

Road Traffic Accident Statistics

Report on a WHO
Ad Hoc Technical Group

Prague
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**WHO AD HOC TECHNICAL GROUP
ON ROAD TRAFFIC ACCIDENT STATISTICS**

Prague, 26–28 September 1978

1. INTRODUCTION

An *Ad Hoc* Technical Group on Road Traffic Accident Statistics was convened by the WHO Regional Office for Europe, in collaboration with the Government of Czechoslovakia, in Prague, from 26 to 28 September 1978.

The meeting brought together temporary advisers from nine countries, one of which was outside Europe (USA), to review present systems of collecting, analysing and disseminating information on the causes and consequences of road accidents, taking into account national experiences and reports by WHO and other international agencies, to seek to devise a methodology providing better and more reliable criteria and comparisons and to recommend steps to be taken in the short term to improve national recording systems.

Experts in statistics from transport and health ministries as well as in traffic medicine and epidemiology attended the meeting.

Dr J. Červenka was elected Chairman of the Group. Dr J.D.J. Havard acted as Rapporteur (a list of participants is annexed).

The Technical Group was welcomed by Dr J. Jirouš, First Vice-Minister of Health, who said that road traffic accidents were of increasing concern to public health authorities in Czechoslovakia and emphasized the importance of the topic to be considered for defining better preventive strategies. He wished the Group every success in its discussions.

On behalf of the Regional Director, Dr Leo A. Kaprio, Dr M. Postiglione, Director, Disease Prevention and Control, WHO Regional Office for Europe, thanked the Government of Czechoslovakia for having accepted to act as host to the meeting. He emphasized the importance of this topic within the overall programme of the Regional Office on road accident prevention, particularly with regard to its worldwide responsibility, as the problem was of equal concern to both developed and developing countries. He gave a brief description of the programme of the Regional Office on the prevention of road traffic accidents.

Dr C.J. Romer, Regional Officer in charge of this programme, spoke about the purpose of the meeting. He referred to past activities of WHO in this field and pointed out that the problem had been a matter of concern for a long time. The main purpose of the Group was to seek methodologies

within the current health information systems for the gathering of better and more reliable statistical data on road accidents. He suggested that, as a preliminary, objectives be defined to guide public health authorities as to their contribution in this field. As other major areas of concern he emphasized the standardization of mortality indicators in the definition of morbidity and disability, the role of the International Classification of Diseases and other classifications, and the presentation of combined statistics. He also pointed out that the recommendations made by the Group would contribute to the joint efforts of WHO and other agencies such as the United Nations Economic Commission for Europe for the improvement of international statistics, with special regard to the problem of international comparisons.

2. BACKGROUND

Public health authorities have only recently shown interest in the quality of the data on morbidity and mortality provided by national returns of road accidents. They have found that the existing systems of recording such data are inherently defective, for largely historical reasons. In 1910 only half the road accidents in Great Britain were caused by motor vehicles and for every death on the roads only 26 persons were reported injured. The ratio has since doubled. In relation to prevailing causes of mortality and morbidity, road traffic accidents were not regarded as very important and in nearly all European countries their control was left to the criminal law in the form of traffic regulations enforced by the police. It would be no exaggeration to say that public health authorities regarded road traffic accidents as "acts of God", and that their responsibility was limited to providing the necessary first-aid, emergency and treatment services to deal with the resulting casualties. The prevention of such accidents was regarded as being a problem for the government department, if any, concerned with transport, or the police.

With increasing motorization both the quantity and quality of road accident data underwent important changes, the extent of which was not fully appreciated as the recording of accident data was left in the hands of the police, who were interested in road accidents for different reasons. Prior to 1926, only the number of accidents was recorded in Great Britain, and it was only after that date that information about the number of persons killed (which had already exceeded 4000 a year) or injured in road traffic accidents was given in the national returns. By that time nearly 90% of the persons killed on the roads were being killed in or by motor vehicles.

For purposes of their national returns most countries adopted arbitrary, *ad hoc* definitions of death (linked to period of survival following the accident) and of severity of injury (which mostly bore very little relationship to

the prospect of permanent disability). It was left to the police to assign the victims to the various categories of injury for purposes of compiling national returns which were collated by government departments of transport or by central statistical bureaux. Details of systems of accident reporting by 61 countries have been obtained by WHO and were published as a special subject article in the *World Health Statistics Report* in 1972 (1).

In most countries the extent to which non-fatal accidents were reported depended upon the degree of interest shown by the police from the point of view of initiating a criminal prosecution. The introduction of compulsory third-party insurance led to an improvement in levels of reporting. But few countries have been able to utilize the data collected by insurance organizations on a national basis for the purpose of monitoring road accident morbidity, as only those accidents involving insured vehicles are covered. Where attempts have been made to coordinate insurance data with national returns it has usually been found that the definitions and criteria adopted by insurance interests are incompatible with those adopted in the national returns, e.g., the definitions of injury in the Federal Republic of Germany (2). Because of the medico-legal consequences of death, the returns of road accident fatalities have always been more reliable.

Public health authorities have shown little interest until recently in the procedure for compiling national returns of road accident mortality and morbidity, for they have regarded the matter as within the competence of other government departments. Meanwhile, the pattern of road accident morbidity has changed considerably. The increasing differential velocity in road accidents has led to a situation where irreversible trauma to the brain and spinal cord is much more common. Furthermore, the demands on expensive hospital facilities have increased considerably. Modern resuscitation techniques have made possible the saving of life in these victims in circumstances which would have been regarded as impossible a few decades ago. A larger proportion of younger road users are now being involved in road traffic accidents and this has brought with it implications for loss of expectation of life and a largely unquantified increase in the pool of permanent incapacity in the community. The present state of national returns of road accidents does not permit public health authorities to assess the extent to which these changes have occurred. It is paradoxical that relatively unimportant infectious diseases remain subject to statutory notification procedures by competent medical personnel, whereas the reporting of road accidents, which account for more than half the male deaths in the 15–24 year age group in some countries, is not given more concern by public health authorities.

In 1973 the European Regional Office sent out a questionnaire to public health authorities in Member States in order to ascertain the existing practice in recording information about road accident morbidity in hospitals and clinics and the use which was made of such information. The results of the survey were as follows:

Recording of road accident morbidity by public health authorities. In only half (14/26) of the countries replying do hospitals and clinics report injuries treated as a result of road traffic accidents to the public health authorities, and in less than half (11/26) of the countries do the public health authorities keep any records of injuries so treated.

Communication of data. In less than two-thirds of the countries are any details of the injuries so treated given to other authorities (e.g., transport and police).

Publication of data. The proportion of countries in which such data are published is about the same, but the answers to this question suggest that many countries have published road accident statistics derived from other sources (e.g., police and transport authorities).

Accident report form. Although the question indicated clearly that information was wanted on the form (if any) in which public health authorities report road traffic injuries, the specimen forms remitted were police reporting forms, dealing mainly with the environmental factors at the scene of the accident, and not with data to be recorded by the health professions.

Classification of injuries and criteria. Ten countries use the International Classification of Diseases and 11 countries adopt the broad classification of death, severe injury and slight injury used by the police. Several countries failed to answer this question.

Use of information by public health authorities. All but four countries claimed that public health authorities made use of information recorded about traffic accidents, but many of these gave no details as to how the information was used, although a specific request for such details was made. Four countries stated that the information was used to plan emergency and first-aid services. Two countries replied that it was used in their health education programmes. Another country replied that it forwards the information to the intergovernmental board concerned with road safety. Many countries replied in vague terms such as "to influence legislation", "forwarded to interested health organs", "for information", "for evaluation of the problem", "feedback". Only two countries gave any indication that the information might be used for epidemiological purposes. The remaining countries gave no details.

Liaison with other authorities. Ten countries replied that there was no liaison with other authorities which collect statistics on road accidents. Of the remaining countries which claimed that liaison took place only four gave any positive details and each of these referred to the existence of intergovernmental committees set up for the purpose of liaison. The great majority either gave no details at all (in spite of a specific request for details) or replied with vague expressions such as "good", "simple contacts", "on demand", "continuous collaboration", "regular", "better methods of liaison are being explored".

3. RELIABILITY OF ROAD TRAFFIC ACCIDENT STATISTICS

Surveys in which the road accident casualties treated in hospitals have been compared with the national returns, show that there is a considerable underreporting and misreporting by the police and that the situation is particularly serious in the case of the so-called unprotected road users (e.g., pedestrians and cyclists), who are most likely to be seriously injured in an accident. It is only in the last decade that the extent of these discrepancies has been realized. A Swedish study presented at an international conference in 1969 (3) showed that only 28% of persons seriously injured in road traffic accidents were reported as such in official road accident statistics, and that a further 20% of them were recorded as only slightly injured. In other words about one-half of the persons seriously injured in road traffic accidents did not appear as such in the official returns. In order to test whether there was a similar discrepancy in the United Kingdom, which has a comprehensive health service, an analysis was carried out of the first 100 cases received each month over a period of a year at the Birmingham Accident Hospital (4). It was found that about one-sixth of the seriously injured and about one-third of the slightly injured road traffic accident victims did not appear in the police statistics.

It was noted that cases most likely to be missed by the police were those in which no ambulance was called, in which only the driver was involved, or in which no other vehicle was involved, and that the recording of injuries involving pedal cyclists was particularly unreliable in that less than one-quarter of those treated at the hospital appeared in the police statistics. These findings were confirmed by two further studies from Sweden and the United Kingdom respectively which were presented at another international conference held in 1975. The Swedish study included all road traffic casualties received at the Department of General Surgery in Halmstad (5). A total of 812 patients attended, of which 21 (less than 3%) had to be excluded as a result of incomplete information about the accident. Age and sex distribution were within expected limits for road accident casualties. It was found that only 42% of the patients with injuries were reported in the road accident statistics kept by the National Central Bureau of Statistics. The classification of injuries adopted by the Central Bureau in Sweden corresponds, as is the case in most countries, with the definitions of severity of injury adopted by the Economic Commission for Europe, and a comparison was made between the official classification and the actual injuries sustained in the case of each victim. It was found that only 35% of casualties were correctly reported. As might have been expected there was no discrepancy over fatalities. However only 43% of those seriously injured were correctly reported, and only 29% of those slightly injured.

An important supplementary finding in this survey was that the distribution of misreporting varies between different categories of road user, with the largest errors occurring in "unprotected" road users, i.e., pedestrians and cyclists, who are not offered any surrounding protection against injury by the vehicle. From the public health point of view these findings raise important issues over the identification of high-risk groups from official road traffic accident statistics. Both single-vehicle accidents and accidents involving unprotected road users were underreported or misreported widely in the official statistics. The survey also established that unprotected road users constitute almost two-thirds of those killed and seriously injured in accidents. Unprotected road users require far longer hospital inpatient treatment and more days in intensive care. Yet the official statistics purport to show that the majority of casualties are protected road users (i.e., occupants of vehicles).

The British survey (6) included all road traffic accident casualties attending a large accident hospital (the Battle Hospital in Reading) during a six-month period in 1973. A total of 846 casualties involved in 644 accidents were studied, of which 308 were inpatients. Of the casualties, 641 were reported in the official statistics and the sex distribution was within expected limits. The distribution of underreporting amongst different categories of road user was similar to that found in the Swedish survey, as was the variation in length of hospital stay. Comparison between the actual injuries and those reported in the official statistics also showed a similar pattern, although not so marked (Table 1).

Table 1. Comparison of injury severity for 308 detained casualties using criteria used in official statistics (i.e., as reported by police) and clinical criteria

Criteria used in official statistics	Number of cases	Clinical criteria	Number of cases
No injury	—	No injury	2
		Minor	40
Slight	—	Moderate	151
Serious	293	Severe	100
Fatal	15	Fatal	15

A further British study (7) between 1974 and 1976 showed that nearly 30% of all road traffic accident casualties were not officially reported, even though they attended hospital for their injuries. The same distribution of underreporting was noted. Two-thirds of all pedal cyclist casualties attending hospital had not been officially reported. The details are set out in Table 2.

Table 2. Underreporting of casualties to the police

	Reported to the police				Not reported to the police				Grand total No.
	Slight No. (%)	Serious No. (%)	Fatal No. (%)		Slight No. (%)	Serious No. (%)	Fatal No. (%)	Total No. (%)	
Vehicle occupants	900 (82)	646 (91)	49 (100)		203 (18)	65 (9)	0 (0)	268 (14)	1863
Pedestrians	140 (60)	215 (82)	27 (100)		94 (40)	47 (18)	0 (0)	141 (27)	523
Cyclists	82 (29)	85 (41)	1 (100)		201 (71)	120 (59)	0 (0)	321 (66)	489
Motorcyclists	218 (54)	259 (73)	12 (100)		182 (46)	95 (27)	0 (0)	277 (36)	766
All road users	1340 (66)	1205 (79)	89 (100)		680 (34)	327 (21)	0 (0)	1007 (28)	3641

Source: Hobbs, C.A. et al. *Classification of injury severity by length of stay in hospital* (Report 871). Crowthorne, United Kingdom, Transport and Road Research Laboratory, 1979.

Misreporting by the police does not imply any fault or negligence on their part. In the first place, the categorization has to take place at the scene of the accident and with no routine follow-up at the hospital to which the victim is admitted. In the second place, the definitions of severity of injury adopted by most countries correspond closely to standard definitions adopted by ECE more than 30 years ago, when the pattern of road traffic accident trauma was very different from what it is today. They bear little relationship to clinical severity, as is shown clearly by the British survey (6) reported above, where the categorization of severity of injury included in the official returns was compared with the clinical assessment of severity (Table 1). The definition of serious or severe injury (8) covers anything from a broken finger to fractures of the skull or vertebral column resulting in paraplegia or quadriplegia, as well as death occurring after the period adopted for the definition of a road traffic death has elapsed.

Working papers presented at the meeting confirm that there is widespread underreporting and misreporting in other countries. In Denmark surveys have shown that only about 36% of road traffic accident victims appear in the official statistics and 66% of the victims not reported are sufficiently seriously injured to need hospital admission (9). About 10% of persons severely injured in road traffic accidents in Poland do not appear in the police statistics (10). The majority of them are believed to be injuries caused by motorcycles, or by drivers intoxicated by alcohol. The reporting of road traffic accident morbidity in Czechoslovakia was also stated to be unreliable and misleading.

4. OBJECTIVES OF COLLECTING ROAD TRAFFIC ACCIDENT STATISTICS

The Technical Group decided that in recommending measures to improve the quality of reporting and recording road traffic accident mortality and morbidity, the following objectives should be kept in mind:

- to determine the nature and extent of mortality from road traffic accidents and its distribution by age, sex and category of road user;
- to determine the nature and extent of both temporary and permanent human disability from road traffic accidents and the degree of resulting social and economic dependency, and to assist in planning for the overall management of such cases;
- to determine the extent to which road traffic accidents make demands on first-aid, emergency, treatment (including intensive care) and rehabilitation services, so as to facilitate the planning of such services in accordance with the manpower and economic resources available;

- to identify the causes of the severity of injuries sustained in road traffic accidents and the human and environmental factors^a influencing this severity, to provide a basis for introducing injury prevention measures, and to monitor the results;
- to identify the human and environmental factors which influence the risk of involvement in road traffic accidents, to facilitate the introduction of countermeasures, and to evaluate their effects.

5. MORTALITY

International statistics provide valuable information on the extent of mortality from road traffic accidents and its distribution by age, sex and category of road user. WHO receives data under the E code (cause of injury) of the International Classification of Diseases (ICD) (11); however, very few countries provide information under the N code (nature of injury), so valuable data on the exact pathology of fatal road traffic accidents are generally missing. The Economic Commission for Europe (ECE) publishes data annually (12) about road traffic accident mortality for 25 European countries and for Canada and the United States. The ECE data provide important information about fatal road accidents which cannot be obtained from the WHO data bank. It includes the situation of the accident (built-up or rural area) and details about the nature of the accident and its surrounding circumstances, together with estimates of the number of persons involved in such accidents who were found to have various concentrations of alcohol in the body.

The two sets of data are not strictly comparable. In the first place, the sources of the information on which the returns are based are different. The WHO data are based upon information contained in death certificates, whereas the ECE data are based upon reports from the police authorities. The ECE data are based upon definitions which do not correspond with the ICD rubrics, in particular the period following an accident within which death must occur if it is to be classified as a fatal road traffic (or motor vehicle) accident. Although fatal accidents are not specifically defined in the ICD, it is implicit in the rubrics which define late effects of injury that deaths occurring within 12 months of the accident will be classified as "late effects" of the accident. As the international form of death certificate requires the approximate time between onset and death to be recorded it is unlikely that classification for ICD purposes gives rise to any difficulty in Member States.

^a In this report "environmental factors" are taken to include vehicles.

The ECE definition includes only those deaths which occur within 30 days of the accident, but a number of countries have not yet adopted the recommended definition and return only those deaths which occur within shorter periods. In order to get over this difficulty the Inland Transport Committee of ECE has suggested that a conversion formula should be adopted as follows:

	Per cent
Died at the scene of the accident or on the way to hospital	65
Died within 3 days.	88
Died within 30 days.	97

From the public health point of view such formulae should be accepted with considerable reservation as they are based solely on statistical calculations of overall death rates. In practice the time taken to die after a road traffic accident depends upon a number of variables. They include the category of road user (unprotected road users such as pedestrians and cyclists generally sustaining more serious injuries), the age of the victim (the survival rate being much higher for younger road users) and the state of the first-aid, emergency and intensive care services in the countries concerned. Nevertheless, most fatally injured victims die within 30 days of the accident and the ECE claims that only a small proportion (about 3%) die between 30 days and a year after the accident. One consequence of these time differences is that the same deaths may be recorded in different years in the two sets of returns. This difficulty was referred to in the special subject article on the availability of accident statistics which was published in the *World Health Statistics Report* in 1972 (1) when it was suggested that the WHO period of one year within which death must occur following the accident was too long. It was proposed that an appropriate subdivision would be as follows:

- (a) fatal accidents: death occurs immediately or within one week of the accident;
- (b) deaths due to accidents: death occurs one week and less than one year after the accident;
- (c) deaths due to late effects of accidents: deaths occur one year or more after the accident.

Another difference is that the ECE data include deaths from all road traffic accidents, whereas the ICD includes only those accidental deaths which are caused by motor vehicles. In order to establish the importance of this difference, figures were obtained from the WHO data bank for deaths from "other road accidents" in the age group 15–24 years, as part of a study carried out for a special subject article in the *World Health Statistics Report* (13). Out of 28 countries for which absolute numbers of such deaths were

available, double figures (10 or more) were recorded in only 3 of them:

Japan (21 in 1974 and 22 in 1975),
Hungary (11 in 1970–1974) and
England and Wales (13 in 1975).

Out of 13 countries for which rates per 100 000 were available, the rate exceeded 0.5 per 100 000 in only 2 of them (Hungary and New Zealand). No country exceeded a mortality rate of 1 per 100 000 population from other road traffic accidents in this age group.

Because of the additional information given in the ECE returns of road traffic accidents it is important to establish the extent to which the two sets of data can be used for purposes of international comparison. In the study mentioned above it was possible to carry out a comparison of the figures for 8 countries covering the years 1975 and 1976 (Table 3). Differences between the two sets of figures were largest in the case of Austria and Hungary, and it is

Table 3. Comparisons between WHO and ECE returns for deaths in the 15–24 year age group for motor vehicle accidents (WHO) and road traffic accidents (ECE) in 1975 and 1976 for 8 countries

Country		1975	1976	Change (%)	Comparison between totals for both years (WHO = 100)
Austria	WHO	594	582	- 2.0	91.3
	ECE	555	519	- 6.5	
Denmark	WHO	200	238	+ 19.0	99.5
	ECE	201	235	+ 16.9	
Germany, Federal Republic of	WHO	4183	4188	+ 0.1	102.7
	ECE	4311	4288	+ 0.5	
Hungary	WHO	376	267	- 38.2	80.7
	ECE	272	247	- 9.2	
Netherlands	WHO	556	651	+ 18.9	101.5
	ECE	577	648	+ 12.3	
Norway	WHO	138	132	- 4.3	94.1
	ECE	142	112	- 21.1	
Sweden	WHO	269	256	- 4.8	94.5
	ECE	253	243	- 3.9	
Switzerland	WHO	318	285	- 10.4	103.8
	ECE	326	300	- 8.0	

significant that these were the only 2 countries which did not adopt the ECE recommended 30-day survival period for defining a fatal road traffic accident. For Austria only those victims in whom death occurred within 3 days of the accident were included in the ECE figures. In the case of Hungary only those victims who died within 48 hours of the accident were included for 1975, after which the ECE recommended period of 30 days was adopted. This had the result of narrowing the difference between WHO and ECE figures from 38.2% in 1975 to 8.1% in 1976.

Taking into account the above considerations it is important that public health authorities, having established from WHO data the mortality rates and trends between their own and other countries including the sex of the victims (which is not given in the ECE data), should study the ECE data for other countries where they can supplement information about the nature and circumstances of fatal road traffic accidents in the countries concerned. In the case of countries not included in the ECE returns, the necessary information for comparative purposes can usually be obtained from national returns based on police reports, which are published by the Central Statistical Bureau or other appropriate government department.

Reference was also made to the OECD activities in standardization of international statistics of road traffic accidents (14).

6. SEVERITY OF INJURY

The unreliability of accident statistics for describing the extent of road traffic accident trauma has already been examined (section 2). The Technical Group also considered that the existing ICD rubrics were inadequate to describe the more severe injuries and that it would be necessary to re-examine them with a view to making them more precise. Only 15 whole numbers of the 159 assigned to trauma by the ICD describe internal injuries to the head, chest and abdomen, so that less than 10% of the code describes those injuries which account for the majority of deaths from trauma (15).

A number of injury rating scales have been proposed to facilitate the classification of severity of injury. The most well known is the Abbreviated Injury Scale (AIS) which has undergone a number of modifications since its introduction in 1969. It was most recently revised in 1975 (16) and provides for six grades of severity:

Grades	Examples
AIS 0 – No injury	
AIS 1 – Minor	Minor cuts, bruises or abrasions. Undisplaced fractures of fingers and toes.
AIS 2 – Moderate	Moderate cuts (more than 2 inches in length on body and more than 1 inch in length on face). Mild concussion. Undisplaced fractures of long bones of arms.
AIS 3 – Severe (not life-threatening)	Severe cuts (greater than 4 inches in length on face or penetrating to deeper soft tissues, e.g., muscles). Displaced fracture of arms. Fractures of long bones of leg.
AIS 4 – Serious (life-threatening but survival probable)	Ruptured spleen. Multiple rib fractures with unilateral flail chest.
AIS 5 – Critical (survival uncertain)	Bilateral flail chest. Extensive lacerations of liver.
AIS 6 – Maximum (injuries currently untreatable)	Decapitation. Massive intracerebral haemorrhage leading to death within 60 minutes. Transection and rupture of the aorta with immediate exsanguination.

This scientific classification of severity of injury takes into account that in some cases the consequence of death may be coincidental. It may result from any of the more severe categories of injury – or even from complications only, as when pulmonary embolism is superimposed on relatively minor injuries. For this reason it is not given a category of its own.

A more detailed scale, which is in effect an extension of the AIS, is the Comprehensive Research Injury Scale (CRIS) (17). Both AIS and CRIS scales require assessment by a physician which limits their application to any national system for recording morbidity. Furthermore, the AIS does not adequately adjust for multiple injuries which are becoming much more common in modern types of road accident. To get over the latter difficulty another system known as the Injury Severity Score (ISS), which is defined as the sum of the squares of the highest AIS grade in each of the three most severely injured areas, has been proposed (15). Studies based on this system show that death rates increase in the presence of injuries involving a second or third body area even when the additional injuries would not be expected to be fatal. The rapidly increasing incidence of multiple injuries is a fairly recent feature of road accidents (18).

Reference was made to a survey carried out in Britain (7) in which the ISS was related to mortality, the time taken to die, duration of hospital stay and disability. A strong relationship was found between dose of injury (as measured by the ISS) and the proportion of cases dying, with a marked age effect in that elderly patients suffer a higher mortality for a given severity of injury. Although the time taken to die, duration of hospital stay and extent of disability also showed a strong relationship with ISS scores, this was more marked for groups of victims than for individuals.

In order to complement the classification of severity of injury by systems such as AIS and ISS, a Collision Deformation Index (CDI) (19) has been developed to provide comparability with the extent of vehicle damage. Attempts are being made to refine this system to provide information about the velocity change involved in the accident, i.e., the total energy load transmitted to the vehicle and through the vehicle to the occupant victims.

All the recording systems described above require assessment by qualified and experienced physicians and this greatly restricts their application to the national recording of road accident morbidity. They are, however, useful in evaluating less sophisticated systems such as those based on assessments made by nonmedical personnel, and are invaluable in the conduct of accident surveys for research purposes in which the use of highly trained investigators is possible. Ultimately, it should be possible to achieve linkage between the environmental data collected by the police at the scene of the accident and the data recorded at the hospital or clinic where the victim is treated. This could lead to the use of the more sophisticated recording systems in collecting data for national returns. There is, however, no immediate prospect of this being achieved and attention has therefore to be given to devising less complicated systems for routine reporting which will not involve the use of highly trained personnel to record the severity of injuries.

More recently, interest has been shown in length of hospital stay as an indication of severity of injury and prospect of incapacity. One analysis, based on a representative sample of all road traffic accident casualties treated at a hospital covering a fixed geographical area in the United Kingdom over a two-year period, showed that 80% of casualties with injuries rated as AIS 3 or greater would be correctly classified if the criterion of detention in hospital for three nights or more were adopted (7). This would offer a simple objective method for use by untrained, nonmedical staff and one which relates much closer to clinical severity than the existing definitions used by the police.

Its adoption for the purposes of compiling national returns would give a very much better indication of the severity of road traffic injuries and of the prospect of incapacity.

It is interesting to note that a few countries have recently adopted length of hospital stay in one form or another as a criterion of severity of injury. Beginning in 1980, Czechoslovakia will require all road accident casualties to be kept under observation for 7 days (8). Meanwhile, the classification of

injury is linked to duration of incapacity (slight 1–42 days; severe more than 42 days). Austria requires injuries necessitating hospitalization for more than 21 days to be classified as “severe” (20). In the Federal Republic of Germany, the corresponding period is one day (21). In Norway, since 1 January 1977, the degree of severity of injury is determined by hospital doctors. Those likely to result in death or permanent disability are classified as “very serious”. Those which are clinically serious although not likely to result in death or permanent disability are regarded as “serious” and other injuries as “slight” (22). These correspond roughly with AIS ratings 5–6, 3–4 and 1–2 respectively. Recent reports suggest that the introduction of these arrangements has not caused any difficulties in Norway.

There remains the problem of the inadequacy of the existing ICD codes in describing trauma from road traffic accidents, to which reference was made at the beginning of this section. The Technical Group decided to recommend that a special working group should be established to propose amendments for the next revision of the ICD in order that these points could be covered.

7. DISABILITY

Few, if any, social security systems in the European Region are able to estimate the extent to which road accidents contribute to the pool of permanent incapacity in the community, although anecdotal evidence based on perceived changes in the occupancy of hospital wards for severely disabled persons suggests that it has been increasing rapidly. A “microcensus” carried out in the Federal Republic of Germany in April 1966 showed that about 100 000 persons were suffering from physical or mental handicaps, or were in receipt of a disability pension before retiring age as a result of road accidents (23). A British study has shown that more than 3% of road accident victims were still invalids six months after the accident (24). A survey based on 4342 admissions to the Birmingham Accident Hospital (25) in 1961 showed that 25% of the motorcyclists, 21% of the vehicle occupants and 11% of the pedal cyclists were permanently disabled. About one-third of the disabilities were severe and one-half of moderate severity. More than half of the disablements occurred to victims who were under the age of 30 at the time of the accident.

Clearly, the fact that it is impossible to identify road accident victims from records kept by social security systems of persons in receipt of disability payments is a serious defect in many countries in the Region. Pilot studies could usefully be carried out on ways of collecting this important information and on the cut-off points to be used in defining disability for recording purposes. The OECD Social Indicator Programme is concerned

with this problem and its reports merit careful study. The standardized indices used by insurance companies could also be considered.

8. RECORDING OF ENVIRONMENTAL DATA

The Technical Group was mainly concerned with the collection and recording of statistics relating to severity of trauma in road traffic accidents and with the factors in the road user which may have contributed to the accident. The collection of environmental data has been reviewed elsewhere. It was noted, however, that an important source of error in road traffic accident statistics might exist in that police officers are trained to record single or primary causes of accidents even in cases where several contributory causes can be clearly identified.

The recording of data by police officers is usually determined by the form which they are required to complete in respect of each accident. In one study of 104 road traffic accidents in Iowa, United States, 668 contributory factors were identified, of which 19% affected the driver, 50% the vehicle and 31% other aspects of the environment (26). In attempting to record these factors on the standard National Safety Council form it was found that only 140 factors could be recorded, 89% of which were human, 11% vehicular and none relating to other aspects of the environment. The form concerned provides the basis for publication of national returns of road traffic accidents in the publication *Accident facts*.

The Technical Group noted that in most countries road traffic accidents reporting forms are based on operational and legal considerations, and furthermore, that they are concerned primarily with the cause of the accident rather than the causes of morbidity and mortality arising during the accident itself or the immediate aftermath. An account was given of three systems which have been developed in the United States in an attempt to remedy these defects, namely the multidisciplinary accident investigation team (MDAI), the fatal accident recording system (FARS) and the national accident sampling system (NASS) (19).

9. RECORD LINKAGE

There is a need to establish record linkage as the coexistence of two sets of data is one of the main reasons for the present inadequacy of road accident statistics. Police records, on which national statistics are based, give many

details about environmental circumstances but far less about associated human factors, whereas the emphasis in hospital records is the reverse. The latter records frequently do not mention the category of road user, and they may not even indicate that the accident was a road accident. Attempts at record linkage have been frustrated by lack of interest, failure to provide resources, or objections relating to the confidentiality of hospital records. Such attempts, however, should be encouraged as they could significantly help to improve the reliability of road traffic accident statistics; the problem of confidentiality could be overcome by using modern computerization techniques.

In 1973 WHO representatives attending the *ad hoc* Meeting on Road Traffic Accident Statistics, convened by the Group of Experts on Road Traffic Safety of the ECE, proposed that a linkage study should be carried out in selected countries. Subsequently the Regional Office designed a joint reporting form which had as its immediate aim the validation of a new and practicable definition of serious injury. The study, which became known as the joint ECE/WHO feasibility study, was approved by the Group of Experts on Road Traffic Safety of ECE in 1974 (27), and the representatives of six countries were invited to consider participating in the study. Unfortunately, none of the countries concerned was able to participate and it was impossible to continue with the study (28).

In 1978 the Regional Office set up an *ad hoc* Working Group on Medical Monitoring of Road Traffic Accidents. The report of the meeting of this Group, which includes important proposals for studies on record linkage, is set out in Annex I. Meanwhile, a few countries have been attempting to introduce the concept of record linkage into their own systems for recording road traffic accidents. Public health authorities in Member States should be prepared to support such proposals by pointing out the use which can be made of the information provided by such linkage. An example of this is the circular issued by the Department of Health in the United Kingdom, described in Annex II to this report.

10. COMBINATION OF DATA

A further matter requiring attention is the combination of data of many different types, e.g., police, certification of death, hospital, social security, occupational accident, sickness, absenteeism and insurance records. Techniques exist for the combination of data and this would be worth undertaking, even if it is possible to do no more than publish all the information available in a convenient form. In the longer term this process could be replaced or supplemented by record linkage. A good example of combining

data is given in the report of the International Driver Behaviour Research Association's study on factors influencing the number and severity of road accidents (29). Meanwhile, it was noted that ECE, ILO and WHO had held a meeting to rationalize the accident mortality and morbidity statistics of the three organizations.

11. DEVELOPING COUNTRIES

Attention was drawn to the fact that road traffic accidents are rapidly increasing in importance in developing countries and that there is therefore an urgent need to ensure that the procedures for recording and storing information about such accidents are placed on a proper basis as early as possible. Meanwhile, it appeared that a number of such countries had been adopting *ad hoc* arrangements which incorporated many of the worst defects of the systems used in developing countries. It was noted that the Regional Office was setting up a study on road traffic accidents in developing countries, and the Technical Group suggested that attention be given to the important problem of information systems in order to provide developing countries with reliable advice on the collection of road accident statistics.

12. CONCLUSIONS

Objectives. Public health authorities should review the contribution they can make towards the improvement of the collection of road traffic accident statistics, taking into account the objectives defined in section 3 of this report.

ICD codes. Validity studies should be carried out to determine the extent of any misreporting of fatal accidents under the ICD codes. The existing rubrics should be examined to determine the extent to which they are capable of describing adequately trauma from road accidents, and public health authorities should be encouraged to furnish information about such accidents under both the N and E coding and by cross-tabulation of both.

Disability. Urgent attention should be given to the need to provide information about the extent of disability in the community resulting from road traffic accidents. Member States should be encouraged to ascertain the extent to which length of hospital stay corresponds with severity of injury and prospect of incapacity in the case of victims of road traffic accidents.

Injury protection. Road accident reporting forms should include provision for the recording of information about factors relevant to protection

from injury, e.g., the wearing of seat belts, crash helmets, etc., as well as the factors which influence the risk of occurrence of an accident.

Record linkage. Public health authorities should cooperate actively in measures to provide linkage between data collected by the police and the hospital records in the case of injury-producing road traffic accidents.

Combination of data. Techniques for combining data from social security, motor insurance, occupational disability, sickness and medico-legal records should be examined. Meanwhile, the information available on road traffic accident victims from such sources should be collected and published in a convenient form.

Special surveys. Pending the introduction of measures to improve the quality of road traffic accident statistics, information about mortality and morbidity should continue to be collected by means of surveys limited to specific geographical areas or populations. Attention is drawn to the work of the *ad hoc* Technical Group on Medical Monitoring of Road Traffic Accidents.

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Annex I

MEDICAL MONITORING OF ROAD TRAFFIC ACCIDENTS^a

1. Outline of WHO activities in this field

Reports on the world health situation have regularly stressed the scale of road traffic accidents, with about 10 million persons injured each year, and 250 000 killed. Nevertheless, figures recorded at national level remain incomplete. This is the reason why the WHO Executive Board,^b followed by the World Health Assembly,^c requested the Director-General to develop a programme on the prevention of road traffic accidents, the WHO Regional Office for Europe subsequently being made responsible for its development.

Systems of information on road traffic accidents play an important role in this programme. Several reports, especially that on the Conference on the Epidemiology of Road Traffic Accidents (Vienna, 1975),^d have stressed the urgent need to have more reliable basic data on mortality and morbidity due to road traffic accidents. This would give a proper epidemiological framework for the establishment of preventive programmes and for the planning of medical services for the injured. It has also been emphasized that national health authorities must play an active part in the prevention of road traffic accidents.

The aim of medical monitoring activities is to test alternative information systems through a network of medical centres experienced in road accident problems, and provide support for special studies on the causes and consequences of accidents.

2. Existing monitoring systems

2.1 National statistics

Official statistics on road traffic accidents and injuries are generally collected and issued by transport and police authorities in collaboration with central government statistics bodies. Some deficiencies in official statistics

^a Based on the report on an *Ad Hoc* Technical Group which met in Odense, Denmark, from 13 to 15 June 1978, and was attended by Dr M. Bogusz, Poland; Dr G.C. Das, India; Dr P.G. Hansson, Sweden; Dr A. Ismael, Morocco; Dr E.L. Nordentoft, Denmark; Professor R.T. Smith, USA; and Dr P.A.M. Weston, United Kingdom.

^b Resolution EB57.R30, 27 January 1976.

^c See minutes of Twenty-ninth World Health Assembly, fifth meeting, 11 May 1976.

^d WHO Regional Office for Europe. *The epidemiology of road traffic accidents*. Copenhagen, 1976 (WHO Regional Publications, European Series No. 2).

have been reported. Mortality figures have been found to be reliable compared to hospital statistics. Morbidity figures are more uncertain and some reports have shown underreporting. As underreporting differs according to the category of road traffic victims, there is a risk that official statistics also give a distorted picture of road traffic injuries.

2.2 Local studies

Limited studies of road traffic accidents and injuries have been undertaken locally, and some of the results published.

An Accident Analysis Group was started at Odense University Hospital in 1971 when an increase observed in the number of road traffic accident victims could not be found to be reflected in official police statistics. Studies have been used mostly for local purposes and the geographical information received is substantial. Studies have also been conducted on types of accidents and injuries. For instance, certain strangulation injuries from scarves caught in moped tyres were identified and then eliminated after the Group had disseminated information on them.

Apart from the strangulation injury described above, it has not been possible to determine causes in the epidemiological studies, but areas have been defined where in-depth studies have been undertaken. These studies include one on seat belt injuries and one on accidents in children.

One problem is to define the population exposed to accidents and injuries. A working model used by the Group is shown in Figure 1.

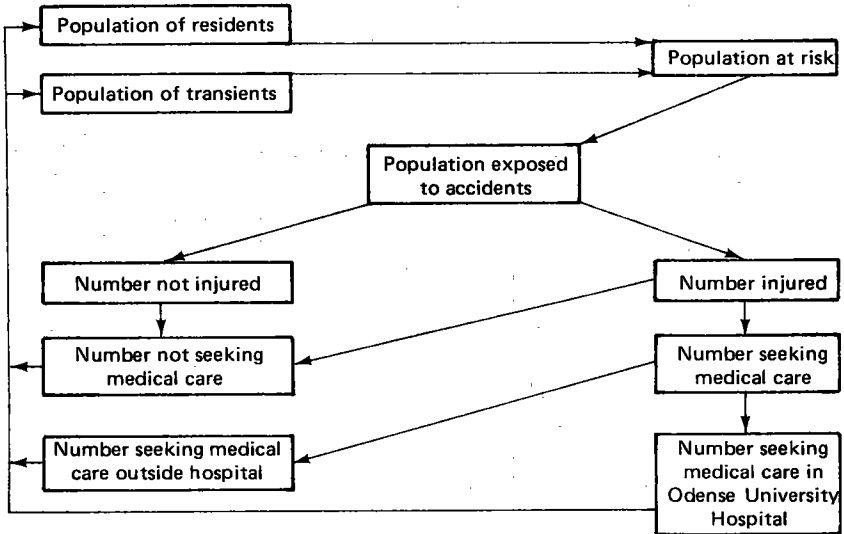
In Denmark identification of victims is much facilitated by the use of the CPR (central personal register) code. CPR numbers comprise ten digits indicating, *inter alia*, the day, month and year of birth, and are specific for each inhabitant in Denmark. The code can also be used for foreigners. All collection and handling of data in Odense is computerized. There is linkage between hospital data and data received from police reports.

In Nottingham, United Kingdom, a codified record sheet for all types of accident is used. Basic records include a simple scale for seriousness of injury and a simple diagnosis code. Efforts are being made to link the information received to information given by police authorities and local traffic safety groups.

In New Delhi, India, all victims of road traffic accidents have to go to one of four large hospitals in the city. A policeman is stationed at the emergency department day and night and thus there is good linkage with police information. A registration department works in the hospitals and the International Classification of Diseases is used for both inpatients and outpatients. Linkage is also possible with insurance reports as there is only one insurance company.

In Halmstad, Sweden, a study has been undertaken dealing with epidemiology, reliability of official statistics, hospital load and economic aspects

Fig. 1. Model of population at risk



of road traffic injuries. Collection of data on road traffic accidents started again in January 1978 and the intention is that the material from Halmstad should be used by the Accident Analysis Group for comparison. There is a strong resistance to record linkage in Sweden and comparison with police data will probably have to be done manually.

In Cracow, Poland, comprehensive police reports are the main source of information. The statistical unit used is the accident, not the victim. There is good linkage between police reports and hospital information. Reports are based on police material and are collected and handled by a Central Bureau of Statistics.

In Rabat, Morocco, accidents involving personal injury are registered by the police. At the moment, hospital statistics cannot be linked to police reports.

2.3 Results

The local studies have already produced some results, which have been used in local traffic safety work and have sometimes served to provide a warning at the national level.

The results include:

- identification of especially dangerous areas (black spots);
- identification of and measures against new types of accident;
- estimation of underreporting in official statistics;
- estimation of load on hospital resources;
- determination of economic consequences of road traffic accidents.

3. Purposes of monitoring

The main purposes of medical information should be:

- to establish standardized descriptive statistics on traffic accidents, to be used in computing incidence rates;
- to identify psychosocial and medical factors involved in accidents, and the sociomedical consequences of traffic injuries;
- to identify high-risk groups and priority fields for further action;
- to give supplementary and corrective information to police derived from information systems;
- to identify types of accident that occur less frequently;
- to establish a framework for establishing common definitions and co-operating in the conduct of in-depth studies.

Local action might also motivate national statistical offices to take action. The medical information collected could be used in estimating the accident burden for the community and in planning medical services.

Later, in-depth studies can be made, one important field to be covered being the estimation of disability risks in relation to different types of accident, injury and treatment.

Reliable tracer data for making comparisons and determining long-term trends (e.g., fatality figures or figures for well defined lesions) are of special interest at the international level. The same is true for data on occurrences which are too infrequent to be used for national statistical analyses.

Definitions of some of the terms most commonly used in the monitoring of road traffic accidents are given in Appendix 1.

4. Population to be studied

It is important to define clearly the population and its characteristics. Geographical limits must be defined locally for each centre participating in the study. Usually the geographical area is the same as the catchment area for the hospital in question. Some difficulties can arise for special types of injuries, e.g., neurological injuries that have to be referred to a neurosurgical unit at some distance from the actual hospital.

If possible, the length and quality of roads in the area should be defined. Other variables that are of interest but are more difficult to obtain are car density (vehicle registration per capita), mileage driven and petrol consumption. Probably these characteristics have to be obtained for a larger area than the one studied.

Sociodemographic characteristics of the population studied must be as well defined as possible. Details of age and sex distribution are essential. Criteria for residence (permanent, transit, regular transit, national, non-national, etc.) must be defined. Other characteristics that could be of value include marital status, occupation (workers, manual, nonmanual, school-children, students, nonworkers, housewives, etc.), educational characteristics (UNESCO standards can be used), labour force characteristics and prescriptive drug use. Population density and characteristics of the area studied can be included. Information of special interest in relation to particular types of road traffic accident includes data on persons frequently involved in accidents in the area and the driving experience of the population.

Problems can arise in identifying residents who have accidents outside the geographical area. These can possibly be estimated by scanning death certificates.

5. Monitoring methods

Hospital information should be the primary source of data. It should be supplemented by information from secondary sources such as the police, road authorities, insurance authorities, etc. For comparison between different centres a minimum core of data should be collected, which could be supplemented by others that are optional. If possible the nature of the optional data should be agreed upon by those concerned, with reference to the possibility of their comparison.

A draft form for the registration of accidents is given in Appendix 2. The layout of the form should, if possible, be the same in all centres (even if language differs), to facilitate central handling and computerization.

Accident linkage number (optional) is used to link all the victims of one accident. Different numbers can be used such as police number, vehicle registration number, etc.

Among the personal data, name, address and other data directly identifying the victim can be withheld by the collecting centre and must not be forwarded to the centre responsible for handling the pool of data. If possible, provision should be made for deletion of this information in the final form before it is forwarded from the collecting centre. Patient secrecy must be respected, but there must be possibilities for identification of the victims for the purpose of follow-up studies.

Date of birth (optional), possibly with the CPR number (also optional), could be of some value in identifying the victim, and in determining age and sex.

Data on *age* and *sex* are core data.

Residence (core and optional) must be clearly defined for each centre participating in the study. This variable must be correlated to corresponding data for the population studied.

Marital status (optional) is sometimes difficult to define as in some countries people form families although the legal requirements of marriage are not fulfilled. Definitions should be left to the discretion of the collecting centre.

Driving experience (optional) can be difficult to define. The number of years that a licence has been held could be ascertained from police data. If there is reason to believe that the number of years of driving experience is different from the number of years that a licence has been held, this should be noted. If the victim is a passenger, this variable can either be deleted or the experience of the person driving the vehicle can be given.

Accident repeaters (optional) can probably best be identified by direct questioning of the victim. A distinction must be made between "active" and "passive" road users. If the study goes on for several years, this variable can probably be controlled in the material collected.

Fatigue (optional) is known to increase the risk of accidents. In some countries there is a law against driving for too long a period without rest. Information on this point probably has to be obtained by questioning the victim. In some vehicles special recorders for time driven, speed, etc., are fitted and are usually checked by the police after accidents.

Occupational status (optional) is of value if the occupational status of the population at risk can be determined.

Place of accident (optional) can be defined according to different systems. In Denmark a special code is used for linkage with police reports. In most centres this probably has to be defined in terms of street address, road number, etc.

Date and hour of accident (core) is a basic epidemiological variable which can also be of some importance for checking accident data linkage and can be correlated to meteorological data for the area studied.

Date and hour of arrival at hospital (core) can be used to estimate the load of the emergency department at different times of the year, month, week and day. Time of transport from accident place to hospital can be estimated on this basis and complementary information about when actual treatment of the victim starts can also be obtained.

Category, transport and counterpart (core) are essential epidemiological variables. There has been some discussion about whether professional drivers such as taxi drivers should be distinguished from amateur drivers.

Purpose of transport (optional) can be of value in assessing the danger of different activities. In some countries accidents occurring on the way to and from work are considered work accidents. This variable can also give information on dangerous areas, e.g., roads leading to schools.

Protective devices (optional) are compulsory by law in some countries. Such devices include seat belts and crash helmets. Other items under this heading include children's seats for bicycles and cars, headrests in cars, etc. Information on such devices can be derived from police reports or direct questioning. These data are subject to caution, as are all data in cases where statements can have legal implications.

The police report (optional) provides a rough check on the proportion of victims included in the official statistics. The information can later be used for in-depth studies of the reliability of official statistics and for completing the accident registration form; in some instances there can be direct linkage between police reports and hospital material.

Type of accident (optional) and *description of scene of accident* (optional) are variables providing a more detailed description of the accident. The four squares are intended for categorization of the accident according to the system worked out by the Organisation for Economic Cooperation and Development (OECD).

Victim's place in car (optional) can be shown. As some countries have left-hand and some right-hand driving, the position of the steering-wheel must be shown.

Condition on arrival (optional) provides a rapid indication of the severity of injury.

Patient disposition (core and optional) shows in more detail the patient's condition and the treatment required and is of some importance for follow-up studies of treatment.

ICD E diagnoses (three digits core; fourth digit optional) are used in WHO for describing the cause of injury. The code can also be used for checking other variables describing accident type.

ICD D diagnoses (core) are used in WHO for describing the type of injury and the injured part of the body. The code is very detailed and can be used in combination with the Abbreviated Injury Scale (AIS) code.

Estimated number of days of incapacity (optional) is the estimated number of days before the victim can return to normal activities.

Length of stay in hospital (optional) can be used in estimating the load on hospital services, in comparing hospital stay for different types of accident and injury and in judging treatment. This variable can show either the number of days for the first stay at the hospital or for all periods of stay

at the hospital for the same injury within a given period of time. Hospitalization at other hospitals and clinics should also be taken into account.

Injury – AIS (core and optional) shows the degree of the injury according to a scale. This variable is used by all major centres working in traffic medicine. The region injured is a core item, while the others are optional. The seriousness of injury on the AIS is estimated according to instructions of AAAM.^a Region and degree of injury on the AIS scale are the two important variables for comparing injury patterns. The other variables are useful for a more detailed description of injuries. A special description of brain injuries has also been found useful.

Special data (optional) is a heading that can be used by the participating centres for special studies, including follow-up studies.

^a American Association for Automotive Medicine. *The abbreviated injury scale (AIS)*, 1976 revision, including dictionary. Morton Grove, Ill., 1976.

Appendix 1

DEFINITIONS

Accident. An accident is an unpremeditated event resulting in recognizable damage.

Road traffic accident. This is an incident in traffic on the road, in which at least one vehicle in motion has participated and which has caused injury or damage to property. This definition is in agreement with that applied by the United Nations Economic Commission for Europe. The concept is specific when the terms "road" and "vehicle" are defined.

Road. A road is a common road, street or locality used for general traffic, or a private locality used as a road, including one with traffic during the winter only. Fenced-in barracks, industrial, hospital or racing areas or other such areas are not considered as roads in the official road traffic accident statistics.

Vehicle. A vehicle is a device on wheels, caterpillars or runners, designed for travel on the ground and not track-bound. Rail vehicles are not considered as vehicles. An accident in which a rail vehicle and pedestrians are the only participating traffic elements is consequently not considered a road traffic accident. Furthermore, accidents in traffic in which only pedestrians participate are not considered road traffic accidents.

Single accident. A single accident involves only one traffic element.

Traffic element. A traffic element is a mobile element on the road, e.g., a private car, a goods vehicle, a motorcycle, etc. In a road traffic accident, a pedestrian is considered a traffic element.

Bicycle. A bicycle is a vehicle intended to be propelled by pedalling or a turning arrangement operated by the road user, but not, however, a vehicle intended only for play.

Pedestrian. This definition includes a person pushing a perambulator, wheelchair or play vehicle, as well as persons skiing, ice-skating or roller-skating.

Motor vehicle. Different types of motor vehicle should be identified according to the definitions used in the countries participating in the study.

Appendix 2

ROAD TRAFFIC ACCIDENTS REGISTRATION FORM

Name of registering centre:

1. Personal data

Name:

Address:

.....

Residency: Resident Regular transit
Nonresident Occasional transit

Driving experience. Number of years holding licence

Years of driving experience

Accident repeater: Number of previous accidents with injury

Fatigue: Number of hours of driving prior to accident

Occupational status: Student
 Housewife
 Manual worker
 Nonmanual worker
 Nonworker

Accident linkage number

Date of birth (CPR):

Sex: Age in years:

Marital status:

Married: Not married:

2. Accident

Place of accident.

Date and hour of accident:

Date and hour of arrival at hospital:

Category: Pedestrian
 Driver
 Passenger
 Unknown
 Front seat
 Rear seat

Transport: Bicycle
 Motorcycle
 Scooter
 Moped
 Passenger car, delivery van
 Lorry
 Bus
 Other.

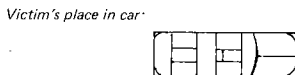
- Counterpart:**
- Pedestrian
 - Bicycle
 - Moped
 - Motorcycle, scooter
 - Passenger car, delivery van
 - Lorry, bus
 - Fixed object
 - Single
 - Other.....

- Purpose of transport:**
- School road
 - Home/work
 - During working hours
 - Leisure time
 - Other.....
 - Unknown

- Protective devices:**
- Seat belt installed Yes No
 - Seat belt used Yes No
 - Crash helmet Yes No
 - Other Yes No — if yes, what device?

Police report: Yes No **Type of accident:**

Description of scene of accident:



3. Injury

- Condition on arrival:**
- Walking
 - Stretcher
 - Dead on arrival

- Patient disposition:**
- No after treatment
 - Family physician
 - Hospital outpatient
 - Admitted to hospital
 - Dead on arrival
 - Dead within 30 days

ICD E diagnosis:

ICD D diagnosis:

Estimated days of incapacity:

Length of stay in hospital:

Annex II

RECORD LINKAGE

The following examples of uses of information obtained by record linkage are taken from a circular issued by the Department of Health and Social Security in the United Kingdom.

(1) Surveys in a number of countries have suggested that the efficacy of seat belts in reducing death or serious injury is about one-half. Some people have argued (with little supporting evidence) that they may make vehicle occupants more vulnerable to injury in certain types of accident. Linkage between the transport (environmental) data on the circumstances of road accidents, including the nature of any collision and the use made of seat belts and the NHS records of the type of injury and its seriousness, will permit better information to be collected on the efficacy of seat belts and the potential for improving their design.

(2) Details of the injuries suffered by pedestrians can help in the development of a safer front-end design for cars. Similar information on car occupants can help in deciding whether there is a case for fitting rear seat belts or for other modifications of the vehicle interior. Injury details to motorcyclists would be valuable for work on the design of the petrol tank and the fairings on the machines.

(3) Legislation for the compulsory wearing of safety helmets raised the proportion of riders and passengers wearing helmets from around 50% for moped riders and 80% for motorcyclists to virtually 100% for all users of two-wheeled motor vehicles. A study of motorcyclist casualties before and after the legislation indicated that the number killed had fallen, but that those seriously injured showed little change. If it had been possible to subdivide the "seriously injured" category one might have been able to detect the reduction of severity of injury within that category, i.e., where previously a motorcyclist casualty might have had both "brain damage" and a "broken arm", with a safety helmet this could have become merely a "broken arm".

(4) Details of injuries suffered can help in identifying groups of the population at which education on road safety should be aimed and help to indicate what should be emphasized in these programmes. Subsequently such data could be used in efforts to measure the effectiveness of safety education.

(5) From transport (environmental) accident data alone there are indications that the severity of injury in drink-related accidents is higher than in nondrink-related accidents. The information on the types of injury will enable this relationship to be studied in more detail.

Annex III

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