AN ASSESSMENT OF THE UNDER REPORTING OF ROAD ACCIDENT CASUALTIES IN RELATION TO INJURY SEVERITY

R J Tunbridge and J T Everest

Transport and Road Research Laboratory
CROWTHORNE, England

1. INTRODUCTION

Previous studies [1-5] have suggested that many road accidents involving casualties are not reported to the police and are thereby seriously under-represented in the national road accident statistics. The aim of this work was to quantify the magnitude of this underreporting, for a sample of road users, in relation to the severity of injuries sustained.

A hospital based study collected information on road accident casualties, presenting to a hospital for the whole of the county of Oxfordshire, England for 1983 and 1984. Particular attention was given to establishing injury patterns, the level of police reporting, demographic characteristics of casualties and accident circumstances.

The rate of reporting was determined for each road user type in relation to the involvement of another vehicle and the severity of injury sustained, as assessed by the Abbreviated Injury Scale (AIS)[6]. A comparison was then made with casualty severity as recorded by the police, for reported accidents. The differences between these assessments is discussed and the implications of any underreporting in relation to total road accident costs is explored.

2. METHODOLOGY

The cases included in this study were drawn from the catchment area for the Accident Service of the John Radcliffe Hospital, Oxford. This includes virtually the whole of the county of Oxfordshire, with the exception of small areas in the north and south. The area is contained within a 25 km radius of the hospital and covers 261,000 hectares with a population of 370,000 (1985).

From 1 January 1983 to 31 December 1984, information on all road traffic injury patients who presented at the Accident Department of the John Radcliffe Hospital was extracted from the casualty register. Casualties within the catchment area who died before reaching the hospital were identified from police accident records and post-mortem reports; these were included in the sample.

Personal details were recorded for each case, as well as a description of the injuries received. Where possible, admitted patients were interviewed by the medical research fellow while they were still on the ward. Case notes were examined for both in-patients and out-patients, and casualty notes were consulted for patients making only one visit to the hospital; X-rays were examined where available.

Injuries were graded by severity according to the Abbreviated Injury Scale (AIS) and also by body region, location and injury type. Details of accidents were recorded and later checked against police records and the national summary of road accident data (Stats 19).

3. PATTERNS OF INJURY SEVERITY AND ROAD USER DISTRIBUTION

The total sample consisted of 5649 cases, which included 2190 vehicle occupants (39 per cent), 1498 motor cyclists (27 per cent), 1461 pedal cyclists (26 per cent), and 500 pedestrians (9 per cent). The age distribution of the injured population showed a prominent peak in the younger age group, the age range 16-25 years containing 44 per cent of the sample, as against 16 per cent in the general population. This susceptibility to injury among the young was common to all road user groups. However there were significant differences in distribution between the various groups; overall the mean age of casualties was 27 years, but it was lowest for pedal cyclists (16 years), and highest for vehicle occupants (33 years).

The overall distribution of MAIS by road user group is given in Table 1; minor injuries of MAIS-1 made up 59 per cent of the total. The proportion of casualties with minor injuries was highest among vehicle occupants (64 per cent) and pedal cyclists (62 per cent). This was in contrast to a high proportion of pedestrians (26 per cent) and motor cyclists (20 per cent) who received serious (MAIS >=3) injuries.

Overall, injuries to the head and extremities were the most frequent. Injuries to the leg were most common among motorcyclists and pedestrians, with injuries to the head (mainly minor) being principally to vehicle occupants. Minor injuries, such as cervical sprain ('whiplash' injury), were most common for vehicle occupants. A large proportion (about 50 per cent) of moderate injuries, MAIS-2, were brief 'knock outs', especially among vehicle occupants and pedestrians. Injuries to arms or legs were frequent among motor cyclists, and injuries to the arm were common among pedal cyclists. For casualties as a whole, serious injuries (MAIS >=3) were most often to the legs. Life threatening injuries were most frequently to the brain, and as a whole were much less common among pedal cyclists than any other road user group.

4. UNDER REPORTING IN RELATION TO INJURY SEVERITY (MAIS) AND INVOLVEMENT OF ANOTHER VEHICLE

The proportion of accident casualties reported to the police was found to vary both with vehicle type and the involvement of other vehicles, as shown in Table 2. This table also classifies casualties according to MAIS severity. In order to facilitate comparison with national road accident statistics (Stats 19, published in Road Accidents Great Britain [7]), the MAIS values are grouped to correspond approximately to the Department of Transport (DTp) severity ratings, with slight injuries being nominally MAIS 0 or 1 and serious injuries MAIS 2-5; fatal injuries are shown separately. The definitions of DTp severity (given in the Appendix) are not precise enough to allow rigid allocation of a MAIS value, but may be a useful approximation. A direct comparison between MAIS and DTp allocated severities is given in section 5.

It can clearly be seen from Table 2 that, as might be expected, reporting rates increase with casualty severity, those in the range MAIS 2-5 having higher reporting rates for all road user groups whether or not another vehicle was involved. All fatal accidents were reported for all groups.

The rate of reporting can also be seen to be higher when another vehicle was involved. This was particularly true for pedal cyclists and motor cyclists where the reporting rate for single vehicle accident casualties was especially low. Thus for pedal cyclists in single vehicle accidents, only 4 per cent were reported, this figure rising to 57 per cent when more than one vehicle was involved. Similarly, for motorcyclists in single vehicle accidents, 36 per cent were reported, this figure rising to 76 per cent in multi-vehicle accidents. These figures confirm the findings of an earlier study [4].

For pedal cyclists, this low rate of reporting is a serious omission, since the distribution of injury severities in the categories up to and including MAIS-3 was the same whether or not another vehicle was involved [8]. This suggests that even if collisions between pedal cyclists and other road users could be prevented altogether (e.g. by using segregated cycleways), the relative incidence of serious injuries would not be significantly reduced, although the absolute number clearly would.

In absolute terms, more casualties arose from multi-vehicle accidents than single vehicle accidents for all road user groups except pedal cyclists. Although there is no legal requirement to report single vehicle pedal cycle accidents (Road Traffic Act 1972, Section 25), the above findings clearly show that the omission of such accidents from the national statistics represents a serious underestimate of total road accident costs. This aspect is considered further in the next section.

5. A COMPARISON OF REPORTING RATES IN RELATION TO DEPARTMENT OF TRANSPORT (DTp) AND (MAIS) SEVERITY SCALES

For the purposes of quantifying the cost of road accident under reporting, it would be desirable to relate the injury severity as assessed at hospital (e.g. using the AIS scale) to the severity as recorded on the police casualty record of an accident (Stats 19). In order to test the suitability of using MAIS as an approximation to DTp severity, the MAIS values allocated at hospital were grouped according to the nominally assigned values for slight, serious and fatal injuries given in section 4. These were then compared with the actual values allocated by the police for reported casualties. The results are given in Table 3.

It can be seen that the agreement is good at all levels of severity and for all road users. This implies that, for reported casualties at least, those with minor injuries (MAIS-1) are correctly categorised as slight casualties by the police, and those with more serious injuries (MAIS 2+) are correctly categorised as serious. All fatalities, including those dying within 30 days were correctly classified. It also follows that road accident data collected prospectively by hospital sources (e.g. using computerised Accident and Emergency records), if coded according to the MAIS, could later be used to quantify under reporting of slight and serious casualties according to the Department of Transport classification.

The figures in Table 3 suggest that under reporting of road accident casualties is substantial for all road user groups, in particular pedal cyclists and motor cyclists. Furthermore, this under reporting is not confined to slightly injured casualties. Considering those casualties classified as serious, according to the DTp system, only one-third of pedal cyclists, two-thirds of motor cyclists and four-fifths of pedestrians were reported to the police. Applied nationally these figures suggest that overall costs of seriously injured casualties would need to be increased by 25 per cent for pedestrians, 50 per cent for motor cyclists and 200 per cent for pedal cyclists. The overall reporting rate of 60 per cent for all severities suggests that road accident costs are at present being substantially underestimated.

6. SUMMARY AND CONCLUSIONS

The aim of this paper has been to quantify the magnitude of police under reporting, for a sample of road user casualties, in relation to the severity of injuries sustained.

The principal conclusions can be summarised as follows:

1. Reporting rates were found to vary considerably according to road user type and involvement of other vehicles.

2. Reporting rates increased with injury severity and were higher for multi-vehicle than for single-vehicle accident casualties, for all road user groups.

3. The reporting rate was particularly low for single-vehicle pedal cyclists (4 per cent); however, a significant proportion of these casualties sustained serious injuries.

4. For all road user groups, except pedal cyclists, more casualties arose from multi-vehicle accidents than from single-vehicle accidents.

5. Banded MAIS severity values gave a good approximation to the injury severity categories used by the Department of Transport.

6. There was a significant under reporting of seriously injured (DTp classification) motor cyclist and pedestrian casualties, only 62 per cent and 80 per cent being reported respectively; seriously injured pedal cyclists were only reported in 33 per cent of cases.

7. Overall reporting rates suggest that road accident costs are at present being substantially underestimated.

REFERENCES

1. TUNBRIDGE, R J (1987). The use of linked transport-health road casualty data. Department of Transport TRRL Report RR96: Transport and Road Research Laboratory, Crowthorne.

2. BULL, J P and B S ROBERTS (1973). Road Accident Statistics - a comparison of police and hospital information. Accident Analysis and Prevention 5(1), pp 45-53.

3. HOBBS, C A, GRATTON E and HOBBS, J (1979). Classification of injury severity by length of stay in hospital. Department of Transport TRRL Report LR871: Transport and Road Research Laboratory, Crowthorne.

4. PEDDER, J B, HAGUES, S B, MACKAY, G M and ROBERTS, B J (1981). A study of two wheeled vehicle casualties at a city hospital. Proceedings of 6th International IRCOBI Conference 1981. France. pp 111-127.

5. MILLS, P J (1988). Pedal Cycle Accidents - A hospital based study. Paper presented at the Second International Conference on Road Safety, Groningen, Aug-Sept.1987.

6. AMERICAN ASSOCIATION OF AUTOMOTIVE MEDICINE (1980). The Abbreviated Injury Scale (1980 Revision).

7. GOVERNMENT STATISTICAL SERVICE (1987). Road Accidents Great Britain 1986 Department of Transport, HM Stationery Office.

8. TUNBRIDGE, et al (1988). An in-depth study of road accident casualties and their injury patterns. Department of Transport TRRL Report RR136: Transport and Road Research Laboratory, Crowthorne.

APPENDIX

Abbreviated injury scale -
Definition of injury categories

AIS 0 No injury

AIS 1 Minor Injury

AIS 2 Moderate Injury

AIS 3 Serious Injury

AIS 4 Severe Injury

AIS 5 Critical Injury

AIS 6 Maximum Injury virtually unsurvivable

Dept of Transport Severity

FATAL INJURY includes only those cases where death occurs in less than 30 days as a result of the accident. FATAL does not include death from Natural Causes

Examples of SERIOUS INJURY are:-

Fracture

Internal injury

Severe cuts and lacerations

Crushing

Concussion

Severe general shock requiring hospital treatment

Detention in hospital as an in-patient, either immediately or later as a result of the injuries

Injuries to casualties who die on or after 30 days as a result of the accident

Examples of SLIGHT INJURY are:-

Sprains

Bruises

Cuts judged not to be severe

Slight shock requiring roadside attention

(Persons who are merely shaken and who have no other injury should not be included unless they receive or appear to need medical treatment)

TABLE 1

Injury Severity (MAIS) by Road User Group

MAIS	vehicle occupants		motor cyclists		pedal cyclists		pedestrians		TOTAL	
	n	%	n	%	n	%	n	%	n	%
1	1408	64.3	791	52.8	907	62.1	239	47.8	3345	59.2
2	442	20.2	406	27.1	415	28.4	132	26.4	1395	24.7
3	240	11.0	253	16.9	117	8.0	93	18.6	703	12.4
4	41	1.9	14	.9	9	.6	12	2.4	76	1.3
5	46	2.1	26	1.7	10	.7	21	4.2	103	1.8
6	13	.6	8	.5	3	.2	3	.6	27	.5
TOTAL	2190	100.0	1498	100.0	1461	100.0	500	100.0	5649	100.0

TABLE 2

Rate of reporting injury accidents to the Police by Road User Type, other vehicle involvement and MAIS

Injury severity	Road User	single vehicle	more than one vehicle	All accidents
MAIS 0-1	vehicle occupants	405	998	1403
	reported	292(72.1%)	817(81.9%)	1109(79.0%)
	motor cyclists	389	402	791
	reported	111(28.5%)	282(70.1%)	393(49.7%)
	pedal cyclists	547	360	907
	reported	17(3.1%)	176(48.9%)	193(21.3%)
	pedestrians reported		239 154(64.4%)	239 154(64.4%)
MAIS 2-5	vehicle occupants	235	489	724
	reported	181(77.0%)	448(91.6%)	629(86.9%)
	motor cyclists	300	376	676
	reported	138(46.0%)	312(83.0%)	450(66.6%)
	pedal cyclists	315	232	547
	reported	18(5.7%)	162(69.8%)	180(32.9%)
	pedestrians reported		234 191(81.6%)	234 191(81.6%)
FATAL	vehicle occupants	20	43	63
	motor cyclists	7	24	31
	pedal cyclists	-	7	7
	pedestrians		27	27
100% reported				
TOTAL		2218	3431	5649
% reported		35.3	77.0	60.7

Table 3

Comparison of MAIS and Department of Transport severity for police reported casualties

Injury severity \ Road User Group		Vehicle Occupants		Motor Cyclists		Pedal Cyclists		Pedestrians	
MAIS	DTp	MAIS	DTp	MAIS	DTp	MAIS	DTp	MAIS	DTp
0-1	Slight	1109 (79.0%)	1074 (76.6%)	393 (49.7%)	421 (53.2%)	193 (21.2%)	193 (21.2%)	154 (64.4%)	157 (65.7%)
2-5	Serious	629 (86.9%)	664 (91.7%)	450 (66.6%)	422 (62.4%)	180 (32.9%)	180 (32.9%)	191 (81.6%)	188 (80.3%)
Fatal	Fatal	63 (100%)	63 (100%)	31 (100%)	31 (100%)	7 (100%)	7 (100%)	27 100%)	27 (100%)
TOTAL		1801 (82.2%)		874 (58.3%)		380 (26.0%)		372 (74.4%)	