

WORLD HEALTH ORGANIZATION  
REGIONAL OFFICE FOR EUROPE

WELTGESUNDHEITSORGANISATION  
REGIONALBÜRO FÜR EUROPA



ORGANISATION MONDIALE DE LA SANTÉ  
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ВСЕМИРНАЯ ОРГАНИЗАЦИЯ ЗДРАВООХРАНЕНИЯ  
ЕВРОПЕЙСКОЕ РЕГИОНАЛЬНОЕ БЮРО

INDEXED

MEDICAL MONITORING OF ROAD TRAFFIC ACCIDENTS

Report on an Ad Hoc Technical Group

Odense  
13 - 15 June 1978



↓  
ICP/ADR 006  
(ICP/HSD 047)  
ENGLISH ONLY

September 1978

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## 1. Introduction

The meeting was arranged by Dr E.L. Nordentoft at the Accident Analysis Group, Odense University Hospital. Also participating, besides staff of WHO and the Accident Analysis Group, were temporary advisers from six countries (Annex III). These temporary advisers are specialists working at hospitals, where action has been or is going to be taken for medical monitoring of injuries from road traffic accidents, and who had expressed an interest to participate in a multi-centre study on medical monitoring of road traffic accidents.

Dr C.J. Romer, Regional Officer for Accident Prevention, welcomed the participants on behalf of the Regional Director, Dr Leo A. Kaprio, and thanked the University of Odense and the Accident Analysis Group for agreeing to host the meeting. He introduced the subject and gave a brief 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,<sup>1</sup> followed by the World Health Assembly,<sup>2</sup> requested the Director-General to develop a programme on the prevention of road traffic accidents, with the WHO European Regional Office subsequently being made responsible for its development. The present meeting is one of a series to be held under the programme.

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),<sup>3</sup> have stressed the urgent need for having 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 or 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 the medical monitoring activities under discussion 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.

The present meeting will be followed by the convening of an Ad Hoc Technical Group on Road Traffic Accident Statistics which will consider the advantages of ad hoc studies which could be implemented through the network of medical centres involved in the medical monitoring project.

## 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 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. The temporary advisers at the meeting gave a brief account of the activities in their countries.

<sup>1</sup>Resolution EBS7.R30, 27 January 1976

<sup>2</sup>See minutes of Twenty-ninth World Health Assembly, fifth meeting, 11 May 1976

<sup>3</sup>WHO Regional Office for Europe. The epidemiology of road traffic accidents, Copenhagen, 1976 (WHO Regional Publications, European Series No. 2)

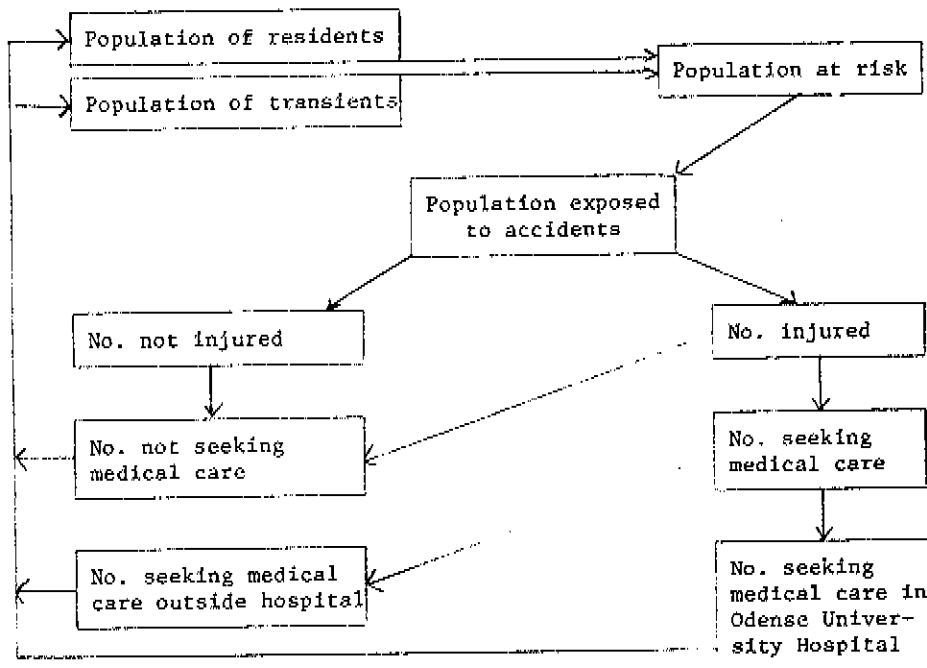
The Accident Analysis Group started in 1971 when an observed increase in road traffic accident victims at Odense University Hospital could not be found reflected in the official police statistics. Studies have been used mostly for local purposes. The geographical information received is substantial and the hospital material on the victims is three times as great as that of the police. This enables the Group to identify dangerous areas faster than the police. Studies have also been done 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 Fig. 1.

In Denmark identification of victims is much facilitated by the use of the CPR (central person 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.

FIG.1. MODEL OF POPULATION AT RISK



In Nottingham, United Kingdom, a codified record sheet for all types of accidents is used. Basic records include a simple scale for seriousness of injury and a simple diagnosis code. There is strong resistance in the country to all sorts of record linkage. Efforts are however being made to link 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 of road traffic injuries. A report of the study was distributed to the participants. Collection of data on road traffic accidents started again in January 1978 and the intention is that the material from Halmstad should be handled by the Accident Analysis Group for a 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 accident and not 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. Information about the data flow was given.

In Rabat, Morocco, accidents with personal injury are registered by the police. At the moment, hospital statistics cannot be linked to police reports. A comprehensive report on injuries from road traffic accidents in the country was presented.

### 2.3 Results

The local studies have already produced some results, which have been used in local traffic safety work and have sometimes served as a national alarm.

The results include:

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

### 3. Purpose of monitoring

The main purpose of medical information should be to:

- establish standardized descriptive statistics on traffic accidents, to be used in computation of incidence rates,
- identify psychosocial and medical factors involved in accidents, and the sociomedical consequences of traffic injuries,
- identify high risk groups and priority fields for further action,
- give supplementary and corrective information to police derived from information systems,
- identify accidents of low frequency
- establish a framework for establishing common definitions and cooperating 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 different types of accidents and with different types of injuries 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 on the international level. The same is valid for data on occurrences which are too infrequent for national statistical analyses.

#### 4. Population to be studied

The importance of a clear definition of the population and its characteristics was stressed.

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, length and quality of roads in the area should be defined. Other variables of interest, but 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. The age and sex distribution is essential. Criteria for residency (permanent, transit, regular transit, national, non-national, etc.) must be defined. Other characteristics that could be of value include marital status, occupation (workers, manual, non-manual, schoolchildren, students, non-workers, 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. Variables of special interest for particular road traffic accidents include accident repeaters in the area and driving experience of the population.

Problems can arise in identifying residents having accidents outside the geographical area. These can possibly be estimated from scanning of death certificates.

#### 5. Monitoring methods

Hospital information should be the primary source of data. It should be completed with information from secondary sources like police, road authorities, insurance authorities, etc. For comparison between different centres a minimum core of data should be collected, which could be supplemented with 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 registration of accidents is given in Annex II. The shadowed squares are for core data and the white squares for optional data. 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 victims from one accident. Different numbers can be used such as police number, vehicle registration number, etc.

Among the personal data name, address and other data for direct identification of 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.

Residency (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) sometimes is 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. Years of holding licence could be ascertained from the police data. If there is reason to believe that years of driving experience is different from years of holding licence, 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 too long a period without rest. Information on this point probably has to be derived 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 it 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 whether professional drivers such as taxi drivers should be separated from amateur drivers.

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

Protective devices (optional) are compulsory according to 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 that are included in the official statistics. The information can later be used for in-depth studies of the reliability of official statistics and it can be used for completing the accident registration form; in some instances there can be a 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 Organization for Economic Cooperation and Development (OECD).

Victim's place in car (optional) can be shown. As some countries have left and some right hand traffic 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 condition and 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 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 type of injury and injured part of the body. The code is very detailed and can be used in combination with the Abbreviated Injury Scale (AIS) code.

Estimated 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 load on hospital services, in comparing hospital stay for different types of accidents and injuries 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.<sup>1</sup> 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.

## 6. Conclusions

There was considerable interest among the participants for medical monitoring of road traffic accidents, and it was felt that an international study involving local centres would be the best way to start such monitoring.

Provided facilities are available, the multicentre study should cover Cracow, Rabat, Halmstad, New Delhi, Nottingham and Odense. Requirements for collecting material include clerical help, computer facilities and printing facilities.

Working materials such as standard forms, the latest revision of the International Classification of Diseases D code and E code, OECD code on type of accident, AIS manual, etc., should be distributed to the participating centres before the start of the study.

Dr Nordentoft and Dr Romer undertook to work out details of the data flow. The Accident Analysis Group has a working system for a local study as described above as well as the facilities and the skill necessary for handling and computing data from all participating centres. Thus, providing these facilities can be maintained, Dr Nordentoft stated that the Group could become the focus for storing and processing the data.

Collection of data should start on 1 January 1979.

After a test period new participating centres can be accepted. If possible a new meeting should be arranged before the start of the activities.

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<sup>1</sup>AAAM. The abbreviated injury scale (AIS), 1976 revision including dictionary. Morton Grove, Ill., 1976

## DEFINITIONS

### Accident

An accident is an unpremeditated event resulting in a 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 maybe a common road, street or common 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, wheel-chair or play vehicle, as well as persons skiing, ice-skating or rollerskating.

### Motor vehicle

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

Name of  
Registering Centre

ROAD TRAFFIC ACCIDENTS  
REGISTRATION FORM

1. PERSONAL DATA

ACCIDENT LINKAGE NUMBER

Name:.....

Address:.....

Date of birth (CPR):

Residency: Resident

Sex:  Age in years:

Regular transit

Marital status:

Non-resident

Married:  Not married:

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

Non-manual worker

Non-worker

2. ACCIDENT

Place of accident:  .....

.....

Date and hour of accident: .....

Date and hour of arrival at hospital: .....

Category:  Pedestrian  
 Driver  Front seat  
 Passenger  Rear seat  
 Unknown

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:

Installed:  Yes  No

Used:  Yes  No

Seat belt  Yes  No

Seat belt  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:

Victim's place in car:

.....

.....

.....



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:

Injury - AIS:

	Region	A I S	Soft lesion	Fracture luxation	Other	
General						
Head			Suspected concussion	Concussion	Contusion	Brain
						Skull, face, Scalp
Neck						Neck
Chest						Chest
						Spine
Abdomen						Abdomen
Pelvis						Pelvis
Extremities						Arms
						Legs
	Region	A I S	Soft lesion	Fracture luxation	Other	

Special data:

<input type="checkbox"/>	.....	<input type="checkbox"/>	.....
<input type="checkbox"/>	.....	<input type="checkbox"/>	.....
<input type="checkbox"/>	.....	<input type="checkbox"/>	.....
<input type="checkbox"/>	.....	<input type="checkbox"/>	.....

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