ROAD TRANSPORT RESEARCH
RECHERCHE EN MATIÈRE DE ROUTES ET DE TRANSPORTS ROUTIERS

FRAMEWORK FOR CONSISTENT TRAFFIC AND ACCIDENT STATISTICAL DATA BASES

CADRE POUR DES BASES DE DONNÉES STATISTIQUES COHÉRENTES SUR LA CIRCULATION ET LES ACCIDENTS

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OCDE Groupe d'Experts Scientifiques T8

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ABSTRACT

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The OECD Road Transport Research Scientific Expert Group T8 "Framework for Consistent Traffic and Accident Statistical Data Bases" was confronted with the old problem of the inconsistency of data between countries, and the lack of some data altogether, especially traffic data for use as a measure of exposure to road accidents.
Instead of carrying out yet another inventory of available data, the group decided that the best way to achieve harmonization and completeness was to create an international database.
As a first step the existing aggregated international database of the German Federal Highway Research Institute (BASt) was chosen in the short term to form the source for international comparisons of road safety. All OECD countries not yet contributing will be requested to contribute their annual data.
Secondly, based on the experience of many road researchers, and in particular the OECD Road Transport Research Programme, a list of variables and values for a future disaggregated database (at the individual accident level) was established. OECD members will also be requested to contribute their annual data to this database.
It is hoped that by contributing data to international databases those countries with definitions and classifications deviating from the Vienna Convention of Road Traffic will adjust them, and those countries not yet collecting agreed data will do so.
A recommendation is made to set up a new, continuous OECD group to actually implement and maintain the two databases.

Subject Classification: 81

Fields: Accident Statistics.

Keywords:
Accident, Accident Rate, Classification, Data Acquisition, Data Bank, Fatality, Injury, International, O.E.C.D., Safety, Standardization, Statistics, Traffic Count, Traffic Survey.

RESUMÉ

DIRR No: 811 327

Dans leur rapport sur le "Cadre pour des données de base statistiques cohérentes sur la circulation et les accidents", le Groupe d'Experts Scientifiques T8 dans le domaine de la recherche en matière de routes et de transports routiers de l'OCDE s'est vu confronté avec l'ancien problème des données non cohérentes entre les différents pays, voire avec le manque total de certaines données, en particulier quand il s'agit de données sur la circulation permettant de mesurer le degré d'exposition aux accidents routiers.

Au lieu de faire le tantième inventaire des données disponibles, le groupe a décidé, pour des raisons d'harmonisation et de complétude, de créer une base de données internationale.

En guise de premier pas, la base de données internationale compilée à l'Institut Fédéral de Recherches Routières (BASt) d'Allemagne a été choisie pour permettre à court terme des comparaisons internationales en matière de sécurité routière. Tous les pays de l'OCDE qui n'ont pas encore fourni jusqu'ici leurs données annuelles, seront invités à ce faire. En second lieu, en se basant sur l'expérience de beaucoup de chercheurs du transport et en particulier de ceux s'occupant du Programme de recherche en matière de routes et de transports routiers de l'OCDE, une liste de variables et de valeurs pour une future base de données disséminée (d'après le taux individuel d'accidents) a été établie.

On peut espérer que la fourniture de données aux bases de données internationales incitera les pays ayant des définitions et des classifications divergeant de celles adoptées par la Convention de Vienne sur le trafic routier à s'aligner et que les pays rassemblant pour l'instant des données non homologuées en feront de meme.

Une recommendation a été faite pour créer un nouveau groupe de travail de l'OCDE à temps complet afin de maintenir et de rendre plus efficaces les deux bases de données actuellement existantes.

Numéro de domaine: 81

Domaine: Statistiques d'accidents

Mots clés:
Accident, Taux d'accidents, Classification, Saisie des données, Banque de données, Tué, Blessure, International, OCDE, Sécurité, Standardisation, Statistique, Comptage (trafic), Enquête de circulation.

FOREWORD

This report is the result of the work of an OECD Road Transport Research Group of Experts during the period of June 1987 to February 1988. In February 1988 it was submitted to the Steering Committee of the OECD Road Transport Research Programme who approved it at their meeting in March 1988.
This report has been published by the Netherlands Institute for Road Safety Research SWOV as the Netherlands was the Pilot Country. SWOV was the representative of the Netherlands and as such also provided the chairman.
13 of the 24 member countries took part, and a further three member countries were corresponding members. The OECD secretariat was represented by Mr. C. Morin. The European Community and the European Conference of Ministers of Transport also participated.
Chapter 3 was written by Dr. E. Brühning of the German Federal Highway Research Institute, Chapter 4 by Mr. J.J. Lawson of the Canadian Department of Transport, and the other chapters by the chairman, Mr. S. Harris of SWOV.

Soon after the completion of the group's work, the representative for Ireland, Mr. Rory Hearne of An Foras Forbatha, died. He had made a great contribution to road safety research in Ireland and was almost from the outset an active member of OECD and other international road safety research projects.
This report is dedicated to him.

AVANT-PROPOS

Ce rapport est le résultat du travail d'un Groupe Expert de Recherche sur le Transport Routier de l'OCDE, durant la période allant de juin 1987 à . février 1988. Il a été soumis en février 1988 au Comité d'Organisation du Programme de Recherche sur le Transport Routier de l'OCDE qui l'a approuvé lors de sa réunion en mars 1988.
Ce rapport a été publié par la Fondation pour la Recherche Scientifique de la Sécurité Routiére SWOV, puisque les Pays-Bays étaient le pays pilote.
Le SWOV était le représentants de Pays-Bays et a ainsi assuré la présidence à ce titre.
Treize des 24 pays membres y ont participé, tandis que trois autres pays membres ont entrenu des correspondances. Le secrétariat de l'OCDE était représenté par M.C. Morin. La Communauté Européenne et la Conférence Européenne des Ministres des Transports ont également participé.
Le chapitre 3 a été écrit par le Dr. E. Brühning de l'Institut Fédéral de Recherches Routières (BASt) d'Allemagne, la chapitre 4 par M. J.J. Lawson du ministrère du Transport canadien, et les autres chaitres par le président, M. S. Harris du SWOV.

Peu après la fin des travaux du Groupe, le représentant de l'Irlande, M. Rory Hearne d'An Foras Forbatha est décédé. Il a apporté une grande contribution à la recherche sur la sécurité routiére en Irlande et il a été un membre actif de l'OCDE et d'autres projets de recherche internationale sur la sécurité routiére.
Ce rapport lui est dédié.

1. BACKGROUND

1.1. Introduction

Most countries compare their own state of affairs or achievements with other countries. The countries chosen for the comparison are usually those considered to be in the same 'league' as the comparing country, as far as the subject to be compared is concerned. Highly-developed, industrialized countries usually compare themselves with other such countries in the belief that differences will not be great. Most countries go even further by concentrating on comparisons with neighbouring highly-developed, industrialized countries in the belief that, being geographically close, these countries will be even less different than such countries further away. Countries compare their economies, health, and welfare with each other as well as many other aspects of life. There are generally two aspects falling under the comparison 1) the present level and 2) the historical development; often leading to 3) the expected future development.
Countries are pleased if they appear to be doing better than other countries and disappointed if the reverse is the case. In the latter case questions are asked about one's own 'poor' performance and one looks to those countries performing better in the hope of learning from them.
In road safety policy and research the situation is the same - one is interested in those countries appearing to be safer. More detailed comparisons with these countries are made (their laws and traffic behaviour) with the purpose of increasing one's own safety.

1.2. International Comparisons of Road Safety

1.2.1. Smeed's "Law"

In 1949 Smeed published the first of his papers on the international comparison of road safety (Smeed, 1949). This contained the 1938 data for 20 highly-developed countries and expressed a statistical relationship between the number of road deaths per inhabitant (mortality) and the number of motor vehicles per inhabitant (motorization). This relationship is one of a declining number of deaths per vehicle as motorization increases.
He later extended his work to more detailed comparisons (modal split) and to lesser-developed countries all over the world: see for example Smeed (1974) and Adams (1985).

Smeed also showed that his statistical relationship, or formula could also be used to show the development of road safety as a time series within one country.
Not only did Smeed pioneer international comparison of road safety; he showed the need for reliable and comparable data to do it, as he was well aware of various shortcomings.

1.2.2. Other Researchers

Since then many researchers have made international comparisons. Two subdivisions can be made. Firstly the division into, on the one hand, comparisons between two (or a few) countries and, on the other hand, multinational comparisons. Secondly the division into, on the one hand, the use of aggregated data and, on the other hand, in-depth disaggregated data.
Because of the amount of work involved and the availability of data, the multinational comparisons limit themselves to the use of aggregated data such as death rates whereas those projects using in-depth data generally limit themselves to two countries.
A recent example of the first type (multinational, aggregated data) is a comparison between the United States and the countries of Europe (Lamm et al., 1985). A recent example of the second type (binational, in-depth data) is a comparison between the Federal Republic of Germany and Great Britain (Hakkert et al., 1987).

1.2.3. International Organizations

The OECD, which has the oldest well-established, continuous research programme, is constantly involved with international comparisons because all of its projects entail a particular problem based on the facts and experiences of the 24 member countries. Practically each project entails a quantitative comparison of the problem in each country. These projects constitute a high proportion of the multinational, detailed comparisons mentioned in 2.2.
One of its projects in 1969 was on the use of statistical methods, and one of its sessions (no. 5) dealt specifically with international comparisons of road accident statistics (OECD, 1970).
The OECD does not usually gather and publish multinational aggregated data, although an exception was made for a special publication reviewing its Road Transport Research programme (OECD, 1986).

There are however four international organizations that publish multinational road accident data annually.

1. The most detailed is the "Statistics of Road Traffic Accidents in Europe" of the United Nations Economic Commission for Europe covering 26 countries of Europe, and the United States.
2. Also detailed is the "Statistical Report on Road Accidents" from the European Conference of Ministers of Transport (ECMT). Their annual report contains data for the 19 member countries complemented by data from the United States, Canada, Australia, and Japan.

Less detailed are the follownig publications

3. "Statistical Yearbook: Transport, Communications, Tourism" of the European Economic Community for the 12 member countries complemented by the non-member countries of Western Europe, the Soviet Union, the United States, Canada and Japan;
4. "World Road Statistics" of the International Road Federation covering more than 100 countries over the whole world; and
5. "World Health Statistics", published by the World Health Organization of the United Nations.

None of these five annual statistical reports actually makes comparisons: they present data, give definitions, and where data are not comparable they warn for differences or attempt to adjust certain data to make them more comparable.

All five publications, apart from presenting absolute numbers of accidents and victims, provide 'exposure' data to relate to the absolute numbers. These exposure data for producing accident, victim, and death rates include populations, road lengths, numbers of motor(ized) vehicles, and (estimates of) vehicle and occupant kilometrage ("mileage" is nowadays an inappropriate term for a quantity expressed in numbers of kilometres).

All five publications make exclusively use of aggregated data acquired from relevant tables of national publications or by means of questionnaires to national bodies requesting data in table form or frequencies.

1.3. Harmonization of International Road Safety Data

1.3.1. Introduction

Just as there have been many attempts at comparing the road safety of various countries, there have been many attempts at harmonizing road safety data to make it comparable. In fact one may say that it was the attempts at international comparison which made clear that the data were not, by any means, always comparable.

1.3.2. Past Attempts

A succesful attempt at getting agreement on definitions relevant for road accident data was the Vienna Convention of Road Traffic in 1968. This provided working definitions for road traffic; accidents, both fatal and non-fatal; drivers, passengers, and pedestrians; types of vehicles; and involved persons and vehicles. These definitions are reported as Annex 1 of the annual UN-ECE publication mentioned in 1.2.3. Furthermore, their Working Party on Road Traffic Safety made a recommendation for adjusting data from countries not using the "30 day" definition for fatal accidents and road deaths.
In 1975 the European Economic Commission organized a seminar on road accident statistics. An analysis of similarities and differences between the road accident report forms of the then 9 EEC members was presented (Andreasen, 1975). He also expressed the hope that the member countries would bring their data more into line in order to be able to combat common road safety problems.
More recently a paper was presented at the International Meeting on the Evaluation of Local Traffic Safety Measures in Paris in 1985. Again a comparison was made between the road accident report forms of eleven European countries - the 12 members of the E.E.C. excepting Ireland and Luxemburg, and complemented by Yugoslavia. A number of proposals were made as to the items to be reported and their breakdown (Ercoli & Negri, 1985). A more extensive coverage of these and other analyses and attempts at harmonization can be found in O'Day & Waissi (1986).

1.3.3. Examples of Differences

Most of these investigations show that on the surface, i.e. the items which are recorded by the police on national road accident report forms, there is quite a lot of similarity - most countries seem to have approximately the same idea of what is important to prosecute offenders (the main purpose for the police) and what is important for statistics and prevention. However, the further one digs below the surface the greater the differences between countries. Items which have the same name sometimes do not mean the same: e.g. do motorway accidents include or exclude accidents on approach roads and ramps; is "nighttime" determined by the reporting policeman or by the combination of date and time of day?

The situation gets even worse when going into the breakdowns (subdivisions) of items. Practically every country has its own system of road classification, usually based on its function or its Road Authority, none of which have much meaning in another country. Countries in which a certain type of vehicle hardly exists lump their data for these (in their vehicle data as well as their accident data) together with another group which seems the most similar: examples are three-wheeled and four-wheeled vehicles or motorcycles and mopeds.

Although not specified in their paper, Ercoli & Negri found that from the 24 items investigated among the 11 countries' accident forms "out of 1,364 specifications, 930 were present in no more than one form, 222 specifications were common in two forms, and 97 were found in three forms. The only specification found in all the forms were those relative to the hour and date of the accident. We are faced with a fragmentation of possible responses such that, the very comparison of national accident statistics of the various countries is compromised" (p. 775).

The situation would have been worse if a similar analysis had been carried out among the 24 OECD member countries.

1.3.4. Improvements

There do not seem to have been many improvements in the situation since the Vienna Convention. The only tangible improvement would seem to be the adoption of the "30 day" definition for fatal accidents and road deaths by Belgium in 1971 and the United States in 1975. Switzerland has announced that she will adopt the definition in 1990. This still leaves 8 of the 24 member countries still using a different definition.

1.3.5. The Definition of "Injured"

No agreement has ever been reached on the definition of "injured". As countries now record non-fatally injured victims it is obvious that there is an enormous discrepency. Using the data from the ECE's Statistics of Road Traffic Accidents in Europe and World Road Statistics for the year 1985 it would appear that there is a range of from 10 injured for every 1 killed in Australia to 81 injured for every 1 killed in the United States

of America. Including those two countries there are 3 countries with a ratio between 10 and 20, 6 between 20 and 30, 3 between 30 and 40, 2 between 40 and 50, 1 between 50 and 60, 1 between 60 and 70, none between 70 and 80 and 1 between 80 and 90. This is a more or less normal distribution scewed towards low ratio's. Even if we discount the 2 extremes there is still a range of 4 between Finland (17) and Japan (69).
It is not considered that this range of a factor 4 reflects real differences in lethality but differences in the definition of what constitutes an injury, or differences in the completeness of the police recording of non-fatal injury accidents. Similary there has been no success in defining "seriously injured". Several definitions have been suggested: such as "hospitalized", "operated on", "professionally treated", "resulting in absenteeism from work/school", "resulting in permanent disability", or a certain minimum score on the Abbreviated Injury Scale (A.I.S.) or on the Injury Severity Score (I.S.S.)

1.3.6. Problems with Exposure Data

There seem to have been no recently published investigations into the necessary harmonization of exposure data (population, road length, number of vehicles, vehicle kilometrage, and occupant kilometrage). This is probably because so few countries have continuous kilometrage data collection.
One would hope that OECD countries provide reliable data on population, road length, and numbers of vehicles. The first two are not easy to measure but do not change so quickly nowadays. The number of vehicles, however, does present problems. Do we count registered or insured vehicles, how many vehicles are not registered or insured, are the records kept up-to-date especially with regard to scrapped vehicles, what is the extent of illegal (unregistered) import and export? Many countries do not know how many mopeds or bicycles they have.
Kilometrage data always presents problems. Few countries appear to have continuous traffic counts on all types of roads for producing vehicle kilometrage data. Few countries have a continuous travel survey for producing occupant kilometrage data. Most countries have some traffic counts on motorways and other important roads, but in the EEC countries these are often only held once every five years for the benefit of EEC statistics. Less important roads and especially roads in built-up areas, and moped and bicycle traffic are seldom counted. Some countries hold travel surveys at

irregular intervals or limited to certain population groups, or limited to certain modes of transport. Cyclist and pedestrian trips are rarely asked for.

The subdivision of roads counted is usually not comparable, with the exception of motorways, because of the different national classifications. The samples and methods of travel surveys vary considerably.

2. AIMS OF COMPARABLE DATA FOR INTERNATIONAL ROAD SAFETY COMPARISONS

2.1. Difficulties

Having made a brief acquaintance with past comparisons of road safety data and the road safety situation it should have become clear that any changes towards greater harmonization or comparability will be extremely difficult to achieve.
The main cause of this difficulty is inertia. If a country has gathered its road safety data in a particular way there have to be very convincing arguments to make it change.
Changes cost a lot of effort and can result in the changed data no longer being comparable with the old data. It is therefore much simpler not to change anything.
A second important difficulty lies in the fact that road safety researchers have insufficient influence over their own national data collection. Road safety researchers usually are employed by or affiliated to their national Ministry of Transport whereas the accident data is collected by the police who are part of the national Ministry of Justice or the Interior. Exposure data, however, is often the responsibility of the Ministry of Transport, the national Bureau of Statistics, or a Research Institute.

2.2. Aims

It is therefore essential to determine what the aims of international comparisons of road safety are before determining a) which data will be needed and b) which changes in the present data will be required.
Basically speaking the scientific purpose of comparison, in space, time, or both is to conduct a controlled experiment, or quasi-experiment, to explain differences found, or the lack of differences, in order to see the effect of independent variables on dependent variables.
In road safety research we are constantly making comparisons on a national level. We compare the safety of different types of roads, vehicles, road-users, and conditions; we compare different regions or cities; and we compare different periods in time. In all cases we are hoping to learn from the safer groups how to make less-safe groups safer.
In comparing countries with each other we are simply (scientifically speaking) adding another independent variable.
Scientifically speaking we are therefore looking at the safer countries in

order to make the less-safe countries safer. The greater safety in a particular country is regarded as being the result of the conditions in that country just as the lesser safety in an other country is regarded as being the result of its conditions.

2.3. Functions

In the more specific case within road safety research of this report viz. accident and exposure data, the situation is slightly different.
Accident data (as reported by the police or from health data) and exposure data (as gathered from traffic counts and travel surveys) only constitute part of the data necessary for researching road safety problems. In fact it would be safe to say that very few road safety problems have ever been researched only using accident and exposure data - additional data: observations, measurements, experiments, simulations etc. were required to supplement them. This is certainly true of all the OECD road research projects (OECD, 1986).
Similarly, on an international scale, it must not be expected that even fully comparable and complete international accident and exposure data would be sufficient on their own for the research of road safety problems. The function of international data is the same as national data - that of a first step or starting point. Having established differences or similarities between countries with regard to a particular road safety problem - using accident and exposure data - the next step is to go beyond such mass data into the field of in-depth data.
Mass data, such as accident and exposure data, are best at showing large differences between countries as to the size, nature, and development of aspects of road safety. Understanding what has led to these large differences requires in-depth data.

This leads us to the conclusion that it is not reasonable to expect that international comparisons of accident and exposure data used on their own will indicate which road safety measures should be taken where, or what the effect has been from measures taken.

2.4. Uses

International accident and exposure data have two main uses. Firstly by indicating that a particular problem has a particular importance which may

vary from country to country. Other information and considerations will finally determine if that problem deserves further attention. Secondly, certain theories can be tested to see of they do appear to exist and if they appear to be the same in all countries. Here again, even if the theory seems to be substantiated, other information and considerations will determine if the theory becomes accepted.
The value of international accident and exposure data lies therefore in their use in conjunction with other more detailed (in-depth) data. On their own their main role is one of indicators.

2.5. Costs and Benefits

The fact that the use of international accident and exposure data has certain limitations means that there are limitations to the extent to which they should be improved and harmonized. As in all things, the cost-benefit ratio must be kept in mind.
So far it would seem that the costs of harmonizing accident data are generally not high. The main problems are those in terms of human effort to change existing procedures and definitions. Costs may arise from having to change existing forms and data processing.
The costs as far as exposure data is concerned are high only for those countries not yet collecting representative data on a national level. Internationally there are great differences in the way road, vehicle, vehicle kilometrage, and occupant kilometrage data is collected; many countries have virtually no kilometrage data at all, or only once every few years, and then only for certain types of roads.
The benefits of comparable data are, as in the case of most benefits, difficult to express in terms of money.

The advantages of comparable road safety data lie in the possibility of making valid comparisons between countries for the benefit of research into road safety problems and decisions for improving road safety.
At the moment, with the data often differing between countries, this is not possible.

3. AN AGGREGATED INTERNATIONAL DATABASE

3.1. Previous International Data Collections (State of the Art)

International road traffic and accident data are collected by national statistical agencies as well as by a number of international organizations (such as UN, EC, ECMT, IRF). The data are collected at the so-called aggregate level in which the data have already been summed, as opposed to disaggregated data which are at the individual accident or trip level. The collected data are usually published on an annual basis (cf. para. 1.2.3).

Such regular publications are important and indispensable for the purposes of transport policy and public information. Their main advantages lie in their wide distribution and the ease of quick reference they allow. For the same reasons some of the national statistical agencies provide data from other countries in their publications as well.
The generally somewhat restricted coverage and insufficient detail of the official statistics has prompted many additional collections undertaken by industrial associations, research institutes, researchers at universities and many others. These "private" data collections use data from very diverse sources. Although some of the institutions also publish their data, sometimes even at regular intervals, they are nevertheless of minor importance.

With all these collections one can to a greater or lesser extent find the following shortcomings:
Even those that are published regularly have generally a rather long delay, thus impairing the necessary up-to-dateness. As the official statistics only give the figures for the most recent years and revisions are only made for those years there is no possibility to use several volumes to compile a consistent time series. Another serious deficiency is that usually the responsibility for the quality of the data lies with the institutions that supply the data. There is thus often no substantial checking of the data by the compiling institutions. Inconsistencies and data errors are often not detected by the compilers mainly because they do not actively use the data for own international comparisons.

Computer assistance, in contrast to national research, is generally not employed by most international data collections. It would considerably advance international comparisons by allowing constant updating and revision of the data, plausibility controls and immediate use without the need for waiting for a publication date.

Thus, there is an obvious need for a computerized database maintained by experienced accident researchers avoiding the shortcomings mentioned above.
The Scientific Expert Group T8 has concluded that at the moment only Germany possesses a database of that type, recently established at the Federal Highway Research Institute (BASt), Bergisch Gladbach. The BASt database is described in the next chapter.

3.2. The BASt Database International Road Traffic and Accident

The database "Datenbank internationaler Verkehrs- und Unfalldaten" (INVUD) has been established at BASt in agreement with the Federal Ministry of Transport.

As a first step, all available national and international statistical publications were evaluated. This was followed by contacting the responsible authorities in the various countries in order to obtain the missing data and to settle questions arising in this process. It was found that in most countries important traffic statistics are compiled and updated at institutions other than the central statistical offices. The acquisition of the data turned out to be very difficult at times and has yet to be completed for a number of countries. However, in some instances, the corresponding partners abroad took great pains to make the data available especially for inclusion into the database. In one case BASt even processed magnetic tapes from the years 1970-72 which were not processible any more by the country itself.
At present the database contains data from 13 OECD countries: Federal Republic of Germany, Italy, Great Britain, France, Spain, the Netherlands, Belgium, Sweden, Austria, Switzerland, Denmark, U.S.A. and Japan.

The main part of the database comprises the following groups of road traffic and accident data as well as figures on population and vehicle population classified on a yearly basis (1965; 1970 up to the present):

- population figures with a breakdown by age groups
- vehicle population with a breakdown by vehicle types
- vehicle kilometres classified by network areas and vehicle types
- number of injury accidents classified by road network areas
- fatality figures (amended to agree to the international standard of "died within 30 days") with a breakdown by types of road usage, age groups and network areas
- network length classified by network areas
- modal split
- area of the state
- risk values: fatalities or accident victims in relation to population or kilometrage figures; accidents/inhabitants.

(A more detailed list of the variables included is given as the Appendix on page 32. In para. 3.3.1 the data coverage of the projected international database is discussed.)

For purposes of database maintenance and updating, a source database has been established containing the source for each figure in the database (publication, correspondence, personal information, etc.).

A separate part of the database contains national data on the number of accident victims, killed and injured persons with a breakdown by age groups (10 groups) and a further breakdown within each age group by types of road usage (9 groups); these data are taken from the annual UN publication "Road Traffic Accidents in Europe".

The database has been established using the SIR database system with a hierarchical structure. It is implemented on the Siemens mainframe of the BASt Computer Center.

Apart from the report on the database (Brühning et al., 1987) there have been various publications based on the resources of the database. Most recently there has been an article on the development of traffic safety on European motorways (Brühning & Von Fintel, 1988) and a paper on international comparisons of traffic safety (Brühning & Von Fintel, 1987).

3.3. The Proposed International Road Traffic and Accident Database

3.3.1. Data Framework

The OECD Scientific Expert Group proposes to use the BASt database as the nucleus of a new international database. The discussion of the data to be included was therefore based on the list of data already collected by BASt.

The range of data of the new database should not be limited to what all countries can contribute now, but to what is considered necessary for meaningful comparisons and is available in at least some countries. Those countries which are not able to supply certain data, because of definition problems or non-collection of data, will leave those variables blank in the hope that they will be able to complete them in later years.

The implementation of the projected international database may help in bringing about some standardization and may gradually increase the overall degree of availability and quality. Once there is a common basis and data have been made available for the aggregated database, the long term goal of a **disaggregated** database will find fewer obstacles being able to build upon the advances made in standardization.

3.3.1.1. Coverage of the BASt Database and Suggested Extensions

The 93 base variables and 33 variables for risk values that are currently included in the main part of the BASt database are listed as the Appendix on page 32. A more comprehensive database for international comparisons could be based on this framework. Various improvements of the statistical breakdown and inclusion of additional data have been proposed by members of the Scientific Expert Group T8.

The projected international database should cover **all OECD member countries.** This requires an extension of the current 13 countries to include 11 more countries: Greece, Ireland, Iceland, Luxemburg, Norway, Portugal, Turkey, Canada, Finland, Australia, New Zealand. Furthermore, the figures for Great Britain should be complemented by those for Northern Ireland (which is at the moment not included in the database) in order to produce data for the whole United Kingdom. It might be of considerable advantage to have the data not only on a national basis but also on the level of regions. The EC has already organized its statistical reports according to a regional breakdown. An extension of the database to an OECD-wide subdivision into regions could be proposed but would certainly lead to problems of data availability.

Listed below are most of the suggestions for additional data segments and new subdivisions. It should be clear that such additions are only useful if they can be made across categories. If, for example, single year age bands for young people are adopted, this division must be made at least for population and fatality figures.

The detailed extensions that have been proposed are as follows:

Breakdown by Sex

Because the casualty rates for males and females are often very different, a breakdown by sex should be added to the population figures as well as for the number of persons killed, hospitalized victims and the corresponding exposure values.

Single Year Age Bands for Young People

The age group division for young people should be more finely subdivided in order to have data for the crucial group of novice drivers. Until now the database has used the age groups 15-17, 18-20, 21-24 years. Data for each individual age from 15 to 20 (or 24) have been suggested. This breakdown would have to be provided for figures of population, persons killed, hospitalized victims and possibly for exposure data (in case the breakdown of vehicle kilometres by age group is adopted).

Hospitalized Victims

The definition of seriously injured persons differs between the various countries. It is proposed to employ the category "hospitalized victims" because most of the countries are able to supply this information. Hospitalized victims are those admitted to hospital as in-patients. Therefore, in addition to figures relating to the number of killed persons, data on the number of hospitalized victims should be included. It should be clarified that this excludes all killed. After such a standardization the same statistical breakdown as for killed persons should be given: by road user category, age group and road type.

Injury Accidents

The category of "Injury Accidents" poses difficult problems of compatibility. It is questionable whether there will be a common basis for international comparisons because of the different definitions underlying the figures for "Injury Accidents" in various countries. The Group therefore considered whether to delete the whole block headed "Injury Accidents" from the database. However, as the data are easily available and in order to be compatible with the official statistics it was conducted that the category should be retained.

Exposure Data

Sound international comparisons of traffic safety depend heavily on detailed exposure data. Apart from the vehicle kilometrage figures already in the BASt database traffic participation data should be included for more categories of road users, e.g. **bicycle & pedestrian kms.** Another very useful exposure variable, especially for pedestrians, is the **time** of traffic participation. For both variables (kms and time of participation) there is, however the serious problem of data availability, which is very difficult internationally at present.
A further suggestion concerning exposure data was to include **exposure by age group and sex.**

Goods Motor Vehicles

The category of "Goods Motor Vehicles" could be further subdivided: **light goods vehicles** < 3.5 tons (delivery vans, camionettes) and **heavy goods vehicles** > 3.5 tons (lorries, camions). Another possible subdivision is: rigid, articulate or tractor.

Road Types

In addition to the current subdivision of road types (i.e. inside/outside urban areas, motorways), a different breakdown could be used: urban roads, rural single carriageways, dual carriageways, motorways. The international availability of data about single/dual carriageways is however not satisfactory. More immediately feasible seems the addition of a category "A-level Roads", present in almost all countries, which comprises those roads outside urban areas that are not motorways but still belong to the top level road network (e.g. the British **A-Roads**, French **Routes Nationales**, German **Bundesstrassen**).

Structural Data

The inclusion of further general indicators was discussed: namely the cost of petrol and diesel per litre and the Gross National Product (adjusted for inflation). These were however rejected as being possible determinants of exposure which is not the purpose of the database.

Implications of Extensions of the Variable List

It should be made clear what the implications of the proposed enlargement of the database would be. The main part of the BASt database currently contains data for 13 OECD countries in 93 base variables for each year, from which further figures (e.g. death rates) can be derived. The undoubtedly necessary addition of 11 more countries to the data coverage will already almost double the size of the database. Every further adoption of a more detailed breakdown or additional variables will "blow up" the database even more. A few examples:

Single year age data from 15 to 20 years for inhabitants, persons killed and seriously injured persons result in 18 new variables. Breakdown of the figures for inhabitants, persons killed and seriously injured persons by sex would mean 6 more variables if it is only used for the totals. Should, however, every age group be subdivided by sex that would mean 66 new variables. Breakdown by sex plus single year age bands from 15 to 20 years already give 120 new variables.

These calculations should provide some idea of the exponential growth of the size of the database that is to be expected even if only a few additional data breakdowns are added to the data framework. This also means that the amount of work required from the host of the database would be accordingly greater, particularly because the additional data will almost certainly be less easy to obtain.

Finally, there are two questions to be considered:

- To what degree is it desirable to have a large list of aggregated data when there is no satisfactory state of completeness on an international basis?
- At what point would it be more efficient to just collect the disaggregated data records and evaluate these (cf. Chapter 4) whenever necessary, instead of putting in all the work to get a large number of aggregated data which will be unable to answer all specific future questions.

Recommended Extensions of the Variable List

After discussing the various suggestions, the Expert Group has drawn up a list of priorities for implementation:

Priority	Data Segment or Subdivision
1 (essential, short term)	Single year age bands from 15 to 20 (population and killed) A-level roads (kms, veh.kms, accidents, killed) Hospitalized victims (subdivided as killed) *)
2A (desirable, middle term)	Single year age bands from 21 to 24 (population and killed) Exposure data for bicycles and pedestrians, number of bicycles Subdivision of goods motor vehicles: <3,5 tons and >3,5 tons (numbers, kms, and killed)
2 (desirable, longer term)	Sex (of population and killed) Exposure by age group and sex Killed in Buses
(implementation not necessary)	Structural data: price of motor fuels, Gross National Product

Concerning the segment headed "Injury Accidents" it was decided not to delete the category because the data is easily available and is included in most of the official statistics.

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*) It was however noted that four large member countries represented (France, Italy, Spain and the UK) cannot as yet provide these data.

3.3.1.2. Expected Problems with Obtaining the Data

The extension of the database discussed in 3.3.1.1 will pose new problems of obtaining comparable data from all countries. It is not to be expected that all partner institutions will be able to devote the necessary efforts to compile the larger list of data. Very detailed splits and breakdowns are probably not included in the routine analyses and have to be made specially for the international database. (Some countries are already now almost incapable of supplying the data; in these cases the collection is accordingly slow-going.)

The experience with the BASt database[1] suggests that special difficulties will be encountered with the following data segments:

- **Single year age data from 15 to 20:**

The BASt database employs an age group division that is based on the one used in UN publications. Nevertheless, various countries have not been able to provide data (especially population data for some former years) for certain age groups (e.g. those of children and young people). Data for single years might be even more difficult to obtain.

- **Exposure data for bicycles & pedestrians as well as by age group:**

Exposure data differ widely in their availability in the various countries and their compatibility is a notorious difficulty. Obtaining data on bicycles and pedestrians and for different age groups will be even more problematic. Standardized traffic surveys would help to amend this situation.

[1] Problems of collecting compatible international data are discussed in Chapter 1 of this report. They are also sketched in para. 2.3. of the Research Report on the database (Brühning et al., 1987).

3.3.2. Technical Layout of the Database

3.3.2.1. Database Environment

The BASt database was implemented using the SIR-Database Management System. This system contains export/import utilities which provide the means of transferring a database between SIR-implementations on different machine types; for example, from Siemens to VAX, IBM, and even Personal Computers. There are also procedures which create files that can be directly processed by other statistical packages (SPSS, BMDP). SIR provides most of the features needed by database users (e.g. sophisticated retrieval capabilities, statistical procedures, graphics). In terms of user-friendliness it seems however not quite up-to-date. So it is not claimed that SIR is the ideal software for this kind of database. A more modern database system with a user interface employing menus and windows would certainly enhance the attractiveness of the new database but also pose serious problems for on-line access because of the present state of transmission technology (TTY, line mode). While smaller hardware systems may offer a wider range of database systems the transmission problems would still remain.

3.3.2.2. Types of Access

During a **transitional phase** the interchange of data could take place via magnetic tape or floppy disks, taking advantage of the export/import facilities of the SIR system. Each partner could receive a copy of the updated database at regular intervals (e.g. four times a year) or as soon as a country's data is completed for one year. The British Department of Transport has already made concrete suggestions for such an exchange during an intermediate phase.

But the state of the art in international communication is, of course, the computer network technology. **On-line access** by the various partners via a computer network seems the best way of organizing access to the database. This would enable everyone to be as up-to-date as possible. It seems furthermore indispensable for overcoming the delays caused by distance between the European countries and other members such as Japan, Australia, New Zealand, Canada and the U.S.A. Before the introduction of a network link there is, however, the question of compatibility of the computer systems used by the partners and, as mentioned in para. 3.3.2.1, the choice of suitable software.

3.3.3. Maintenance of the New Database

The new international database will be operated and maintained by one of the partner institutions. The hosts will not only provide the necessary hardware and software environment. They will also have to conduct substantial input control and thus ensure the consistent quality of the incoming data. The inputting countries will, of course, be responsible to the hosts and the other countries for the quality of their data. But even possible on-line access should not lead to unchecked input into the database. The hosts are in the best position to check the data and detect inconsistencies because they have a complete overview of the data. It should by now be obvious that the hosts should therefore be road safety researchers experienced in international comparisons who will also continue to use the data from the database in their regular research work. They will thus be able to learn immediately about problems and deficiencies of the figures.

The OECD Scientific Expert Group T8 proposes that BASt should be asked to assume the task of hosting the new database at least for a starting period of some years. This requires that the budgetary questions are settled before.

3.3.4. Nature of Possible Annual Reports

If it should be decided to publish an annual standardized report, its contents should primarily be geared towards the needs of users (ECMT, EC). If a satisfactory way of accessing the database has been established, this would mean that the report could be compiled by a different institution than the host of the database.

3.3.5. Communication between the Partners

Once the international database has been established the data will be used by many partners in a decentralized manner. Similar to the International Road Research Documentation (IRRD) it will exist as a permanent database with a lot of institutions in many countries having direct access to the output. It is proposed to establish a continuous OECD-group (cf. Chapter 5, Recommendations). This group will not only have management functions but could also serve as a forum for contacts between the users and the hosts of the database. They would thus be able to exchange experiences and discuss arising problems, possible improvements and extensions.

APPENDIX: LIST OF VARIABLES OF THE BAST DATABASE, WITH PROPOSED EXTENSIONS

TOTAL HOME POPULATION
  Population female
  Population male
HOME POPULATION AGED 0 - 5 YEARS
HOME POPULATION AGED 6 - 9 YEARS
HOME POPULATION AGED 10 - 14 YEARS
HOME POPULATION AGED 15 - 17 YEARS
HOME POPULATION AGED 18 - 20 YEARS
HOME POPULATION AGED 21 - 24 YEARS
  Single year ages from 15 to 20 (24) years
HOME POPULATION AGED 25 - 34 YEARS
HOME POPULATION AGED 35 - 44 YEARS
HOME POPULATION AGED 45 - 54 YEARS
HOME POPULATION AGED 55 - 64 YEARS
HOME POPULATION AGED 65 - 69 YEARS
HOME POPULATION AGED 70 YEARS AND MORE
HOME POPULATION AGED 0 - 14 YEARS
HOME POPULATION AGED 15 - 24 YEARS
HOME POPULATION AGED 25 - 64 YEARS
HOME POPULATION AGED 65 YEARS AND MORE
HOME POPULATION AGED 18 - 24 YEARS
HOME POPULATION AGED 55 - 59 YEARS
HOME POPULATION AGED 60 - 64 YEARS
HOME POPULATION AGED 25 - 59 YEARS
HOME POPULATION AGED 60 YEARS AND MORE

NUMBER OF ALL MOTOR VEHICLES
  Number of bicycles
NUMBER OF MOPEDS AND MOFAS
NUMBER OF MOTORCYCLES AND -SCOOTERS
N.O. PASSENGER CARS AND STATION WAGONS
NUMBER OF GOODS MOTOR VEHICLES
  Goods motor vehicles < 3,5 tons
  Goods motor vehicles > 3,5 tons
NUMBER OF BUSES
NUMBER OF OTHER MOTOR VEHICLES

TOTAL VEHICLE KILOMETRES
VEHICLE KMS INSIDE URBAN AREAS
VEHICLE KMS OUTSIDE URBAN AREAS
VEHICLE KMS ON COUNTRY ROADS
  Vehicle kms on A-level roads
VEHICLE KMS ON MOTORWAYS

  Pedestrian kms and/or hours
  Bicycle kms
VEH. KMS OF ALL MOPEDS AND MOFAS
VEH. KMS OF ALL MOTORCYCLES AND -SCOOTERS
VEH. KMS OF ALL PASS. CARS AND STAT. WAG.
VEH. KMS OF ALL GOODS MOTOR VEHICLES
  Goods motor vehicles < 3,5 tons
  Goods motor vehicles > 3,5 tons
VEH. KMS OF ALL BUSES

  Exposure by age group and sex

INJURY ACCIDENTS - INV. INJURY OR DEATH
INJURY ACC. INSIDE URBAN AREAS
INJURY ACC. OUTSIDE URBAN AREAS
INJURY ACC. ON COUNTRY ROADS
Injury Acc. on A-level roads
INJURY ACC. ON MOTORWAYS
INJURY ACC. AT KNOWN LOCATION
INJURY ACC. AT UNKNOWN LOCATION

KILLED AND INJURED PERSONS

TOTAL NUMBER OF KILLED ROAD USERS
KILLED PEDESTRIANS
KILLED OCCUPANTS OF BICYCLES
KILLED OCCUPANTS OF MOPEDS AND MOFAS
KILLED OCC. OF MOTORCYCLES AND -SCOOTERS
KILLED OCC. OF PASS. CARS AND STAT. WAG.
KILLED OTHER ROAD USERS - EXCL. UNKNOWN
Goods motor vehicles $<$ 3,5 tons
Goods motor vehicles $>$ 3,5 tons
Buses
KILLED - KNOWN TRAFFIC PARTICIPATION
KILLED - UNKNOWN TRAFFIC PARTICIPATION

Killed persons - female
Killed persons - male
KILLED AGED 0 - 5 YEARS
KILLED AGED 6 - 9 YEARS
KILLED AGED 10 - 14 YEARS
KILLED AGED 15 - 17 YEARS
KILLED AGED 18 - 20 YEARS
KILLED AGED 21 - 24 YEARS
Single year ages from 15 to 20 (24) years
KILLED AGED 25 - 34 YEARS
KILLED AGED 35 - 44 YEARS
KILLED AGED 45 - 54 YEARS
KILLED AGED 55 - 64 YEARS
KILLED AGED 65 YEARS AND MORE
KILLED OF KNOWN AGE
KILLED OF UNKNOWN AGE
KILLED AGED 0 - 14 YEARS
KILLED AGED 15 - 24 YEARS
KILLED AGED 25 - 64 YEARS
KILLED AGED 18 - 24 YEARS
KILLED AGED 55 - 59 YEARS
KILLED AGED 60 - 64 YEARS
KILLED AGED 25 - 59 YEARS
KILLED AGED 60 YEARS AND MORE

KILLED INSIDE URBAN AREAS
KILLED OUTSIDE URBAN AREAS
KILLED ON COUNTRY ROADS
Killed on A-level roads
KILLED ON MOTORWAYS
KILLED AT KNOWN LOCATION
KILLED AT UNKNOWN LOCATION

The same statistical breakdown as for killed persons should be given for hospitalized victims.

TOTAL NETWORK LENGTH OF ALL PUBLIC ROADS
TOTAL NETWORK LENGTH INSIDE URBAN AREAS
TOTAL NETWORK LENGTH OUTSIDE URBAN AREAS
TOTAL NETW. LENGTH OF ALL COUNTRY ROADS
Total network length of all A-level roads
TOTAL NETWORK LENGTH OF ALL MOTORWAYS

MODAL SPLIT: PASSENGER CARS AND ST. WAG.
MODAL SPLIT: PUBLIC TRANSPORTATION
MODAL SPLIT: RAILWAY
MODAL SPLIT: AIRPLANE

AREA OF STATE

DEATH RATE, TOTAL (Killed per 10^9 vehicle kms)
DEATH RATE, INSIDE URBAN AREAS
DEATH RATE, OUTSIDE URBAN AREAS
DEATH RATE, COUNTRY ROADS
Death rate, A-level roads
DEATH RATE, MOTORWAYS

ACCIDENT RATE, TOTAL (Injury Accidents per 10^6 veh. kms)
ACCIDENT RATE, INSIDE URBAN AREAS
ACCIDENT RATE, OUTSIDE URBAN AREAS
ACCIDENT RATE, COUNTRY ROADS
Accident rate, A-level roads

ACCIDENT RATE, MOTORWAYS

KILLED PER 100 000 POPULATION
KILLED PER 100 000 POP. (0 - 5 Y.)
KILLED PER 100 000 POP. (6 - 9 Y.)
KILLED PER 100 000 POP. (10 - 14 Y.)
KILLED PER 100 000 POP. (15 - 17 Y.)
KILLED PER 100 000 POP. (18 - 20 Y.)
KILLED PER 100 000 POP. (21 - 24 Y.)
Single year ages from 15 to 20 (24) years
KILLED PER 100 000 POP. (25 - 34 Y.)
KILLED PER 100 000 POP. (35 - 44 Y.)
KILLED PER 100 000 POP. (45 - 54 Y.)
KILLED PER 100 000 POP. (55 - 64 Y.)
KILLED PER 100 000 POP. (65 Y. AND MORE)
KILLED PER 100 000 POP. (0 - 14 Y.)
KILLED PER 100 000 POP. (15 - 24 Y.)
KILLED PER 100 000 POP. (25 - 64 Y.)
KILLED PER 100 000 POP. (18 - 24 Y.)
KILLED PER 100 000 POP. (55 - 59 Y.)
KILLED PER 100 000 POP. (60 - 64 Y.)
KILLED PER 100 000 POP. (25 - 59 Y.)
KILLED PER 100 000 POP. (60 Y. AND MORE)

INJ.ACCS. PER 100 000 POPULATION
KILLED AND INJURED PER 1 MILL. VEH.-KM
KILLED AND INJURED PER 100 000 POP.

4. A DISAGGREGATED INTERNATIONAL DATABASE

4.1. Introduction

Attempts to make international comparisons of specific characteristics of the road accident problem have frequently been frustrated by a lack of pertinent data in the accident record systems, by differences in definitions of accident data elements that are recorded, and by the almost complete absence of sensitive measures of exposure. Successive research groups called together under the Road Research Programme of OECD, to document the nature of particular safety problems among member nations, and to attempt to recognise effective and promising safety measures, have struggled to extract information from these inadequate or incompatible data, and have documented many of the inadequacies. Their recommendations for future research have called loudly and often for improvements to national data systems, and for international standardisation of data elements and their definitions.

To meet these recommendations, some specifications are proposed for a centralized bank of international records of accidents and traffic, which could be used for cross-national research. The proposals include the data elements to be included, some standard definitions of elements, and management and access procedures.

It is anticipated that the longer-term development of accident and traffic data collection systems in member countries will allow the enrichment of the information recorded, so that the information can become more useful to those charged with research into safety measures and management of safety programmes. While inflexible in the short term, accident report forms and police reporting procedures can be modified over time to incorporate new items of interest or investigation methods. It can also be expected that parallel improvements will be made to the official systems recording health care activity, vehicle licensing and driver licensing, each of which might contain information which could usefully supplement the accident records provided by the police. And the improving efficiency of electronic data processing and transmission should make the matching of these large files of disaggregated data sufficiently practical that it becomes routine at the national level.

At the same time, the techniques of exposure data collection are evolving. Interview techniques to obtain personal trip characteristics are well-established, and are used regularly in a number of countries. The complementary ability to record traffic characteristics automatically at specific locations is improving rapidly, with the development of equipment for vehicle recognition. This raises possibilities of estimating by efficient sampling methods a number of important features of total national traffic, such as volumes, vehicle classifications, speeds, and headways, by various classes of road.

Over time, therefore, the opportunity exists for safety administrators in each member country to intervene to introduce new data items recognised to be important for international comparisons, and to accomodate standardised definitions. Thus the possibility of making use of multinational data to analyse safety problems could deliberately be developed. At the same time, the improving efficiency of data processing and communications capabilities make it more practical to consider creation of a central international data base to facilitate such analyses.

The intention here is to offer a design for an international system which can guide the long-term development of national data systems. It is recognised by the Group that it is unlikely that any single member country could supply all of the proposed information currently, and that many could provide very little in the precise format specified. It is expected that the international data base could be initiated with information from only those countries which were able to provide many or most of the data elements, conforming either to compatible definitions, or to definitions which allow estimation of comparable elements. It would likely also be restricted initially to sub-groups of accidents, probably beginning with only fatal accidents, while experience was gained in its operation.
The data base would then grow by the addition of new data elements and new countries, as the national data sytems evolved.

4.2. Accident Data Elements

The data elements to be included are recommended based on the Group's experience with the data collection systems, and incorporating the recommendations made by experts within the safety activities under the OECD Road Research Programme over about the last fifteen years, as reported in references 1 to 12. The elements are listed in Table 1, below. Where specific data elements in the list can be related directly to those recommendations, the reference is cited by number.

The data elements are referred to in the list as "variables", which are the features we wish to describe, and "values" which are the alternative descriptions we allow variables to take. The Group has not attempted to prescribe and define the precise values to be included, but offers the list to suggest the types of information that members expect to be useful.
Neither has the group attempted, as in the case of the aggregated database (Chapter 3), to determine a priority ranking of the variables.

4.3. Exposure Data Elements

Exposure data is necessary to allow for the great differences in population and traffic between countries.
Exposure data to be included in the data base are to be compatible with the accident data, in order to allow the files to be combined to estimate relative risks associated with the accident characteristics. Risk is here calculated by dividing accidents (or casualties) involving the characteristic by a measure of the exposure of the same characteristic in the traffic system. Two types of measures, or substitute measures, of exposure in traffic will be included, as follows:

- population, numbers of inhabitants;
- distance travelled, kilometres (+ possibly, travel time).

Population measures allow international comparisons of accident and casualty risks per capita (the hazard to public health), for the different victim types (users of the various classes of vehicle, and pedestrians). The characteristics of population which can usefully be matched with accident data are probably only age and sex. There is therefore no requirement for "disaggregated" population data in the international data bank, but merely a matrix of tabulated population estimates by age, sex and calendar year. Population estimates should be readily-available from official census agencies, in the relevant detail.

Measures of distance allow comparisons of accident and casualty risks per vehicle-kilometre or occupant-kilometre (as result of mobility) for the various categories of road user, vehicles, roads and environmental conditions (time, weather) identified in the accident records. Estimates of total vehicle-kilometres, distributed by a number of the characteristics of roads and vehicles, as well as by time, can be obtained from automatic vehicle counting at representative samples of road sites. However, such automatic systems cannot readily be adapted to obtain vehicle occupant and trip characteristics, nor pedestrian flows. These latter types of information are available instead from sample surveys of individuals, obtaining records or logs of trip-making behaviour. Such surveys in turn are not well-suited to obtaining roadway characteristics of trips. Therefore, while ideally we should obtain distance travelled classifed simultaneously by all of the road, vehicle and occupant characteristics included in the accident records, in practice the collection methods provide two separate data sets:

(i) From vehicle counting, estimates of vehicle-kilometres by road type by vehicle type by time (hour, day, month). With so few variables, again the "disaggregated" data records are not required for the international data bank, but instead a matrix of estimates of national traffic, cross-classified by those variables.

(ii) From surveys of trip-making, estimates of vehicle-kilometres, occupant-kilometres and numbers of trips, by a number of trip characteristics, excluding those describing the roadway. As a large number of variables can be matched with the accident data, allowing many possible research analyses, it might in the long term be useful to make available the disaggregated exposure files in the international data bank. As the data are from sample surveys, probably using complex multi-stage samples, they will require weighting to give estimates of national totals of distances. The individual records in the disaggregated files should be weighted appropriately before transmission to the international data bank.

Vehicle fleet data will not be used for comparisons of accidents and casualties per registered vehicle, but for evaluating changes in numbers of accidents and casualties per distance travelled as a consequence of changes in the characteristics of the vehicle fleet. The main character-

istics of the fleet to be matched with the accident data are vehicle class and vehicle age (calculated from the year of first registration). The international data bank will not require "disaggregated" vehicle data (individual vehicle records), but simply the tabulated fleet characteristics of vehicle type by vehicle age. The vehicle classification adopted in the national accident record system should be the same as that used in the national vehicle registration record system, so it should be possible to obtain routinely the vehicle fleet size in the appropriate classification. Vehicle type should include the variables identified in the accident data of laden weight for HGV's and engine power and displacement for motorcycles.
Vehicle fleet data will also be used to check the data on distances travelled, especially sudden changes from year to year.

Table 2 below lists the proposed exposure data elements to be transmitted to an international road safety data bank. The list is more abbreviated than the list of accident data elements, because it does not repeat the listing of the "values" of each variable cited. It should be understood that the values intended for each variable are the same as in the list of proposed accident data elements, unless (as with age-group, e.g.) the intended classification is included in Table 2. It is recognized that the exposure survey methods presently available are unable to provide all of the sub-classes of variables distinguishable in the accident data. The vehicle counting techniques are not yet able to recognize all of the classes of vehicle listed in Table 1, and the trip survey methods allow only limited categories in order to encourage understanding and response. Therefore, to facilitate matching of the exposure and accident data, the counting systems and surveys should be careful to use definitions which are compatible with the accident data systems, by being equivalent to combinations of the variable values used for the accident data.

N.B. The terms "vehicle kilometre" and "occupant kilometre" include pedestrians.

4.4. Operational Requirements for an International Database

4.4.1. Data Entry

A common format for all of the data records will be specified. Each participating country will then submit its data annually to the designated central computing facility on magnetic tape. No editing or conversion process will therefore be required. Quality control at the central facility will consist of the identification of ineligible or unexplained missing items, and their referral back to the originating agency for correction.

Participants will also be responsible for the provision of documentation of their collection and processing procedures.

4.4.2. System Access

The central facility will provide "on-line" access so that researchers can interrogate the data-base using terminals connected by common-carrier trunk lines. A remote job entry system will allow queries to be designed and edited, prior to submission to the computer as "batch mode jobs". Results would then be obtained in a subsequent terminal session.

For efficient and convenient storage and access of the information, a relational data structure is suggested, with separate "rectangular" files for different classes of data, e.g. within the accident data system separating "accident" characteristics from "vehicle", "driver" and "victim" sub-sets. Only the files containing data elements of interest to a specific analysis request need then be joined and processed.

4.4.3. Regular Reporting

It is not anticipated that the central facility should provide any regular reports of tabulations or analyses of the data, but that the system should serve entirely for research by outside users. Nevertheless, the facility will need to provide totals of records kept, classified separately by many of the main variables, to allow users to verify that they are using the system correctly.

4.4.4. Qualifications for System Management

The Group strongly recommends that the system management have experience in road safety research. While this might not appear essential for the operations outlined above, it is felt necessary to have a sensitivity to the data limitations in order to guide potential users on the practical possibilities for analysis.

Tables 1 and 2

In the following Tables 1 and 2 the reference number of the OECD group in which the data was requested is given in square brackets. [ ].

1. OECD: Young driver accidents, 1975.
2. OECD: Adverse weather,reduced visibility and road safety, 1976.
3. OECD: The role of alcohol and drugs in road accidents, 1978.
4. OECD: Safety of two-wheelers, 1978.
5. OECD: Traffic safety in residential areas, 1979.
6. OECD: Road safety at night, 1980.
7. OECD: Methods for evaluating road safety measures, 1981.
8. OECD: Traffic safety of children, 1983.
9. OECD: Integrated road safety programmes, 1984.
10. OECD: Guidelines for improving the safety of elderly road users, 1986.
11. U.S. Dept. of Transportation: Effectiveness of safety belt use laws: a multinational examination, 1986.
12. OECD: Symposium on the role of heavy freight vehicles in traffic accidents - Summary report, unpublished draft 1987.

TABLE 1: PROPOSED ACCIDENT DATA ELEMENTS

Variable	Values	Notes on definitions
Country (possibly Region)	1 to 24	
Hour of accident [6]	0 to 23 hrs	
Day of week	Sunday to Saturday	
Month	Jan to Dec	
Year	Calendar years	
Reporting officer at scene	Yes No	
Light condition [6]	Day Dark - lit Dark - unlit Dawn Dusk	
Weather [2,6]	Clear Cloudy Rain Snow Hail/sleet/freezing rain Fog Wind	
Road class [5]	Motorway Trunk road Other	Including access/exit ramps "A" class or equivalent
Road type [5]	Divided Undivided One-way	
Number of lanes	1 to n	Total, both directions
Speed limit	Legal speed limit, kph. No limit	
Traffic count	AADT	Most recent estimate
Location type [5,8]	Built-up Non-built-up	Vienna Convention definition
Adjacent land use [5,8]	Residential Commercial Industrial Parkland Agricultural Open space	
Road situation	Straight section Curved section Intersection	
Gradient	Level Up-grade Down-grade	
Special traffic control	None present Overtaking prohibited Construction zone Braking lane	

Intersection traffic control	None present Traffic signals Stop sign Yield sign Pedestrian crossing Officer/flagman/school guard Railway crossing Other	
Surface material	Asphalt Concrete Gravel/crushed stone Earth Brick/paving stone	
Surface condition [2,6]	Dry Wet - water Snow Ice Loose sand, gravel or dirt Mud Oil - spill or fresh application	
Vehicle type [4,12]	Car Van Pick-up truck HGV. Bus - Urban bus - Intercity bus/coach - School bus Motorcycle Moped/Motorized bicycle Bicycle Tram Train	 - enclosed goods compartment - open goods compartment see classes in Annex 1 (Three separate classes of bus to be distinguished, if recognizable)
HGV laden weight [12]	Weight in kg.	
HGV load [12]	Full load Partial load Unloaded	
Motorcycle power	Kilowatts	
Motorcycle displacement [4]	Engine displacement in cc.	
Vehicle model	Model name or code	
Number of passenger seats	1 to n	
Year vehicle first registered	Calendar year	
Odometer reading	Distance in km.	
Vehicle condition [6,12]	Not known No apparent defect Defective brakes Defective steering Defective lights Tire blow-out Incorrect tire pressure Insufficient tire tread Loaded incorrectly	Reporting officer did not inspect
Vehicle inspection	Date of last official inspection	

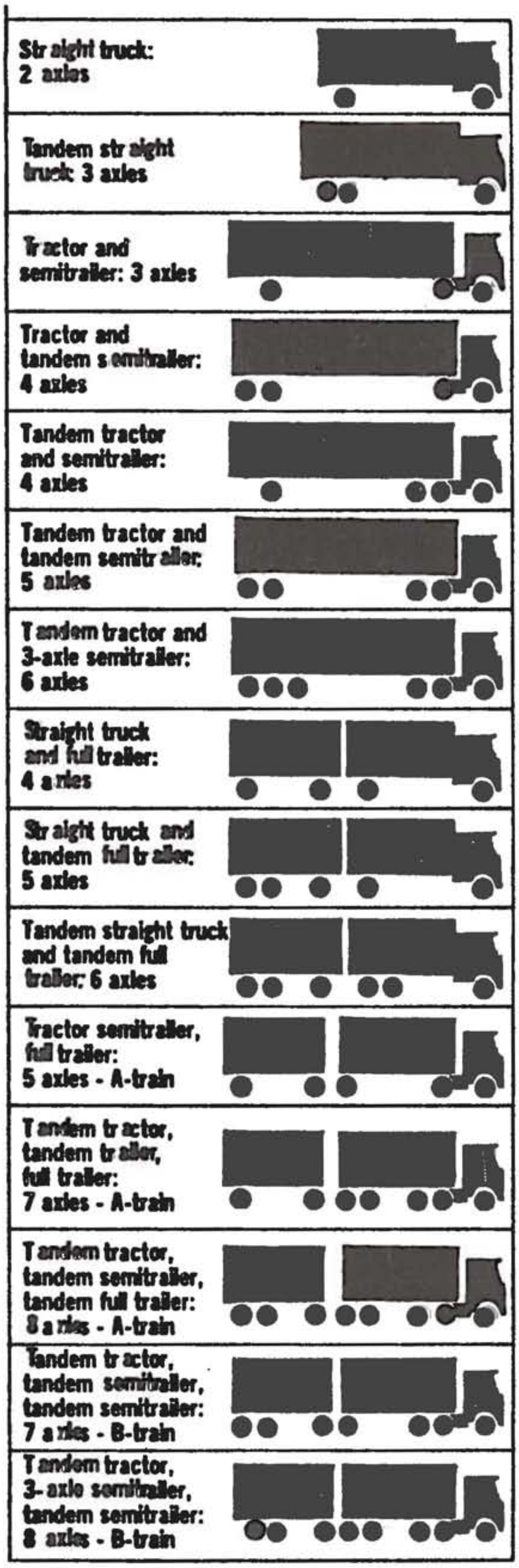
Vehicle manoeuvre	Going straight Turning left Turning right Changing lanes Merging Reversing Parked	
Object struck [10]	Other vehicle Pedestrian Fixed object Overturned	 As first event, no object struck
Direction from which vehicle struck [11]	1 to 12 Top Bottom	As hours on clock face
Vehicle damage [11]	No visible damage Superficial Moderate Severe	 Safe to drive away Unsafe for use without repair Vehicle towed from scene
Driver age [1, 4, 10]	Age in years	
Driver sex	Male Female	
Driver licence status	Learner/probationary Full Suspended	
Date first licensed [4]	Month and year first licensed for this vehicle class	
Driver training [4]	Formal course Informal	Applicable to this vehicle
Driver condition [3, 6]	Not known Apparently normal Had been drinking Judged drug-impaired Judged fatigued	Not interviewed immediately
Level of alcohol [3, 6]	Not tested Blood alcohol concentration, or equivalent measure	
Driver accident history	Number of accidents on record	
Driver violations	Number of moving violations on record, last 5 years	
Victim severity [11]	Killed Major injury Minor injury	 Admitted to hospital overnight Not requiring admission
Victim AIS	AIS 1 to 6	Interpreted from ICD code on medical record
Elapsed time to death	Time between accident and death, in days and hours	
Length of hospitalisation [8, 9]	Number of days	

Victim type [4, 11]	Driver/rider in control Passenger - front centre seat Passenger - front outboard Passenger - rear centre seat Passenger - rear outboard Passenger - other Pedestrian Other	
Victim age [1, 10]	Age in years	
Victim sex	Male Female	
Occupant ejection [11]	Not ejected Partially ejected Fully ejected	
Safety device use [11]	Seat belt worn Seat belt available - not worn Seat belt not available Child restraint used Motorcycle helmet worn Motorcycle helmet not worn	
Automatic occupant restraint [11]	Air bag - deployed Air bag - not deployed Automatic belt No automatic restraint	
Victim injury location [11]	Face Head Neck Chest Back Shoulder, upper arm Elbow, lower arm, hand Abdomen, pelvis Hip, upper leg Knee, lower leg, foot Non-specific	Location of most serious injury
Victim injury type [9, 11]	ICD nature of injury, from medical record	

TABLE 2: PROPOSED EXPOSURE DATA ELEMENTS

Exposure measure	Classification required, by accident variables
Population	Age-group (0-5; 6-9; 10-14; 15-17; 18-20; 21-24; 10-year groups thereafter up to and including; 75 and older). Single year ages 15-20(24). Sex
Vehicles registered	Vehicle type HGV's by laden weight Motorcycles by power and displacement Age (estimated from year of first registration)
Vehicle-kilometres, from samples using automatic counting	Hour of day Day of week Month Year Road type Vehicle type
Vehicle-kilometres and Occupant-kilometres from Travel Surveys (+ possibly time travelled)	Hour of day Day of week Month Year Mode of travel (vehicle type; walking) Driver age-group Driver sex Passenger age-group* Passenger sex* Trip purpose* (classified by: [activity at origin] x [activity at destination] using the "activities": home work personal business shopping education recreation)

* Note these variables are of interest in calculating and interpreting risks per capita or per kilometre, but do not necessarily appear in the accident data.



ANNEX 1: Configuration classes for heavy goods vehicles

5. RECOMMENDATIONS

5.1. Introduction

The group considers that it is particularly important to progress significantly in the field of international comparisons of road safety levels as well as in the research of relevant indicators.
To this end it is indispensible to make available to the international community appropriate databases and adequate statistical analysis.
This group considers that the only means of conducting in-depth, comparative studies and evaluating the effect of road safety measures is the development of a disaggregated database, which is a longer term objective requiring important efforts of data collection and harmonization of definitions.
However, it should be noted that intermediate steps within national databases can be reached in the shorter term.
In the short term, an aggregated database allowing the development of more approximate safety indicators, offers important services and is already an improvement on the situation in the past.
The fundamental objective being the implementation of a disaggregated database means that there must be a consistency between the aggregated and disaggregated databases.

A recent world-wide survey (Sivak & O'Day, 1987) has shown a great interest among researchers and others for an international file of fatal accidents, and a considerable interest for an international file of non-fatal accidents.

5.2. Accident data

5.2.1. General

5.2.1.1. Definition of a Fatal Accident/Fatality

That preferably from the year 1990, all OECD countries adopt the 30 day limit i.e. "died within 30 days as a result of the accident".
Weighting data from countries with deviating definitions (24 hours, 3, 6, and 7 days) for the total number of roads deaths using a fixed ratio, is for at least two reasons insufficient: firstly, the duration between accident and moment of death differs between age groups and between categories of road user (two of the most important classifications) whereby; secondly, because shares per age group and category of road user differ between countries and

change in the course of time, weighting for the total number of road deaths changes in time.
For internal uses of accident data each country, if deemed necessary, will continue to use its old, deviating definition.
For international uses, data submitted abroad will use the 30 day definition. Countries encountering difficulties in achieving this change can call upon the international bodies to use their influence to persuade national authorities.

5.2.1.2. Definition of "Hospitalized"

That preferably from the year 1990, all OECD countries adopt the definition of "hospitalized" as those non-fatal victims who are admitted into hospital as in-patients.
Although it is recognized that the criteria for hospitalizing a road traffic victim will vary between countries (according to available beds, other available treatment, financial considerations etc.) it is felt that such a definition is workable, and in every country will contain the majority of those likely to have any lasting or permanent physical disability.
For some countries this will mean requesting the police (at the behest of international bodies as well as in the national interest) to record hospital admission.

5.2.1.3. Other definitions

That OECD countries follow the definitions of the Vienna Convention of Road Traffic 1968 as published by the United Nations Economic Commission for Europe in its annual "Statistics of Road Transport Accidents in Europe" (see Appendix 1).
This convention includes the 30 day definition for fatal accidents and fatalities.

5.2.2. Aggregated Accident Data

5.2.2.1. That from the year 1990 the international database of the German Federal Highway Research Institute (BASt) be adopted by the OECD countries as the central source of accident and victim data for use in their international comparisons at the aggregate level.

5.2.2.2. That international bodies as the OECD, EEC, ECE, CEMT, IRF, PIARC and WHO be requested to use the above-mentioned database as a prime source of data required for their annual reports and ad hoc studies at the aggregate level insofar as the necessary data is available in the database. This will save them the trouble of collecting their own data and ensure that no conflicting data is published.

5.2.2.3. That all OECD countries transfer their annual data to the above-mentioned database. This they will do as soon as the data is available and will do it during the year after the data year.

5.2.2.4. That all those OECD countries not being able to provide all the required data, or having data not conforming to the Vienna Convention definitions, take the necessary measures backed by the international bodies.

5.2.2.5. That the proposed additions to the variables and values in the above-mentioned database be provided by all OECD countries on the same basis as the present data.

5.2.2.6. That the OECD requests the EEC, ECE, CEMT and WHO to draw up and send a combined petition to the national authorities (Ministries of Justice and/or the Interior for the police, Ministries of Transport, and Bureaus of Statistics) urgently requesting them to ensure that the data agreed upon be gathered.
The combined international bodies could mention those national research institutes (the institutes represented in this Expert Group) which should be consulted and can offer assistance in taking the necessary measures.

5.2.2.7. That operating arrangements, such as access to the database, and financial arrangements, such as compensation to the German Federal Highway Research Institute, be decided by a new, continuous OECD group responsible for this database (see para. 5.4).

5.2.3. Disaggregated Accident Data

5.2.3.1. That the new continuous OECD group recommended in 5.2.2.7 create an International Road Safety Database at the disaggregated (individual accident/victim record) level i.e. the way each country creates its own national database.

5.2.3.2. That this database include those variables and values set out in Chapter 4 and that each country provide these variables and values according to a prescribed format and choice of media.
These variables and values have been selected because of their established importance in road safety research: the variables are important safety factors and there are important differences in safety between values. Their importance has been established in OECD Road Transport Research Groups and in many national research projects.

5.2.3.3. That the Vienna Convention definitions be followed. Where definitions do not exist the initial contributing countries will establish definitions.
In time it is hoped that these new definitions will be universally adopted and added to the Vienna Convention definitions.

5.2.3.4. That the database commences with fatal accidents and fatalities awaiting the experience of the BASt aggregated database as to the operationalization of the definition of "hospitalized" (see 5.1.1.2).

5.2.3.5. That further operating arrangements, such as input and output media, access, and the choice of a host be decided by the new, continuous OECD group (see para. 5.4).

5.2.4. Linking Accident Data to other Databases

That, when revisions of the police road accident report form, aimed at achieving international harmonization, are under consideration, the following common key variables, if not already available, be included in order to facilitate linking the police accident data to other relevant databases:

Database	Common Key Variable
Road Characteristics	Location Code
Vehicle Characteristics	Vehicle Registration/Identification Number
Driver Characteristics	Driver's Licence Number
Injuries & Treatment	Hospital Name/Code
Material Damage	Vehicle Insurance Policy Number

Names, addresses, and dates of birth are also of course the ideal common key variables but are usually not available in databases for reasons of privacy.

Whether the above-mentioned common key variables are used or are supplemented by names, addresses, and dates of birth; it should be emphasized that, in order to protect the privacy of the individual, once other databases have been linked to the accident database at the national level, personal identification data will be deleted before the linked databases are forwarded to an international database.

(A detailed discussion of the benefits and problems of linking the police accident data to other databases can be found in Harris, 1986).

5.3. Exposure Data

5.3.1. General

The exposure data required to supplement both the aggregated and disaggregated accident data entails data at the vehicle level, for relating to numbers of accidents, and at the road user level, for relating to numbers of victims. These two levels of data cannot as yet be combined in one data gathering method.
Therefore it is recommended that all OECD countries have two continuous exposure-measuring projects: a National Traffic Count for the vehicle data and a National Travel Survey for the road user data.

5.3.2. National Traffic Count

It is recommended that continuous traffic counts be carried out for a road sample which is representative for the road type classification listed in Chapter 4, Table 2 and the vehicle type classification listed in chapter 4, Table 1; and which register date and time of day.
This method can be supplemented by periodic odometer readings of a representative vehicle sample.

5.3.3. National Travel Survey

5.3.3.1. It is recommended for that data not available from traffic counts: personal details of road users such as age, sex and driving experience; trip details such as purpose, length and duration; and vehicle details such as weight, engine capacity (displacement) and age; be collected by the interview method.

5.3.3.2. The interview method requires a population sample representative for the variables and values listed in Chapter 4, Table 2.
The occupant kilometre data thus obtained only contains data on residents and will therefore have to be supplemented by the occupant kilometrages of road users from abroad.

5.3.4. The Combination of Traffic Counts and Travel Surveys

The validity of kilometrage data as measured by traffic counts is greater than that as measured by travel surveys. Traffic counts use a direct measurement (in the traffic itself) whereas travel surveys use an indirect method (questioning road users retrospectively).
There will in any case always be differences between the results obtained by traffic counts and those obtained by travel surveys.
For a comparison of the characteristics of the two methods and the data that can be obtained from each see Appendix 2.
It is therefore recommended that traffic counts and odometer readings be used to calculate the absolute level of kilometrage and that travel surveys be used to break this down by those variables not obtainable by the traffic count method.

5.3.5. A Final Recommendation

That countries setting up traffic counts or a travel survey send their research designs in advance to the other OECD countries for their comments and advice and that these comments and advice be circulated to all countries.

5.3.6. A Final Remark

Exposure data, in the form of vehicle and occupant kilometrages, is also needed by traffic researchers and various types of planners. Road safety researchers should enlist their help in ensuring that these data is collected.

N.B. For a more detailed description of how a National Traffic Count and a National Travel Survey can best be carried out, and for a comparison of the two methods together with Traffic Observations, see Appendix 2 "The Measurement of Exposure".

5.4. A New OECD Group

5.4.1. The T8 Scientific Expert Group has laid the basis for the two international accident and exposure databases it recommends.

5.4.2. It recommends to the Steering Committee of the OECD Road Transport Research Programme that it establish a new OECD group whose task it will be to actually set up these two international databases.

5.4.3. It therefore recommends that this group, in contrast to other OECD group, be continuous, because once the databases have been set up and implemented they will need to be maintained, evaluated, and possibly modified. This cannot be achieved during the normal two-year life cycle of OECD groups.

5.4.4. The group recommends that this new OECD group will:
1. Choose its own form of organization, officers, decision taking procedures, and methods of operations.
2. Fix definitions.
3. Determine the exact content of the disaggregated database (that of the aggregated database has already been determined by this present group).
4. Arrange technical details of the databases.
5. Finance the databases and make financial arrangements for hosts, contributing member countries, and other interested international and national bodies wishing to use the data.

5.4.5. Further recommendations are:
1. That first the aggregated database be expanded as recommended, and that after this the disaggregated database be implemented.
2. That before the first meeting of the new group, the German Federal Highway Research Institute (BASt) provide a background paper on the technical, operational, and financial aspects of the aggregated database.
3. That the OECD provide the usual organisational support and meeting facilities at OECD headquarters.
4. That international bodies be invited to join the new group.

6. CONCLUSIONS

6.1. It will come as no surprise that this Expert Group has encountered the same problems of data absence and incompatibility that many researchers and research groups, such as those of the OECD, have in the past.

6.2. The data, where available, is different partly because the countries themselves are different. Apart from such obvious differences as landscape, climate and population density there is also the difference in wealth. Although the countries of the OECD belong to the 'rich' countries of the world they are not homogeneous. There is a factor 3 between the Gross National Product per capita of the poorest and the richest OECD country.

6.3. What the experiences of the international database of the German Federal Republic Highway Research Institute (BASt) and the experiences of the Nordic Countries' database show, however, is that actual co-operation between countries in setting up and maintaining an international database encourages the collection of data not yet gathered, and encourages the harmonization of data.
Such projects are the quickest way to achieving our goal of reliable, comparable, and consistent traffic and accident data.

6.4. The expansion of the existing international aggregated database of the German Federal Highway Research Institute (BASt) and the creation of an international disaggregated database will facilitate the transfer of one country's experience to another, without duplication of research efforts. It will also help in the establishment of international standards and regulations for road traffic and motor vehicles, and of integrated road safety policies.

6.5. It has been widely remarked that the development of fatality figures has been similar in a variety of countries. This aspect merits further thought.
In spite of all the national differences it is obvious that we live to a large extent in a world of internationally harmonized traffic.
Important external influences are roughly the same at least for the western industrial states: one can think of the energy crisis, the development of petrol prices, the safety standard of vehicles, the larger economic situation etc. Furthermore the list of possible traffic safety measures is

limited: safety belts, crash helmets, speed limits, improvement of roads, alcohol laws, etc. are recurrent themes in the international discussion; there are few countries who take exceptional measures. Therefore it is no surprise that the development of accident figures is largely similar. When talking of similarity this does not mean "laws". Various national peculiarities and differing success in learning in the face of the challence of road traffic lead to different levels of traffic safety. It is, however, possible to improve one's international position through especially successful safety measures.
As ways of evaluating national success in improving traffic safety there are two important methods:
1. Comparing the national figures with those of previous years, which is at present almost exclusively used.
2. Comparing the national development with that of other countries.
The latter method, international comparisons, are in the long run the best indicator of whether a country has managed to improve its traffic safety significantly.

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APPENDIX 1: LIST OF DEFINITIONS USED IN THE UN/ECE "STATISTICS OF ROAD TRAFFIC ACCIDENTS IN EUROPE"

ANNEX I

DEFINITIONS AND GENERAL NOTES

A. Definitions relevant to the tables of this Bulletin

Accidents

Accidents included are those:

a) which occurred or originated on a way or street open to public traffic;

b) which resulted in one or more persons being killed or injured (see below) and

c) in which at least one moving vehicle was involved.

These accidents therefore include collisions between vehicles, between vehicles and pedestrians, and between vehicles and animals or fixed obstacles. Single vehicle accidents, in which one vehicle alone (and no other road user) was involved, are included.

Multi-vehicle collisions are counted as only one accident provided that the successive collisions happen at very short intervals.

Fatal accident – Any accident in which one or more persons were killed (see below).

Non-fatal accident involving bodily injury – Any accident in which no person was killed but in which one or more persons were seriously or slightly injured (see below).

Killed – Any person who was killed outright or who died within 30 days as a result of the accident.

Injured – Any person, who was not killed, but sustained one or more serious or slight injuries as a result of the accident.

Built up area 1) – An area with entries and exits specially sign-posted as such.

Driver 1) – Any person who drives a motor vehicle or other vehicle (including a cycle), or who guides cattle, singly or in herds, or flocks, or draught, pack or saddle animals on a road.

Passenger – Any person, other than the driver, who is in or on a vehicle.

Pedestrian – Any person other than a driver or a passenger according to the above definitions. Persons pushing or pulling a child's carriage, a bath chair or invalid chair, or any other small vehicle without an engine, or pushing a cycle or moped, and handicapped persons travelling in invalid chairs propelled by such persons or moving at walking pace shall be treated as pedestrians 1).

Road vehicle – A vehicle running on wheels and intended for use on roads.

Motor vehicle 1) – Any power-driven vehicle which is normally used for carrying persons or goods by road or for drawing, on the road, vehicles used for the carriage of persons or goods. This term embraces trolley-buses, that is to say, vehicles connected to an electric conductor and not rail-borne. It does not cover vehicles, such as agricultural tractors, which are only incidentally used for carrying persons or goods by road or for drawing, on the road, vehicles used for the carriage of persons or goods.

Power driven vehicle 1) – Any self-propelled road vehicle, other than a moped and a rail-borne vehicle.

Cycle 1) – Any road vehicle which has at least two wheels and is propelled solely by the muscular energy of the person(s) on that vehicle, in particular by means of a pedal system, lever or handle (e.g. bicycles, tricycles, quadricycles and invalid carriages).

Moped 1) –Any two wheeled or three wheeled road vehicle which is fitted with an internal combustion engine having a cylinder capacity not exceeding 50 cc (3.05 cu. in.) and a maximum design speed not exceeding 50 km (30 miles) per hour.

Motor cycle 1) –Two-wheeled road motor vehicle with or without a side-car, including motor scooter, or three-wheeled road motor vehicle not exceeding 400 kg (900 lb) unladen weight. This term does not include mopeds.

Passenger car – Road motor vehicle, other than a motor cycle, intended for the transport of passengers and seating not more than nine persons (including the driver). The term "passenger car" therefore covers taxis and hired vehicles, provided that they have fewer than ten seats.

Motor coach or bus – Passenger road motor vehicle, seating more than nine persons (including the driver).

Trolleybus – A passenger road vehicle, seating more than nine persons (including the driver), which is connected to electric conductors and which is not rail-borne.

Tramcar – A passenger road vehicle, seating more than nine persons (including the driver), which is connected to electric conductors and which is rail-borne.

Goods road vehicle – Road vehicle designed, exclusively or primarily, to carry goods.

Tractor – Road motor vehicle designed, exclusively or primarily, to haul other road vehicles.

Articulated vehicle 1) – Combination of vehicles comprising a motor vehicle and semi-trailer coupled to the motor vehicle.

Combination of vehicles 1) – Coupled vehicles which travel on the road as a unit.

Permissible maximum weight 1) – Total of the weight of the vehicle when stationary and ready for the road (including the weight of the driver and of all other persons carried at the same time) and of the weight of the load declared permissible by the competent authority of the country of registration of the vehicle.

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1) These definitions appear in or conform with the substance of those given in the Convention of Road Traffic (Vienna, 1968) and in the European Agreement supplementing the Convention.

B. Other definitions

Vehicles involved

Vehicles directly involved in accidents, and, so far as possible, those indirectly involved, should be recorded on the statistics report form.

a) Are regarded as being directly involved:

i) vehicles of which any of the occupants were killed or injured as a result of the accident;

ii) vehicles colliding with one or more vehicles (in motion, stationary, or parked), with pedestrians, with animals, or other obstacles,

iii) vehicles whose driver or passengers were injured while alighting from or boarding the vehicle;

b) Are regarded as being indirectly involved:

i) vehicles whose movements were considered to have contributed to an accident, but which were not themselves directly involved;

ii) stationary or parked vehicles whose position was considered to have contributed to an accident, but which were not themselves directly involved.

Persons involved – Details of all persons injured in accidents should be recorded in the statistics, together with details of drivers of all vehicles directly involved, whether or not injured.

Serious injuries – Fractures, concussion, internal lesions, crushing, severe cuts and laceration, severe general shock requiring medical treatment and any other serious lesions entailing detention in hospital.

Slight injuries – Secondary injuries such as sprains or bruises. Persons complaining of shock, but who have not sustained other injuries, should not be considered in the statistics as having been injured unless they show very clear symptoms of shock and have received medical treatment or appeared to require medical attention.

Accidents causing material damage

Accidents causing material damage are accidents:

a) which occured or originated on a way or street open to public traffic;

b) as a result of which at least one of the vehicles involved sustained or caused material damage only;

c) in which a moving vehicle was involved.

C. Departures from the definition of persons killed, and of serious and slight injuries

Significant departures from the commonly agreed definition are as follows:

Austria: As from 1966, persons are recorded as killed who die within 3 days as a result of the accident; persons who die later are recorded as injured. Before 1966, the standard definition was applied whenever possible.

Belgium: As from 1971 the standard definition is applied. Before 1971, persons were recorded as killed only if they died at the scene of the accident; persons who died after removal from the scene of the accident were recorded as injured.

Czechoslovakia: As from 1980, the standard definition is applied. Before 1980, persons were recorded as killed who died within 24 hours as a result of the accident; persons who died later were recorded as injured.

France: As from 1967, persons are recorded as killed who die within 6 days as a result of the accident; persons who die later are recorded as injured. Before 1967, persons were recorded as killed who died within 3 days as a result of the accident. Serious injuries are those requiring hospitalization for more than 6 days. Slight injuries are those requiring hospitalization for up to 6 days.

German Democratic Republic: As from 1978, the standard definition is applied. Before 1978, persons were recorded as killed who died within 72 hours as a result of the accident; persons who died later were recorded as injured.

Greece: Persons are recorded as killed who die within 3 days as a result of the accident, persons who die later are recorded as injured.

Italy: As from 1964, persons are recorded as killed who die within 7 days as a result of the accident; persons who die later are recorded as injured. Before 1964, persons were recorded as killed who died at the scene of the accident.

Poland: As from 1975, the standard definition is applied. Before 1975, persons were recorded as killed who died within 48 hours as a result of the accident; persons who died later were recorded as injured.

Portugal: Persons are recorded as killed who die at the scene of the accident or during or immediately after transport from the scene of the accident; persons who die later are recorded as injured.

Spain: Persons are recorded as killed who die within 24 hours as a result of the accident, persons who die later are recorded as injured.

Note: After studying the information provided by the governments on the distribution of casualties in their countries according to the time of death (at the scene of the accident, on the way to hospital, during the remainder of the first three days, between the third and the thirtieth day), the Working Party on Road Traffic Safety of the Inland Transport Committee of the United Nations Economic Commission for Europe came to the tentative conclusion that figures in respect of deaths resulting from accidents can be broken down according to the time when they occur roughly as follows:

Died at the scene of the accident or on the way to the hospital	65%
Died within three days	88%
Died within thirty days	97%

APPENDIX 2: THE MEASUREMENT OF EXPOSURE

1. THE RECOMMENDED METHODS

1.1. The Exposure Data Needed

The exposure data (defined here as kilometres travelled) required to supplement both the aggregated and disaggregated accident data entails data at the vehicle level (vehicle kilometres), for relating to numbers of accidents, and at the road user level (occupant or person kilometres), for relating to numbers of victims. These two levels of data cannot as yet be combined in one data gathering method.
Therefore it is recommended that all OECD countries have two continuous exposure-measuring projects: a National Traffic Count for the vehicle data and a National Travel Survey for the road user data.

1.2. National Traffic Count

1. It is recommended that the road network be inventoried according to the variables listed in Chapter 4 Table 2 of which the most importance is road type (motorway, other dual carriageway, single carriageway, one-way).
2. That a random sample of these roads, both inside and outside urban areas, be drawn. The sample size will largely depend on the diversity of the national highway network.
3. That continuous traffic counters be installed at the points in the sample. These counters must be able to distinguish between the categories of vehicles listed in chapter 4 and register the time of day and the date. The sophistication of these counters and the extent to which they are linked to other apparatus for totalization will be dependent on the resources available.
4. Totalized sample data will then be multiplied by the sample fraction (total road length/sample road length) to produce national data on vehicle kilometres.
5. Use of visual counters to register vehicle occupation will make possible the conversion of vehicle kilometres into occupant kilometres.

1.3. National Travel Survey

1.3.1. It is recommended that data not available from traffic counts be collected by the interview method. These include: personal details of road users such as age, sex and driving experience; trip details such as purpose, length and duration; and vehicle details such as weight, engine capacity (displacement) and age.

1.3.2. Census data must be studied, paying attention to the variables in Chapter 4, Tabel 2. The most important are the age and sex distribution.

1.3.3. A random sample of the population must be drawn so as to be representative for the above-mentioned variables. In practice this will mean a sample of the household population as those living in institutions, such as old-peoples' homes, are usually difficult, if not possible to reach.
The sample size will generally be determined by the size of the smallest group of road users one wishes to obtain accurate data about. This will vary from country to country according to the age distribution and vehicle use.
Motorcyclists or mopedists (a better word than moped riders) are the smallest group in most countries.

1.3.4. Each day of the year a subsample will complete trip diaries for one day to obtain numbers, lengths, and durations of trips broken down by the variables given in chapter 4, Table 2 as well as the personal characteristics already mentioned.

1.3.5. The totalized data will then be multiplied by the sample fraction (population/sample) to obtain population occupant kilometrage.

1.3.6. The kilometrage travelled abroad will have to be subtracted from the total. The kilometrage of 'foreigners' (residents of foreign countries) will then have to be added to the domestic kilometrages of the population. Estimates of motor vehicle kilometrages of residents of foreign countries can be obtained by occasionally counting the proportion of foreign number plates during visual traffic counts.

1.4. The Combination of Traffic Counts and Travel Surveys

The validity of kilometrage data as measured by traffic counts is greater than that as measured by travel surveys. Traffic counts use a direct measurement (in the traffic itself) whereas travel surveys use an indirect method (questioning road users retrospectively).
There will in any case always be differences between the results obtained by traffic counts and those obtained by travel surveys.
It is therefore recommended that traffic counts be used to calculate the absolute level of kilometrage and that travel surveys be used to break this down by those variables not obtainable by the traffic count method.

1.5. Odometer Readings

This is a cheap method of obtaining total (e.g. annual) vehicle kilometres. The kilometres themselves cannot be broken down, as is possible with Traffic Counts and Travel Surveys, but they can be related to a variety of vehicle and owner characteristics.
A sample of the national vehicle registration file is taken. The owners of these vehicles are sent a postcard and requested to enter the odometer reading of that vehicle on a certain date.
After a certain period (e.g. one year) the same owners are sent a second postcard and requested to enter the odometer reading of the same vehicle on another certain date (e.g. exactly one year after the first reading).
Special treatment is required for those vehicles bought, sold, or scrapped during that period.
The vehicle and owner characteristics available depends on the contents of the national vehicle registration file, but will generally at least include vehicle type, make and model, and age; and the age of the owner.

APPENDIX 2: THE MEASUREMENT OF EXPOSURE

2. A COMPARISON BETWEEN TRAFFIC COUNTS, TRAFFIC OBSERVATIONS, AND TRAVEL SURVEYS AS METHODS OF EXPOSURE MEASUREMENT

2.1. Introduction

Traffic observations were not discussed in Chapter 5 of the report. (Recommendations) because they are far more expensive than either traffic counts or travel surveys.
For the sake of completeness, however, they will be included in this comparison.

2.2. Definitions

Traffic Counts - counting, either manually or using automatic apparatus, the numbers of vehicles passing a particular (imaginary) line across a road in such a way as to be able to distinguish between different types of vehicles.
Traffic Observations - viewing, either with the naked eye or by film/video camera, the numbers of vehicles passing a particular (imaginary) line across a road.
Travel Surveys - the filling in, by road users or interviewers, of trip diaries recording details of trips made, and of questionnaires on socio-demographic and other details.

2.3. Characteristics

2.3.1. Traffic counts and observations are theoretically the most reliable because they measure directly the traffic itself, where and when it takes place, whereas travel surveys are retrospective i.e. the information is recorded after the journey has taken place.
In the case of kilometrages (the most important exposure measurement) travel surveys use estimated - often subjective - trip distances (estimated by the respondent) whereas traffic counts and observations use the sample road length, which is objective.
There are of course methods for increasing trip distance estimate accuracy, such as drawing the route taken on an accurate map with a known scale.

2.3.2. Traffic counts and observations measure foreign vehicles (vehicles with foreign number plates) but travel survey interview only residents, and usually only those not living in institutions such as old-peoples' homes, and usually not those not speaking and reading the local language.

2.3.3. The response in traffic counts and observations is 100%, i.e. unless the measurers malfunction, all vehicles are counted. In travel surveys, however, the response rate lies usually between 50% and 70% bringing into doubt the representativeness of the sample. People refuse to take part or are not found at home: both these groups can and often do have a road usage deviant from the response.

2.3.4. All three methods can measure 24 hours a day except traffic observations if there is no street lighting or floodlighting at the sample points.

2.3.5. Traffic counts can only measure vehicle kilometres whereas traffic observations, if the number of occupants is observed, can also measure occupant kilometres. Travel surveys measure vehicle and occupant kilometres if a distinction is made between driver and passenger kilometres.

2.3.6. The total costs of traffic observations are by far the highest because of either the labour-intensive work of observing, or analysing the films.
Travel surveys are more expensive than traffic counts because of the labour-intensive work of data collection and processing.
Traffic counts however are expensive per unit of measurement because they only register the vehicle type whereas traffic observations can register much more (see 'Data gathered') and travel surveys can ask a lot more questions.

2.4. Data Gathered

2.4.1. General

Of the 18 variables listed in the table, traffic counts can measure 9, traffic observations 12, and travel surveys 8 plus an additional 9 "sometimes", i.e. on short trips in which the variable remains constant.

2.4.2. Vehicle Type / Modal Split

Automatic traffic counts can only distinguish between vehicle types by measuring vehicle length or weight. Traffic counts cannot measure pedestrians whereas traffic observations and travel surveys can. Only travel surveys can measure vehicle age.

2.4.3. Local Conditions

Traffic counts and observations can measure all sorts of necessary fixed variables of the road and its surroundings, whereas travel surveys can only do so if a trip is made on one type of road and surroundings. If the type of road and surroundings change along the route it is not possible to allocate the kilometres travelled to the various types.
Traffic observations can also measure variables which can change (rapidly) in time such as the weather and whether the road surface is wet or dry.

2.4.4. Road User Variables

Only the travel survey can measure age, sex and driving experience of (the kilometres of) road users.

2.4.5. Travel Time

Only travel surveys can measure travel time.

2.5. Conclusions

2.5.1. Methodologically, traffic counts and observations are superior to travel surveys. They are more reliable and accurate, and measure the right population.

2.5.2. Travel surveys gather the most data, although some variables can only be measured under restricted conditions ("Sometimes").

2.5.3. Traffic counts and observations measure more road and surroundings variables but only travel surveys can measure road user variables and travel time.

2.5.4. However, of course not all characteristics and variables are of the same importance. This means that the choice depends on the relative importance of the advantages and disadvantages of each method.

2.5.5. Apart from financial considerations it is clear from all the above that the exposure data recommended can only be gathered by a combination of methods. No single one is sufficient.

Appendix 2: A COMPARISON BETWEEN TRAFFIC COUNTS, TRAFFIC OBSERVATIONS, AND TRAVEL SURVEYS.

CHARACTERISTIC	TRAFFIC COUNT	TRAFFIC OBSERVATION	TRAVEL SURVEY
1 Instrument	Counter	Camera	Trip diary + Questionnaire
2 Method	Direct (roadside)	Direct (roadside)	Indirect (at home)
3 Reliability	Objective	Objective	Subjective
4 Target group	Residents + foreigners	Residents + foreigners	Residents
5 Sample frame	Road network	Road network	Addresses
6 Sample	Roadside points	Roadside points	Individuals
7 Period	24 hours a day	24 hours (or 12 if unlit)	24 hours a day
8 Response	100%	100%	50-70%
9 Unit of measurement	Vehicle	Vehicle + occupants	Occupants
10 Exposure unit	Vehicle kilometres	Vehicle + occupant kms.	Vehicle + occupant kms.
11 Amount of data per unit	Low	Low	High
12 Total costs	Low	High	High
13 Cost per unit	High	High	Low

DATA GATHERED			
1 Trips	No	No	Yes
2 Travel time	No	No	Yes
3 Road type	Yes	Yes	Sometimes
4 Speed limit	Yes	Yes	Sometimes
5 Road surface type	Yes	Yes	Sometimes
6 Road surface condition	No	Yes	Sometimes
7 Road gradient	Yes	Yes	No
8 Adjacent land use	Yes	Yes	Sometimes
9 Place/area/region	Yes	Yes	Sometimes
10 Urban-rural	Yes	Yes	Sometimes
11 Weather conditions	No	Yes	Sometimes
12 Light conditions	No	Yes	Sometimes
13 Time of day, DDMMJJ	Yes	Yes	Yes
14 Vehicle type/ modal split	Yes (via length/weight)	Yes	Yes
15 Vehicle age	No	No	Yes
16 Age of drivers and passengers	No	No	Yes
17 Sex of drivers and passengers	No	No	Yes
18 Driving experience	No	No	Yes

APPENDIX 3

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