acpplan)
☐Augmented care period local ID (acplcid)
☑ Augmented care period number (acpn)
☑ Augmented care period outcome indicator (acpout)
☑ Augmented care period source (acpsour)
☑ Augmented care period speciality function code (acpspef)
☑ Augmented care period start date (acpstar)
☑ High dependency care level (depdays)
☑ Intensive care level days (intdays)
☑ Number of augmented care periods within episode (numacp)
☑ Number of organ systems supported (orgsup)

Maternity (up to 9 per record)

☐ Anaesthetic during labour (delpren)
☐ Anaesthetic post-delivery (delposn)
☐ Antenatal days of stay (antedur)
☐ **Birth date (baby) (dobbaby)**
☑ Birth order (birordr)
☑ Birth weight (birweit)
☑ Change of delivery place (delchan)
☑ Delivery method (delmeth)
☑ Delivery place (delplac)
☑ First antenatal assessment date (anadate)
☑ Gestation period in weeks at first antenatal assessment (anagest)
☑ Intended type of delivery place (delintn)

☑ Length of gestation (gestat)
☑ Live or still birth (birstat)
☑ Method to induce labour (delonse)
☑ Mother's age at delivery (matage)
☐ **Mother's date of birth (motdob)**
☑ Number of babies (numbaby)
☑ Number of previous pregnancies (numpreg)
☑ Postnatal stay (postdur)
☑ Resuscitation method (biresus)
☑ Sex of baby (sexbaby)
☑ Status of person conducting delivery (delstat)
☑ V code indicator (vind)

Psychiatric

☑ Age at psychiatric census date (censage)
☑ Carer support indicator (carersi)(4)
☑ Date detention commenced (detndat)
☑ Date detention commenced check flag (det_cfl)
☐ **Detention category (detncat)(5)**
☑ Duration of care to psychiatric census date (cendur)
☑ Duration of detention (detdur)
☐ **Legal group of patient (psychiatric) (legalgpc)(8)**
☑ Marital status – psychiatric (marstat)
☑ Mental category (mentcat)
☑ Psychiatric patient status (admistat)(3)
☑ Status of patient included in psychiatric census (censtat)
☑ V code indicator (vind)(2)
☑ Ward type at psychiatric census date (cenward)

HRG and costs(16)

☑ Dominant procedure code assigned by NHS during HRG derivation (domproc)
☑ Healthcare resource group – latest version (hrglate)(1)
☑ Healthcare resource group – original version (hrgorig)(1)
☑ Healthcare resource group – version 3.5 (hrg35)(19)
☑ NHS generated HRG code (hrgnhs)
☑ NHS generated HRG code version number (hrgnhsvn)

System

☑ Combined grossing factor (gross_b)(17)
☑ Coverage grossing factor (gross_a)(17)
☑ Date data received by NHS wide clearing service (subdate)
☑ Record identifier (epikey)

ONS mortality data

☐ Death Date[18]

[1]From 1995–96 onwards.
[2]Up to 1995–96, then replaced by ADMISTAT and NEOCARE.
[3]From 1996–97 onwards.
[4]From 1997–98 onwards.
[5]From 2000–01 onwards
[6]Up to 2000–01 inclusive
[7]Up to 2001–02 inclusive
[8]From 2002–03 onwards
[9]PCGCODE field retained for years 1999–2000 to 2001–02.
[10]Field historically derived for years from 1997–98 to 2001–02 on the same basis as for 2002–03.
[11]Field historically derived for years from 1996–97 to 2001–02 on the same basis as for 2002–03.
[12]Field historically derived for years from 1999–2000 to 2001–02 on the same basis as for 2002–03.
[13]The field SEX will be sensitive when combined with DOB and HOMEADD.
[14]Please refer to 3.2 on page 9 of the HES application form.
[15]PROCODE3 (previously known as PRODMUT) identifies an individual hospital provider by using the first 3 characters of PROCODE. From 2003–04, PROCODET contains the 3-character code except where 5 characters are required to identify a distinct organisation and PROTYPE contains a summarised description of the organisation type. Applicants will need to determine whether 3- or 5-character PROCODE is required.
[16]Fields providing relative costs of treatment and costs per day (TREAT, HOTEL and TOTCOST), that were used for economic modelling, have now been removed from the available list.
[17]Not yet available for 2002–03 or 2003–04.
[18]Please refer to 3.1 on page 9 of the HES application form.
[19]From 2003–04 onwards.
[20]The well baby flag indicates which episodes relate to healthy live infants.

☐ Fields in bold are sensitive and will need SCAG approval.

Other details

APPENDIX 5

List of fields collected in the Scottish Morbidity Record

List of fields collected in Scottish Morbidity Record (SMR) which could be used for road injury analyses of anonymised data.

Table A5.1: Analysis of Scottish hospital and mortality data for the Department for Transport/Scottish Executive study of trends in fatalities from road accidents. Linked database – (a) discharges and (b) deaths
(a) Discharges
Records required: all anonymous records in which the person was admitted to hospital between 1997 and 2004 as a result of a transport accident – ICD-10 codes VO1–V99 or died from a transport accident (ICD-10 codes VO1–V99 and ICF 9 codes E800–E848)
Fields required (from COPPISH SMR01 – Record Type 01B)
Personal identifier – (link number)
Date of admission
Date of discharge
Record type = 01B=SMR01 record (1997 Q2 onwards)
Date of linkage
Continuous inpatient stay
Summarised admission code
Summarised discharge code
Sex
Ethnic group
Location
Speciality
Admission type
Admission reason
Admission transfer from
Discharge type
Discharge/transfer to
Main condition
Other condition 1

Other condition 2
Other condition 3
Other condition 4
Other condition 5
Main operation – A
Main operation – B
Date of main operation
Other operation 1 – A
Other operation 1 – B
Other operation 2 – A
Other operation 2 – B
Other operation 3 – A
Other operation 3 – B
Inpatient/day case marker
1991 Carstairs Deprivation Category
1991 Carstiars Deprivation Quintile
1991 Carstiars Deprivation Score
Electoral ward
Council area
Health board of residence number
Health board of treatment number
Age in years
Healthcare Resource Group

(b) Deaths
Records required: all anonymous records in which a person died from a transport accident (ICD-10 codes VO1–V99 and ICF 9 codes E800–E848)
Fields required from GRO death records
Personal identifier – (Link number)
Date of event
Record type
Date of linkage
Institution
Primary cause of death
Secondary cause 0
Secondary cause 1
Secondary cause 2
Secondary cause 3
Secondary cause 4
Secondary cause 5
Secondary cause 6
Secondary cause 7
Secondary Cause 8
Secondary Cause 9
Age
Sex
Country of residence code
Social class
Council area
Health board area
Place of occurrence code

APPENDIX 6

Tables of matched data for an English hospital for 1996 and 1998–2004

Table A6.1: Composite data for 1996 after matching casualties for an English hospital and STATS19

1996		Serious	Slight	All police	All casualties
	Casualties known only to the police	14	175	189	189
	Casualties known only to the hospital				
Admitted/transferred	38	18	19	37	75
Clinic/follow-up	17	5	16	21	38
Discharged/sent to GP/did not wait	295	8	158	166	461
All hospital	350	31	193	224	574
All casualties	350	45	368	418	987
Reporting rate		**69**	**52**		

Table A6.2: Composite data for 1998 after matching casualties for an English hospital and STATS19

1998		Serious	Slight	All police	All casualties
	Casualties known only to the police	11	165	176	176
	Casualties known only to the hospital				
Admitted/transferred	22	8	15	23	45
Clinic/follow-up	38	1	21	22	60
Discharged/sent to GP/did not wait	243	1	135	136	379
All hospital	303	10	171	181	484
All casualties	303	21	336	357	660
Reporting rate		**48**	**51**		

Table A6.3: Composite data for 1999 after matching casualties for an English hospital and STATS19

1999		Serious	Slight	All police	All casualties
	Casualties known only to the police	13	184	197	197
	Casualties only known to the hospital				
Admitted/transferred	24	15	14	29	53
Clinic/follow-up	35	2	20	22	57
Discharged/sent to GP/did not wait	295	6	151	157	452
All hospital	354	23	185	208	562
All casualties	354	36	369	405	759
Reporting rate		**64**	**50**		

Table A6.4: Composite data for 2000 after matching casualties for an English hospital and STATS19

2000		Serious	Slight	All police	All casualties
	Casualties known only to the police	22	196	218	218
	Casualties known only to the hospital				
Admitted/transferred	28	12	14	26	54
Clinic/follow-up	26	1	19	20	46
Discharged/sent to GP/did not wait	303	11	134	145	448
All hospital	357	22	167	189	546
All casualties	357	46	363	407	764
Reporting rate		**52**	**46**		

Table A6.5: Composite data for 2001 after matching casualties for an English hospital and STATS19

2001		Serious	Slight	All Police	All casualties
	Casualties known only to the police	21	192	213	213
	Casualties only known to the hospital				
Admitted/transferred	14	20	15	35	49
Clinic/follow-up	26	6	15	21	47
Discharged/sent to GP/did not wait	296	11	161	172	468
All hospital	336	37	191	228	564
All casualties	336	58	383	441	777
Reporting rate		**64**	**50**		

Table A6.6: Composite data for 2002 after matching casualties for an English hospital and STATS19

2002		Serious	Slight	All police	All casualties
	Casualties known only to the police	18	209	227	227
	Casualties only known to the hospital				
Admitted/transferred	25	14	15	29	54
Clinic/follow-up	23	5	12	17	40
Discharged/sent to GP/did not wait	235	15	117	132	367
All hospital	283	34	144	178	461
All casualties	283	52	353	405	688
Reporting rate		**65**	**41**		

Table A6.7: Composite data for 2003 after matching casualties for an English hospital and STATS19

2003		Serious	Slight	All police	All casualties
	Casualties known only to the police	11	168	179	179
	Casualties only known to the hospital				
Admitted/transferred	19	14	12	26	45
Clinic/follow-up	12	3	5	8	20
Discharged/sent to GP/did not wait	274	5	148	153	427
All hospital	305	22	165	187	492
All casualties	305	33	333	366	671
Reporting rate		**67**	**50**		

Table A6.8: Composite data for 2004 after matching casualties for an English hospital and STATS19

2004		Severity of casualties as recorded by the police			
		Serious	Slight	All police	All casualties
	Casualties known only to the police	16	173	189	189
	Casualties only known to the hospital				
Admitted/transferred	28	10	6	16	44
Clinic/follow-up	16	1	13	14	30
Discharged/sent to GP/did not wait	268	10	169	179	447
All hospital	312	21	188	209	521
All casualties	312	37	361	398	710
Reporting rate		**57**	**52**		