INSTITUTE FOR
ROAD SAFETY RESEARCH

Data sources

Comprehensive overview

Comprehensive overview of data sources used by SWOV.

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Content

Foreword		**7**
1.	**The national road crash registration BRON**	**8**
1.1.	Application in road safety research	8
1.2.	Method	8
1.3.	Availability crash data	9
1.4.	Reliability, accuracy, completeness	9
1.5.	Literature and sources	10
2.	**Population Statistics**	**11**
2.1.	Application in road safety research	11
2.2.	Method	11
2.3.	Availability data	12
2.4.	Reliability, accuracy, completeness	12
2.5.	Variables	12
2.6.	Regional grouping of municipalities	12
2.7.	Literature and sources	13
3.	**Community database on Accidents on the Roads in Europe (CARE)**	**14**
3.1.	Available CARE data	14
3.2.	Comparability of CARE data	14
3.3.	Literature and references	14
4.	**Cause of Death Statistics**	**14**
4.1.	Method used to collect data	16
4.2.	Codering	16
4.3.	Population	16
4.4.	Reliability, accuracy, completeness	17
4.5.	ICD-lijsten	17
4.6.	Literature and sources	17
5.	**Serious road injuries**	**18**
5.1.	Application in road safety research	18
5.2.	Method	18
5.3.	Availability data	19
5.4.	Reliability, accuracy, completeness	19
5.5.	Variables	19
5.6.	Literature and sources	20
6.	**Eurostat**	**21**
6.1.	Literature and sources	21
7.	**International Road Traffic and Accident Database (IRTAD)**	**22**
7.1.	Application in road safety research	22
7.2.	Method	22
7.3.	Availability data	22
7.4.	Reliability, accuracy, completeness	23
7.5.	Registration rate crashes and casualties	23
7.6.	Literature and sources	24

8. National Basic Register Hospital Care (LBZ) (previously National Medical Register (LMR)) 25
8.1. Application in road safety research 25
8.2. Method 25
8.3. Availability data 26
8.4. Reliability, accuracy and completeness 27
8.5. Literature and sources 28

9. Injury Information System (LIS) 29
9.1. Application in road safety research 29
9.2. Method 30
9.3. Reliability, accuracy and completeness 32
9.4. Literature and sources 32

10. National Roads Register (NWB) 33
10.1. Application in road safety research 33
10.2. Linking crashes with the NWB 33
10.3. Road length 34
10.4. Roundabouts 34
10.5. Literature and sources 34

11. Injuries and Physical Activities in the Netherlands (OBiN) 35
11.1. Literature and sources (in Dutch) 35

12. Mobility of Persons 36
12.1. Application in road safety research 36
12.2. Method 37
12.3. Availability data 38
12.4. Reliability, accuracy and completeness 38
12.5. Variables 39
12.6. Literature and sources 39

13. Study 'Driving under the Influence' (ROI) 40
13.1. Application in road safety research 40
13.2. Method 41
13.3. Availability data 42
13.4. Reliability, accuracy and completeness 42
13.5. Variables 43
13.6. Literature and sources 43

14. Road Statistics (Statistics Netherlands) 45
14.1. Road length 45
14.2. Motorvehicle kilometres travelled 45
14.3. Index rural traffic volume 46
14.4. Literature and sources 46

15. Passenger Transport Statistics (Statistics Netherlands) 47
15.1. Literature and sources 47

16. Dutch Motor Vehicle Fleet Statistics (Statistics Netherlands) 48
16.1. Application in road safety research 48
16.2. Method 48
16.3. Availability data 48
16.4. Reliability, accuracy and completeness 49

16.5. Available characteristics 49
16.6. Literature and sources 50

17. Road Deaths Statistics (Statistics Netherlands) 51
17.1. Application in road safety research 51
17.2. Method 51
17.3. Availability data 52
17.4. Reliability, accuracy and completeness 52
17.5. Literature and sources 52

18. Traffic offences 54
18.1. Method 54
18.2. Fines 54
18.3. Availability of data 55
18.4. Reliability, accuracy and completeness 55
18.5. Literature and sources 57

19. The registration rate of casualties and crashes 58
19.1. Registration rate and available tables 58
19.2. What does the registration rate in the tables reflect? 58
19.3. How is the registration rate by road type determined? 59
19.4. Literature and sources 61

Foreword

In its research SWOV uses various data sources. Some of these sources are public, others are not.

The SWOV website offers a considerable proportion of this data in graphs, tables and fact sheets. On the SWOV website you can use the software programme Cognos Powerplay on the available data and make your own selections and tables.

This publication presents an overview of all data sources that are used by SWOV and the acknowledgement you need to give if use the data in your own publication.

1. The national road crash registration BRON

A road traffic crash is a 'traffic related incident that occurs on a public road, causing damage to objects or injury to persons and in which at least one moving vehicle is involved'. All road traffic crashes in the Netherlands that are recorded by the police in reports or registration sets are included in the national road crash register BRON. The registration is compiled by the Centre for Transport and Navigation (DVS) which is part of the Ministry of Infrastructure and the Environment.

BRON contains a large number of characteristics of the crash and the drivers and casualties involved. The crash location is linked to the National Roads Register (NWB). Vehicle information is added using the vehicle registration as a basis.

Data is available from 1976. BRON contains 90% of the fatal crashes. For crashes of lesser severity the registration is less complete. Comparison or linking with other files make it possible to estimate the real numbers of casualties.

The police assessment of the crash severity is not always accurate. Therefore, SWOV supplements the BRON data with data from the National Basic Register Hospital Care (LBZ), which was previously known as the National Medical Register (LMR). This results in more reliable information about the real severity of injury sustained in traffic crashes.

1.1. Application in road safety research

The road crash registration contains the most important information for road safety analyses. Generally, the nature and size of the road safety problem are first determined using the BRON data. It is used to trace hazardous situations, to evaluate measures, for road safety analyses, and for scientific research. Both absolute numbers and relative dimensions (risk) are important.

Research has shown that someone who, according to the police (and therefore also according to BRON), is a hospitalized casualty, is not necessarily a serious road injury. Therefore, the number of inpatients is not a reliable measure of the number of serious road injuries. Comparison of the BRON data with the LBZ hospital data, on the other hand, does make it possible to determine the number of serious road injuries. A ‘serious road injury’ is defined as a casualty who has sustained injury of a minimum severity of 2 on the AIS scale (see also Serious road injuries). In 2010, the Ministry of Infrastructure and the Environment in the Netherlands decided to abandon the term ‘inpatients’ for monitoring and policy and to use the term ‘serious road injuries’ instead.

1.2. Method

When someone is involved in a road crash, this person or one of the bystanders calls in the police. The police has to deal with crashes in accordance with the *Aanwijzing verkeersongevallen*, which translates into

English as ‘Direction road crashes’ (OM, 2009). In the registration system (Basis Voorziening Handhaving BVH, previously Xpol, Genesis or BPS) the police enter a report or registration set. Since 2010, a characteristics report has been sufficient for very slight crashes. The police then sends this information to the Centre for Transport and Navigation (DVS) which is part of the Ministry of Infrastructure and the Environment according to the ‘Aanwijzing informatieverstrekking verkeersongevallen’, the ‘Direction information road crashes’ (OM, 2009). DVS then enters the crashes and the drivers, vehicles and casualties into BRON.

When BRON was introduced in 2004, DVS changed its work method. The file is now coded in accordance with the information on the registration form. When the information is incomplete of ambiguous, action is no longer taken to supplement the information. Exceptions are serious crashes, fatal crashes or those with serious road injury, in which case DVS contacts the police to: supplement lacking data or correct inconsistent data; determine the location, if the precise location on cannot be found in the NWB; remove double records, if after screening the suspicion arises that a crash has been reported earlier.

Part of the data processing is linking the crash data to the NWB. Generally, this is an automatic process in which names of streets and municipalities are used. In the process a crash is situated in the middle of a road section, for roads divided into hectometres this is done at a hectometre point. The precise location of the crash can therefore be different from the registered location.

Since 2001, based on the vehicle registration, vehicle characteristics are obtained from RDW, Vehicle Technology and Information Centre, are also added to the vehicle data in BRON.

Information about the MAIS value and about linking BRON to the LBZ can be found under Serious road injuries.

1.3. Availability crash data

Every year in April, the data of the previous year is made available in BRON. At this occasion the Minister of Infrastructure and the Environment also announces the number of road deaths (see also: Road deaths). In the third quarter the data of the road crash casualties in hospitals is made available. SWOV then links the LBZ data and the BRON data of injured casualties, based on which the real number of serious road injuries is estimated.
The crash data, including medical severity based on the LBZ link, is available on the SWOV website from 1993 onward. The data of the years from 2004 onward is BRON data; the older data has been converted from the earlier system called ‘Crashes and Network’. The original severity as registered by the police is still available in these tables as an individual variable, The original BRON data (1987-present) and VOR/Crashes and Network data (1976-2003) is also still available.

1.4. Reliability, accuracy, completeness

The road crash registration is incomplete as for a number of reasons the police do not register all road crashes and casualties. The degree of

completeness is called the ‘registration rate’ (see also Registration rate). The registration rate is the proportion of real casualties that is registered in BRON. The registration rate is higher as crashes and injuries are more serious, and is much higher for crashes involving a motor vehicle than for crashes not involving such a vehicle. Single bicycle crashes are almost entirely absent from the crash register. Of course, this complicates the analysis of these crashes and of the characteristics of the casualties in such crashes.

In general, about forty characteristics are recorded of those crashes that are registered by the police. In addition to date and time, location, vehicle registration, mode of transport, casualty characteristics and driver characteristics, information about the crash opponent is also registered. Many of these characteristics are objective and can be determined after the crash has occurred. Matters that are not easily established by the police after the crash, e.g. exceeding the speed limit, are less frequently recorded as the crash cause than the somewhat more obvious circumstances like ‘failing to give priority’ or ‘refusing passage’.

The real numbers of deaths and serious road injuries are determined by comparing the data of the road crash registration with the data in other sources like Causes of Death and the National Basic Register Hospital Care (LBZ).

1.5. Literature and sources

Ministerie van Verkeer en Waterstaat, Adviesdienst Verkeer en Vervoer (AVV) (2002). *Verkeersongevallen in Nederland 2001*. Heerlen.

SWOV (2007). *De top bedwongen. Balans van de verkeersonveiligheid in Nederland 1950-2005*. SWOV, Leidschendam.

SWOV (2009). *De balans opgemaakt. Duurzaam veilig 1998-2007*. SWOV, Leidschendam.

Weijermars, W.; Korving, H.; Schagen, I. van; Goldenbeld, Ch.; Bos, N. (2016). *Monitor verkeersveiligheid 2016; Toename verkeersdoden en ernstig verkeersgewonden*. R-2016-14. SWOV, Den Haag.

Openbaar Ministerie (2009) *Aanwijzing informatieverstrekking verkeersongevallen* (2009A027)

Openbaar Ministerie (2009) *Aanwijzing verkeersongevallen* (2009A026)

Aard ongeval en Manoeuvre (DVS), 1987-heden. Afgeleid uit de betrokken partijen/objecten en de 6 aspecten van de manoeuvre (uitgangssituatie, voorgenomen beweging, aangrijppunt, beïnvloede beweging, eindsituatie en toedracht).

2. Population Statistics

These statistics are composed by Statistics Netherlands. The population tables on the SWOV website show the number of people on 1 January of a given year by age category, gender, and municipality. For the latter, the most recent division into municipalities is used. Population data is available from 1950 onward. During the past 60 years, the Dutch population grew from 10 million in 1950 to 17 million inhabitants in 2016.

2.1. Application in road safety research

By relating the numbers of road traffic casualties to the size of the population we can see which groups are more likely and which groups are less likely to be involved in a road crash. The number of road deaths per capita is called mortality. Due to the long period of availability and the accuracy of the population data, it is very suitable for analysis of the road safety development. The population data is also relevant for international comparison. Other road safety related data can also be expressed 'per capita', for instance ownership and use of vehicles, driving licence possession, road length, or the number of journeys and the distance travelled.

Some road safety indicators are also found to relate to population density.

In some cases correction to the *mobile population* is relevant. The mobile population defines the proportion of the population who participate in traffic as accurately as possible. Correction is made for institutionalised households and the average population in a is calculated based on the numbers of 1 January of that year and 1 January of the following year. The mobile population is the multiplication framework for Personal mobility.

2.2. Method

Since 1995, establishing municipal population data is the responsibility of the Municipal Personal Records Database (GBA). The data from before 1995 have been determined in consultation with the municipalities. This data refers to all people who are registered in the GBA (the 'de jure' population). In principle, everybody who resides in the Netherlands for an indefinite period is included in the Municipal Personal Records Database of the municipality where generally the nights are spent (the municipality of residence). People who are 'de jure' part of the Dutch population, but who cannot be assigned to a permanent municipality of residence, are registered in the Municipal Personal Records Database of the municipality The Hague. Annually, the inhabitants per municipality are assessed on 1 January. The GBA data is used to determine the number of inhabitants in the Netherlands.

Since 1995, the observations in relation with population size have been based on a selection of data that Statistics Netherlands (CBS) receives from the GBA.

2.3. Availability data

At the end of each month the preliminary population data of the preceding month is published. In February/March of each year, preliminary data of the preceding calendar year about the most important subjects is published in relation with the *development* of the population. This is done on 1 January of the present calendar year for data in relation with the *size* of the population. In September/October the preliminary data is replaced with permanent data.

2.4. Reliability, accuracy, completeness

The quality of the received data equals that of the population registers. It is a complete register; all mutations (births, moves – including immigration and emigration – and deaths) are stored by the municipalities.

Sometimes the quality of the address data is slightly worrying. However, this hardly affects the population numbers per municipality as they are used here.

For all mutations made by the municipality, administrative corrections are sometimes necessary.

2.5. Variables

The following variables are available on the SWOV-website:

Year	-	1950 – present.
Age	-	all ages up until 94 and 95+
Gender		
Marital status	-	1950 - 2000: unmarried, married, widowed, divorced. Unknown for the period from 2001 onward
Municipality	-	1950 - 1977 unknown. 1978 - present: municipality code and name.

2.6. Regional grouping of municipalities

Population data is not only available per municipality, it is also available per police region, per framework act area, and per province. Municipal data is linked to achieve this.

Municipal reorganization
The table always shows the most recent municipal composition. The data of no longer existing municipalities are transferred to the new municipality. If a no longer existing municipality has been divided among different other municipalities, the old municipality is entirely added to the new municipality to which the majority of inhabitants of the old municipality were assigned. This method is also used for all other relevant data files like crashes, vehicle fleet, and road length.

Municipal reorganization during the period 1978–2011 resulted in a decrease of the number of municipalities in the Netherlands from 833 to 418.

2.7. Literature and sources

CBS (2000). *Bevolking der gemeenten van Nederland op 1 januari 2000*. CBS, Voorburg/ Heerlen.

CBS *Gemeentelijke herindelingen*, actuele lijst, CBS, Voorburg/ Heerlen.

CBS Beschrijving *Bevolkingsstatistiek*.

CBS Theme Population with Statline.

3. Community database on Accidents on the Roads in Europe (CARE)

European data is available in the database 'Community database on Accidents on the Roads in Europe' (CARE). CARE contains detailed data even to the level of individual crashes in a large number of European countries. The availability of very detailed information distinguishes CARE from other international databases.

The CARE database is accessible for subscribers only; in the Netherlands the subscribers are the Ministry of Infrastructure and the Environment (IenM) and SWOV.

3.1. Available CARE data

24 of the 27 EU Member States have supplied data of traffic crashes for a number of years. Most of the older Member States have been supplying data since 1991. New Member States who joined the EU in recent years generally have no data available or have only data of recent years. Until recently German data was inaccessible, but this has recently been made available.

The database contains numbers of casualties for some of the characteristics of the crash:

- Location (country, urban/rural, motorway/other roads, intersection/road section)
- Date/time (year, month, day of the week, time)
- Crash data (crash severity, crash type, weather conditions, light conditions, vehicle type involved in the crash)
- Casualty data (injury severity, age, mode of transport, road user type, gender).

Data can be retrieved for each combination of these variables. More information about the available variables can be found in the *Glossary of CARE variables* (2006 version).

3.2. Comparability of CARE data

Although in all countries the crash data is collected by the police, there are substantial differences in the way the data is collected and the registration sets that are used. Comparison of the registration sets (the characteristics and their possible values) has resulted in a set of 'Common Variables'. There have been several initiatives to make the CARE-variables for different countries comparable. The most recent activities to achieve this were undertaken in the European sixth framework programme project SafetyNet.

3.3. Literature and references

Website: CARE - European Road Accident Database

Treny, V. Evgenikos, P., Yannis, G., Hemdorff, S. et al. (2008). *Harmonising national road accident data: Development of transformation rules for 15 European countries*. Deliverable D1.12 of SafetyNet. European Commission Brussels.

Projectwebsite van het EU zesde kaderproject SafetyNet

4. Cause of Death Statistics

The Cause of Death Statistics is compiled by Statistics Netherlands (CBS) and gives the primary cause of death of inhabitants of the Netherlands. Age (at last birthday) and gender are known of each age group of deceases. Data is available from 1969 to present.

4.1. Method used to collect data

For every deceased individual in the Netherlands a death certificate (B certificate) is filled out by the physician who examines the body. The municipality in which the death has occurred sends this death certificate to the medical officer of Statistics Netherlands in a closed envelope. Statistics Netherlands processes the form. This is done fully anonymously; the name of the deceased is unknown to Statistics Netherlands.

4.2. Codering

Classification and coding follow the WHO (World Health Organisation) guidelines as strictly as possible. Only the primary cause of death is reported on. A maximum of three secondary causes of death are allocated to one deceased individual.

Coding according to the WHO (World Health Organisation) guidelines means that only one illness or event can be given as the primary cause of death: the illness or event that initiated the chain of events that led to the death.

Consequences or their complications are generally registered as the secondary cause of death, similar to other diseases that were present at the time of death and sometimes had a part in it. In the case of what is called ‘unnatural death’ (death due to external factors), the event is nearly always registered as the primary cause of death and the resulting injury as the secondary cause of death. It is particularly difficult to distinguish between primary and secondary cause of death when multiple causes are involved. In that case a responsible choice is made, taking account of the WHO guidelines. The information provided by the physician is decisive in this. If anything is unclear, the physician is asked for clarification in writing or by telephone.

4.3. Population

The Cause of Death Statistics contains data of deceased individuals in the Municipal Personal Records Database (GBA). In principle, everyone who lives in the Netherlands permanently is registered in the Personal Records Database of the municipality where he or she resides.

It is important to know that road deaths among non-residents of the Netherlands are not registered for road crashes. Residents of the Netherlands who die in a road crash in another country, however, *are* registered. All other series of data on the SWOV-website relate to casualties on roads in the Netherlands, irrespective of their nationality.

4.4. Reliability, accuracy, completeness

Completeness is checked using the death records that have been provided by the Municipal Personal Records Database (GBA). Correspondence with physicians takes place about death certificates that are unclear or incomplete. The data from the Statistics of Unnatural Deaths, the Statistics of Road Traffic Deaths and the Statistics of Cause of Death are compared and can influence each other's contents before these are final. As a last step the cause of death data is checked for its likelihood.

4.5. ICD-lijsten

The ICD, International Classification of Diseases, is the international classification of diseases that is used by the World Health Organisation.

The ICD-8 classification was used during the period 1969 to 1978, the ICD-9 was used during the period 1979 to 1995, and the ICD-10 classification has been used since 1996.

Although the classification according to ICD 8, 9 and 10 is not comparable on details, CBS was successful in drawing up a consistent series of the important primary causes of death. The series consists of 72 categories of causes of death, 10 of which are deaths of unnatural causes. Road traffic crashes have been placed in one of these categories.

Since 1996 detailed ICD10 data is available via Statline, the Statistics Netherlands website.

4.6. Literature and sources

SIG (1988). *Classificatie van ziekten 1980; gebaseerd op International Classification of Diseases, 9th revision, Clinical Modification (ICD-9-CM)*. SIG Informatiecentrum voor de Gezondheidszorg, Utrecht.

CSIZ (1997). *Internationale statistische classificatie van ziekten en met gezondheid verband houdende problemen ICD-10*. Wereldgezondheidsorganisatie WHO, 1992/1993 / Coördinatiepunt Standaardisatie Informatievoorziening in de Gezondheidszorg CSIZ, Genève / Zeist.

Hollander, A.E.M. de Hoeymans, N. Melse, J.M. Oers, J.A.M. van & Polder, J.J. (eindred.) (2006). *Zorg voor gezondheid : volksgezondheid toekomst verkenning 2006*. Rijksinstituut voor Volksgezondheid en Milieu RIVM. Bilthoven.

5. Serious road injuries

Serious road injuries are casualties who have been seriously injured in a traffic crash in the Netherlands. This means that they have been admitted to a (Dutch) hospital with injury of a minimum AIS value of 2 for which they received treatment. AIS is the abbreviation of Abbreviated Injury Scale. The value of an injury on this scale indicates the injury severity. The value of the Maximum AIS (MAIS) indicates the most severe injury sustained by a casualty.

Previously, all casualties who were admitted to hospital were considered to be seriously injured. Whether someone was admitted to hospital was derived from the police registration form. Comparison of the police register (BRON) and the hospital data (LBZ/LMR)) showed that:

- road injuries who have been admitted to hospital are not necessarily (seriously) injured; sometimes they are only admitted for observation.
- the information on the police registration form is not always correct. Some casualties who, according to BRON, have been admitted to hospital, cannot be traced in the LBZ. On the other hand, there are also casualties who, according to the police, sustained only slight injury, but who are found to have been admitted to hospital with serious injury.

In 2010, this finding resulted in a new definition of seriously injured casualties: 'serious road injuries'. From then on, the Ministry of Infrstructure and the Environment has also used this definition for monitoring and road safety policy.

5.1. Application in road safety research

BRON as well as LBZ have their limitations for application in research. Linking the two files has made available an optimally usable file which is used to estimate the real number of serious road injuries. An annual estimate of this real number using a consistent method is important to ascertain and understand the trends in the numbers of casualties.

5.2. Method

Every year SWOV compares the BRON and LBZ data files. How this is done has been reported in several study reports (Reurings & Bos, 2009, Reurings, 2010). Linking the files makes clear which casualties can be found in both BRON and LBZ. On this basis an estimate can be made of the numbers of casualties that are missing in each of the files. This way the number of serious road injuries can be estimated.

Size of the file

The degree of completeness of a data file is expressed in the 'registration rate', the proportion of a specific group of casualties that is registered in the data file. BRON's registration rate has declined over the years. During the last four years, the completeness of the LBZ has also been declining, because some hospitals no longer (completely) fill in the LBZ. Fortunately, in this case the degree of inaccurateness is quite well known. Both these

developments have resulted in a smaller number of serious road injuries that can be found in both files, the correction estimates therefore being larger. Since 2013, the hospitals have gradually started using the new registration system LBZ (previously LMR was used), which has improved the register's quality.

Multiplication and weighting
For the best possible estimate of the number of serious road injuries, each serious road injury registered in BRON or the LBZ is attributed a weight. This weight indicates how many casualties with the same characteristics as this person have actually occurred.

Since late 2009, the quality of the crash registration in BRON has deteriorated to such an extent that a reliable calculation of these weights is no longer possible.

5.3. Availability data

Data is available from 1993 onward. During this period, the number of serious road injuries in crashes ***with*** motor vehicles has declined considerably, from about 12 500 to 10 000 in 2015. However, during the same period the number of serious road injuries in crashes ***not*** involving motor vehicles increased from about 5 300 to more than 10 000 in 2015.

In the third quarter of every year, the data is supplemented with the preliminary data of the previous year. At the same time, the data of the preceding year is revised.

5.4. Reliability, accuracy, completeness

The numbers of serious road injuries that are shown are an estimate based on a probabilistic, distance-based link between the road crash register BRON and the medical register LBZ (Reurings & Bos, 2009).

Each record (i.e. each part of the data file relating to a seriously injured traffic casualty) has been weighted. The size of the weighting factor varies between 0.8 and 3 (Reurings, 2010). Numbers of casualties with very specific characteristics (e.g. a moped rider in the town of Purmerend (province Noord Holland), crashed into a tree on a Wednesday at 3 o'clock at night) have also been weighted. This does not mean that such a specific combination of characteristics is assumed to have indeed occurred, for instance, three times; the numbers are only statistically reliable at a sufficiently aggregated level (e.g. moped riders in the province Noord Holland on a weekday night).

The total has an accuracy margin of error of about 2%. The margin of error is always higher for subsets of data.

5.5. Variables

In principle, all variables in BRON for a casualty and/or in LBZ for a patient, can be linked. Of course this can only be done if the records in each of the data files refer to the same person. No corresponding data is known for

records that are only present in one of the sources and refer to a serious road injury.

5.6. Literature and sources

Korving, H., Goldenbeld, Ch., Schagen, I.N.L.G. van, Weijermars, W.A.M., et al. (2016). *Monitor verkeersveiligheid 2016; Achtergrondinformatie en onderzoekverantwoording*. R-1016-14A. SWOV, Den Haag.

Reurings, M.C.B. (2010). *Ernstig verkeersgewonden in Nederland in 1993-2008: in het ziekenhuis opgenomen verkeersslachtoffers met een MAIS-score van ten minste 2. Beschrijving en verantwoording van de schattingsmethode.* R-2010-15. SWOV, Leidschendam.

Reurings, M.C.B & Bos, N.M. (2009). *Ernstig gewonde verkeersslachtoffers in Nederland in 1993-2008; Het werkelijke aantal in ziekenhuizen opgenomen verkeersslachtoffers met een MAIS van ten minste 2*. R-2009-12. SWOV, Leidschendam.

Zie ook de beschrijving van de beide gegevensbronnen
Verkeersongevallenregistratie (BRON)
Medische Registratie (LBZ)

6. Eurostat

Eurostat is the organisation for statistics of the European Union. Its task is to provide the European Union with European statistics that can be used to compare counties and regions.

6.1. Literature and sources

Eurostat

7. International Road Traffic and Accident Database (IRTAD)

IRTAD is the permanent working group of the Joint OECD/ITF Traffic Research Center (JTRC) and comprises a database as well as a network of experts in the area of road safety data and statistics. It is an initiative taken in 1988 by the Organisation for Economic Coordination and Development (OECD) and has been merged with the ECMT (European Conference of Ministers of Transport), now the International Transport Forum.

The database contains data on traffic and traffic crashes of 29 of the 30 OECD countries (all except Mexico) and is open to other countries that wish to cooperate. JTRC is the IRTAD database manager. Until 2006, it was managed by the Bundesanstalt für Strassenwesen BASt. The data is generally supplied by the national institutes for road safety research. In addition to these data suppliers, about 30 other organizations are members; these are for example active in (international) research and industry.

7.1. Application in road safety research

The International Traffic Safety Data and Analysis Group (IRTAD) makes international comparison possible by providing:

- up-to-date information,
- detailed information on a variety of subjects,
- international comparability of the data,
- consistent time series,
- computerized databases and data processing.

7.2. Method

In all Western countries the police are responsible for the registration of road crashes. A central institute collects the data and maintains the crash file.

7.3. Availability data

IRTAD has a continuous data supply. The data on the SWOV website is updated with the latest data about twice a year.

IRTAD contains data of 20 of the 27 European Union member states: Belgium, Denmark, Germany (data earlier than 1990 are also included in the categories D-east and D-west), Finland, France, Greece, Italy, Luxembourg, the Netherlands, Austria, Portugal, Spain, United Kingdom (=Great Britain + Northern Ireland, both countries are also included individually) and Sweden.

IRTAD contains data of five of the ten countries that joined the EU in May 2004: Hungary, Poland, Czech Republic, Slovenia en Slovakia.
No data is available of Cyprus, Estonia, Latvia, Lithuania, Malta, Romania en Bulgaria.

The other eleven countries in the IRTAD database are: Norway, Iceland, Switzerland, Turkey, Israel, Australia, New Zealand, Japan, Korea, United States and Canada.

Lithuania, Argentina, Cambodia and Malaysia are prospective members whose data has as yet not been included in the public database; see the IRTAD Annual Report 2011.

The available data is:
- number of inhabitants by age group (fine);
- number of vehicles (fleet data) by type;
- road deaths by age group (fine);
- road deaths by vehicle type and by age group (rough);
- road deaths by road type;
- road deaths per 100 000 inhabitants by age group (fine);
- road deaths per billion vehicle kilometres by road type;
- road deaths, serious road injuries and injury crashes per month;
- injury crashes per road type;
- injury crashes per 100 000 inhabitants;
- injury crashes per billion kilometres travelled by road type;
- acreage;
- percentage of seat belt wearing by road type;
- kilometres travelled by vehicle type;
- casualties (injuries and road deaths);
- casualties per 100 000 inhabitants;
- casualties per million vehicle kilometres;
- vehicle kilometres by vehicle type;
- vehicle kilometres by road type;
- road length by road type;
- serious road injuries by age group (fine);
- serious road injuries by vehicle type;
- serious road injuries by road type;
- serious road injuries per 100 000 inhabitants, subdivided by age group (fine);
- serious road injuries per billion vehicle kilometres by road type.

7.4. Reliability, accuracy, completeness

The IRTAD organization aims to use similar definitions of characteristics and categories, also when the countries that supply the data use different definitions. For example, the internationally accepted definition of a road fatality is: a casualty who dies of the consequences of a road crash within 30 days. The data of countries that use a different definition are corrected.

Recently it has been recommended to harmonize the definition of serious road injuries at injury with a minimum of MAIS 3 (IRTAD 2011). Data according to this definition is not yet available.

7.5. Registration rate crashes and casualties

A study by the Norwegian Public Roads Administration (1994) indicates that the registration is mostly limited to injury crashes.

Type of casualty	Registration rate
Fatal	~ 100%
Seriously injured	50-90%
Slightly injured	20-80%

Table 7.1. *Registration rate casualties. Source: Norwegian Public Roads Administration (1994.*

Despite the efforts to achieve harmonization, the differences in definitions and procedures are so great that comparing the registration rates of the countries is well-nigh impossible.

Due to the considerable underregistration of 'light transport modes' the average registration level in a country is also determined by the amount of bicycle and pedestrian traffic in that country. The registration of crashes in which just one (moving) vehicle is involved also leaves much to be desired. Some countries even require a motor vehicle being involved in order to register a crash, which means that the definition does not apply to crashes between cyclists or singe vehicle bicycle crashes.
See also SWOV Fact sheet *International comparability of road safety data*

7.6. Literature and sources

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Derriks, H.M. & Mak, P.M. (2007). *Underreporting of road traffic casualties*, IRTAD special report, OECD/ITF Parijs.

Norwegian Public Roads Administration (1994). *Under-Reporting of road traffic accidents recorded by the police, at the international level*. IRTAD special report. Norwegian Public Roads Administration/ OECD, Oslo/Paris.

IRTAD (2014). *Road Safety Annual Report 2014*. OECD/ITF, Paris.

IRTAD (2011). *Reporting on Serious Road Traffic Casualties*. OECD/ITF, Paris.

Website http://www.irtad.net/

The IRTAD data on the SWOV website can only be used with due acknowledgement.

The online database is only accessible for subscribers; in the Netherlands these are Rijkswaterstaat Water, Traffic and Environment (RWS-WVL) and SWOV.

8. National Basic Register Hospital Care (LBZ)
(previously National Medical Register (LMR))

The National Basic Register Hospital Care (LBZ) is maintained by the hospitals in the Netherlands and has been started for the purpose of research and policy. Discharge data from patients who have been in a Dutch hospital are at the core of the database.

Commissioned by Dutch Hospital Data (DHD), the LBZ data is collected by the hospitals. Data delivery is not mandatory, but all hospitals affiliated to the two umbrella organisations NFU (Dutch Federation of University Medical Centres) and NVZ (NVZ Association of Hospitals) are statutory committed to participate in the LBZ.

8.1. Application in road safety research

The medical registration offers valuable information on the nature of the injury sustained by crash casualties. The injury severity can be derived from this information; this is expressed in the maximum AIS-value (MAIS). The number of road crash casualties that has been admitted to hospital has been increasing in recent years. The number of serious road injuries that is determined on the basis of LBZ, has been declining for casualties in crashes involving a motor vehicle and increasing for casualties in crashes without a motor vehicle being involved (Reurings, 2009). During the period 1984-2005, the length of the hospital stay went down from 16 days to 6 days (van Kampen, 2007). This is not the result of the injuries being less severe (Cryer, 2010), but of policy regarding admission and discharge, and of changed treatment methods.

8.2. Method

De LBZ contains data on:

- personal details like age and gender (anonymous);
- date and time of admission;
- region in which the hospital is located;
- injury diagnoses;
- treatment codes;
- external causes (nature of the crash, including the casualty's mode of transport);
- length of hospital stay;
- manner of release.

Approximately 10% of all inpatients are admitted with so-called external causes (i.e. injury); 10% of these admissions are casualties from road traffic crashes.

The international system of the World Health Organization is used to encode the injury diagnosis, the nature of the crash and the casualty's transport mode. This WHO system is the ICD9-CM (International Classification of Diseases, 9th revision, Clinical Modification) (SIG, 1988). In ICD9-CM, all

external causes are coded with a so-called E-code. The injury diagnoses are usually presented in clusters, for example:

- by injury pattern (percentages of injury by body parts);
- by injury type (e.g. fractures, wounds, sprains et cetera).

Based on the coded injuries, SWOV uses the software programme ICDmap90 to determine the Abbreviated Injury Scale (AIS) per body part. These results are used to determine the Maximum AIS (the highest AIS value) and the ISS (Injury Severity Score, the sum of the squares of the three most severely injured body parts. The MAIS values range from 1 (slight injury) to 6 (maximal, not treatable, life-threatening injury). The ISS values range from 1 to 75. A patient with MAIS 6 automatically gets ISS value 75. The severity of some of the injuries cannot (yet) be determined. These are given a MAIS 0 or 9 (ISS is 0 or 99).

8.3. Availability data

Around the summer of every year the data of the previous year becomes available. SWOV receives a selection of about 100.000 patient records. These records all have an external cause in the E-code range E800-E848, E880-E899, E928, E929, E958, E988. The ranges E810-E819 and E826-E829 refer to road crashes involving and not involving a motor vehicle respectively.

In the third quarter of the year, the link is established with the road crash register BRON, which allows also determining the number of serious road injuries. Road traffic casualties who have not been given the E-code for a road traffic crash are also found in LBZ due to this link. Based on LBZ only, these casualties could not have been identified as road traffic casualties.

Due to the large number of generated records and the diminished completeness of the road crash register, a different procedure to estimate the number of serious road injuries has been used since 2010.

Some of the variables seem to be in accordance with the variables in the road crash register BRON. However, in LBZ the number of casualties registered by, for instance, mode of transport differs from that in the table containing real numbers of serious road injuries. This can be explained by contradictions between the linked records and the added estimated extra patients who cannot be identified as road crash casualties in LBZ. Therefore there can be no simple comparison between the data from these two sources, they can only be compared within their own series (as index data or as a proportion).

In the third quarter of the year, the link is established with the road crash register BRON, which allows also to determine the number of serious road injuries. Road traffic casualties who have not been given the E-code for a road traffic crash are also found in LBZ due to this link. Based on LBZ only, these casualties could not have been identified as road traffic casualties.

Due to the large number of generated records and the diminished completeness of the road crash register, a different procedure to estimate the number of serious road injuries has been used since 2010 (Bos, 2015). After 2012, the registration has gradually been improving. Since 2015, the

link has to be made at the offices of Statistics Netherlands for privacy reasons.

Some of the variables seem to be in accordance with the variables in the road crash register BRON. However, in LBZ the number of casualties registered by, for instance, mode of transport differs from that in the table containing real numbers of serious road injuries. This can be explained by contradictions between the linked records and the added estimated extra patients who cannot be identified as road crash casualties in LBZ. Therefore there can be no simple comparison between the data from these two sources, they can only be compared within their own series (as index data or as a proportion).

8.4. Reliability, accuracy and completeness

As nearly all hospitals (except a few specialised hospitals with very few traffic casualties) in the Netherlands participate in LBZ, LBZ can be considered to be a complete data file. From 2005 onward, not all hospitals have provided data at the level of records. However, the number of day admissions and clinical admissions per treating specialism is known. Commissioned by Dutch Hospital Data DHD, Kiwa Prismant generates records for these missing admissions. *Table 8.1* shows the percentages of missing (and therefore generated) records for clinical and day admissions.

Year	Clinical admissions	Day admissions
2005	2,8%	3,9%
2006	9,7%	10,4%
2007	11,5%	9,7%
2008	11,6%	10,8%
2009	12,8%	14,4%
2010	12,0%	15,9%
2011	16,4%	23,8%
2012	19,5%	29,5%
2013	15,7%	25,4%
2014	3,6%	21,6%

Table 8.1. *Percentages of missing records in LMR/LBZ*

Paas & Veenhuizen (2002) investigated the quality of LMR with a validation study using the medical files of 5 745 patients in 55 hospitals. They did this by checking – per characteristic – which percentage had been coded correctly. High scores were found for the personal data (99%), the crash circumstances (91%), the diagnoses (87%) and the treatments (92%). This indicates that LMR is of rather high quality.

In 2013, the National Basic Register Hospital Care (LBZ) was introduced as the successor of LMR. Also from that year the injuries have been coded in ICD-10 (RIVM, 2006).

8.5. Literature and sources

The LBZ/LMR data on the SWOV website have been provided by Dutch Hospital Data. This data can only be used with due acknowledgement.

Bos, N.M., Houwing, S. & Stipdonk, H.L. (2016). *Ernstig verkeersgewonden 2015; Schatting van het aantal ernstig verkeersgewonden in 2015*. R-2016-13. SWOV, Den Haag..

CBS (2012). *Documentatierapport Landelijke Medische Registratie 2012*. Centraal Bureau voor de Statistiek.

Cryer, C., Gulliver, P., Langley, J.D. & Davie, G. (2010). *Is length of stay in hospital a stable proxy for injury severity?* In: Injury Prevention, vol. 16, nr. 4, p. 254-260.

Dutch Hospital Data. *Beschrijving LMR*

Dutch Hospital Data. *Beschrijving LBZ*.

Kampen, L.T.B. van (2007). *Verkeersgewonden in het ziekenhuis; ontwikkelingen in omvang, letselernst en verpleegduur sinds 1984*. R-2007-02 SWOV, Leidschendam.

Paas, G.R.A., Veenhuizen, K.C.W. (2002). *Onderzoek naar de betrouwbaarheid van de Landelijke Medische Registratie LMR*. Prismant, Utrecht.

Reurings, M.C.B & Bos, N.M. (2009). *Ernstig gewonde verkeersslachtoffers in Nederland in 1993-2008; Het werkelijke aantal in ziekenhuizen opgenomen verkeersslachtoffers met een MAIS van ten minste 2*. R-2009-12. SWOV, Leidschendam.

RIVM (2014). *WHO Family of International Classifications (FIC); ICD-10*. Bilthoven.

SIG (1988). *Classificatie van ziekten 1980; gebaseerd op International Classification of Diseases, 9th revision, Clinical Modification (ICD-9-CM) Deel 1 Systematisch*. SIG Informatiecentrum voor de Gezondheidszorg, Utrecht.

9. Injury Information System (LIS)

The Injury Information System (LIS) of VeiligheidNL contains data of casualties who after an accident (private, sports, traffic, work), violence or self–mutilation received treatment at an Accident & Emergency Department (A&E) and were then allowed to go home (1st aid, *Table 9.1*).

Number (sample)	2008	2009	2010	2011	2012	2013
Hospital admissions	2 604	2 472	2 394	2 786	2 831	2 647
1st aid	10 726	10 518	10 017	10 054	9 608	8 998
Total A&EH	13 330	12 990	12 411	12 840	12 439	11 645

Table 9.1. *LIS number of road crash casualties 2008-2013*

The hospitals in LIS are a representative sample of all hospitals in the Netherlands that have an A&E department that is open continuously. This enables estimates of the data at a national level. The total of both the above groups is the number of people who visited the A&E department.

LIS also contains personal data, crash circumstances and injury data of these casualties. In addition, a brief description of the crash is added for each casualty.

SWOV has access to the LIS road crash casualty data for its research and publishes some of this on the SWOV website.

9.1. Application in road safety research

LIS allows making differentiated analyses of injury and circumstances concerning casualties who received A&E treatment. These casualties may be considered to have sustained ‘slight injury’. This makes LIS a useful supplement to the police registration and the medical register LBZ, both of which only offer reliable information about road deaths and serious road injuries (MAIS2+).

LIS and LBZ both provide information about the number of hospital admissions. These numbers differ. As an example the overview of the available data in 2010 (*Table 9.2*):

Traffic selection	LIS sample	LIS multiplied	LBZ
Admissions MAIS2+	2 394	21 000	17 539
Admissions MAIS1-			6 906
A&E only	10 017	88 000	--

Table 9.2. *numbers of registered patients in LIS and LBZ, 2010.*

As in principle LBZ is a full registration and further differentiation by injury severity is possible (MAIS), it is preferable to base research of serious traffic

injuries on LZB. For research into slightly injured (including hospitalization) LIS is very well suited. Because of the uncertainty margin of the raised rating in LIS (based on a sample of 15%-20%), the LIS estimate of the number of serious traffic injuries is sometimes above or below the LBZ numbers.

LIS contains some variables that describe the traffic crash, such as the mode of transport of the casualty and whether the crash occurred on a public road. More detailed information about the location is not available. Sometimes this is derived from short descriptions of the circumstances of crashes that are made in the A&E.

9.2. Method

When a patient arrives at the A&E of one of the participating hospitals, basic data is recorded for the hospital administration. If injury or poisoning is the case, the circumstances are recorded. During the treatment, information about the treatment and the circumstances is supplemented. Upon discharge from the hospital release data is registered. Finally, the data is exported to LIS and electronically sent to VeiligheidNL.

To ensure the quality of the LIS data, the data is checked in different ways while it is entered. The software is responsible for some of the controls and checks automatically for non-existing codes and impossible or unlikely combinations of codes. If necessary, the software gives an error message or a warning. For more information, see the LIS factsheets.

Among others, LIS contains:

- Personal characteristicslike age and gender (anonymous);
- Dat/time the injury was sustained;
- Admission and discharge hospital;
- Type and location of the injury;
- Mode and manner of transport of casualty and crash opponent (if applicable);
- Transport to the A&E by ambulance or self-arranged.

Sample size
About 13 of the approximately 105 hospitals with an SEH (National Public Health Compass, 2014) participate in LIS; all patients who arrive there are recorded in LIS, unless they have any objections.

Deelname aan LIS	Jaar															
Ziekenhuis	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Mesos Medisch Centrum, Utrecht	■	■														
Albert Schweitzer, Dordrecht	■	■	■													
Albert Schweitzer, Zwijndrecht	■	■	■													
Bernhoven, Oss	■	■	■													
Zweedse Rode Kruis, Zierikzee	■	■	■	■	■											
Vlietland, Vlaardingen	■	■	■	■	■	■										
Diaconessenhuis/Maxima, Eindhoven	■	■	■	■	■	■	■	■	■	■	■					
Canisius-Wilhelmina, Nijmegen	■	■	■	■	■	■	■	■	■	■	■	■	■			
Academisch St. Radboud, Nijmegen	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
AMC, Amsterdam	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Diaconessenhuis, Meppel	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Maasziekenhuis, Boxmeer	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
St.Jans Gasthuis, Weert	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
VU-MC, Amsterdam	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
de Gelderse Vallei, Bennekom/Ede	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Zuiderzeeziekenhuis, Lelystad	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Streekzhs Kon.Beatrix, Winterswijk		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Lievensberg, Bergen op Zoom			■	■	■	■	■	■	■	■	■	■	■	■	■	■
Ommelander St Lucas, Winschoten										■	■	■	■	■	■	■
Ommelander Delfzicht, Delfzijl													■	■	■	■
Admiraal de Ruyter, Goes														■	■	■
Admiraal de Ruyter, Vlissingen														■	■	■
Aantal ziekenhuizen	16	17	17	14	14	13	12	12	12	13	13	12	13	14	14	14

Figure 9.1. *Hospitals participating in LIS in 1998-2013 and the total annual number.*

Multiplication and weighting
As LIS is a sample of the hospitals in the Netherlands, the data must be multiplied to obtain national data. VeiligheidNL sets a weighting factor based on the number of hospital admissions in all of the LBZ and the share that have been admitted in LIS hospitals.

For 2010 (see LIS factsheet 2010 (SCV 2011)), for instance, this leads to an multiplication factor of 163.376 / 18.644 = 8,763. Irrespective of external cause or severity, all LIS records in that year are given this multiplication factor.

The 12 411 road crash casualties who are registered in LIS can then be used to make an estimate of the total number of A&E treatments for road crash casualties in the Netherlands. In 2010, this yielded a total of 109 000 for the year 2010. The injuries of approximately one fifth of the casualties are so severe that they need to be admitted to hospital The remaining casualties were able to go home after the A&E treatment.

Availability data
SWOV heeft de beschikking over LIS data voor de jaren vanaf 1998. Het gaat dan alleen om de slachtoffers die als gevolg van een *verkeers*ongeval op de SEH behandeld zijn. De LIS-gegevens komen jaarlijks in het derde kwartaal beschikbaar.

9.3. Reliability, accuracy and completeness

The annual, multiplied LIS numbers for all of the Netherlands sometimes vary considerably (order of magnitude 20%). Change in the composition of the sample of hospitals in the last years may have contributed to this. Because of these fluctuations the reliability is insufficient to observe small changes accurately. It is therefore recommended to consider small differences as a statistical effect and to round the figures to hundreds. Larger numbers can sometimes be obtained by totalling the data of several years.

9.4. Literature and sources

Letsel Informatie Systeem. *LIS Factsheet 2010*. Amsterdam, Stichting Consument en Veiligheid, 2011, Factsheet No. 24 - ISBN 978-90-6788-458-7.

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Neden, K. van (2013). *Analyse op het Letsel Informatie Systeem, stageverslag*.

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10. National Roads Register (NWB)

The NWB is a digital geographic database containing nearly all roads in the Netherlands. The roads that are included are those roads that are managed by the national government, provinces, municipalities and water boards, provided they have a street name or number. This means that separate pedestrian and bicycle paths and gravel roads are also included in the NWB when they have a street name. If a road has separated carriageways, these are included in the register as separate road sections.

The NWB's geometry is equal to axes of the Top10 Roadfile of The Netherlands' Cadastre, Land Registry and Mapping Agency. The geometric accuracy is therefore similar to maps with a scale of 1:10,000.

The NWB is a network that consists of intersections connected by road sections. An intersection can be:

- a location in the road network where traffic exchange can take place (e.g. an intersection);
- the end of a no-through road;
- the location at which a road section crosses the municipal border.

10.1. Application in road safety research

The NWB is particularly important because it links several data sources.

- road crashes are linked to the NWB;
- registers of road characteristics like 'Wegkenmerken+' and 'Weggeg' use the NWB;
- road managers link their traffic counts to the NWB.

This makes it possible to analyse road safety in relation with the traffic volume and the infrastructural characteristics.

10.2. Linking crashes with the NWB

Before 2004, all crashes were manually linked to the NWB. The introduction of BRON changed the manner in which crashes are linked with the NWB. In principle, crashes are automatically linked to the NWB based on the names of towns and roads. For each crash an indication is given of the accuracy of the link:

- *Exact*: the crash has an exact link to a road section or intersection. It may be the case that the information on the registration form is insufficient to result in an exact link. In case of a serious crash (fatal or hospital admission) information is requested from those who reported the crash. All these crashes are therefore linked accurately. For other crashes no information is requested.
- *Street/intersection*: the information on the registration form is insufficient for an exact location, but the approximate location can be indicated by using the street names.
- *Municipality*: if linking on the level of streets is not possible, the crash is attributed to a road section/intersection in the town where the crash occurred, or, if that is also unknown, to the municipality. In this case it is

therefore always the same road section to which these crashes are linked. This sometimes results in pseudo-crash concentrations.

10.3. Road length

One possible application of the NWB is to calculate the road length of the network. Here 'road length' means the length of the route from A to B, regardless of whether this route is single lane, double lane, or x-lane. As the NWB distinguishes between single lane and double lane carriageways, it is insufficient to just add all NWB road lengths without further consideration. The result of such an addition would be the total length of all carriageways which, of course is considerably more than the total length of 'routes'.

10.4. Roundabouts

Roundabouts are not included in the NWB; this is inherent to the structure of the NWB which consists of road sections that begin and end in an intersection. In the NWB a roundabout therefore also consists of sections and intersections. SWOV has had to take some additional interpretative steps to identify (the number of) roundabouts in the NWB.

10.5. Literature and sources

Handleiding Nationaal Wegenbestand – NWB, Ministerie van Verkeer en Waterstaat, Adviesdienst Verkeer en Vervoer AVV, Directoraat-Generaal Rijkswaterstaat, Rotterdam, 5 maart 2003.

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Veilig op weg. Monitoring Startprogramma Duurzaam Veilig. Eindverslag. Goudappel Coffeng & Adviesdienst Verkeer en Vervoer AVV, Directoraat-Generaal Rijkswaterstaat, Rotterdam, 13 september 2005.

11. Injuries and Physical Activities in the Netherlands (OBiN)

Injuries and Physical Activities in the Netherlands (OBiN) is a continuous survey into injuries due to crashes and sports injuries, sports participation and physical activity in the Netherlands. The survey asks about injuries sustained in traffic, in work, during exercise and in activities in the private sphere. Questions are also asked about the sports activities (the quality and quantity of participation in organised and unorganised sport) and about the amount of physical exercise and the pattern of movement of the Dutch population.

The OBiN data collection started in January 2000 as a follow-up to the previous survey 'Accidents in the Netherlands' which was carried out in 1992/1993 and in 1997/1998. OBiN acquires data on the number of injured casualties (incidence) and on the number of casualties who suffer from injuries which were sustained earlier (prevalence). It gives insight into the origin of the injury, the nature and the necessary medical treatment.

The OBiN activities are carried out by VeiligheidNL, SWOV, University Centre for Sports Medicine, location UMC Utrecht, and the Netherlands Organization for Applied Scientific Research TNO. The study is financed by the Ministry of Health, Welfare and Sport.

11.1. Literature and sources (in Dutch)

For more information see:

- The VeiligheidNL website.
- Hertog, P.C. den, et al. (2003). *Ongevallen en Bewegen in Nederland, Kerncijfers 2000-2001 voor beleid en onderzoek* Stichting Consument en Veiligheid, Amsterdam.

12. Mobility of Persons

An annual survey on their travel behaviour among a sample of the population is used to measure the mobility of inhabitants of the Netherlands. This has resulted in a continuous series of data from 1985 onward about the mobility of persons.

Until 2003 the study was called Survey Travel Behaviour (OVG) and was carried out by Statistics Netherlands. The survey was then transferred to the Centre for Transport and Navigation (WVL) and was called Mobility Study Netherlands (MON). In 2010 the study was returned to Statistics Netherlands and is now carried out under the name Study of Mobility in the Netherlands (OViN).

The survey produces a considerable amount of useful information about travel behaviour in the Netherlands. However, there are some restrictions for its use in research, for example due to the trend breaks, the size of the sample, and the fact that it does not cover all mobility in the Netherlands.

12.1. Application in road safety research

The study into the mobility of persons is carried out with a survey among a sample of the population of the Netherlands. Data is gathered about the trips the respondent has made on a specific day that has been assigned to him/her and on which the questionnaire must be filled in. In addition to the distance travelled and the transport modes that were used, the survey also asks about, among other things, the places of departure and arrival, and the reason the journey was made. Besides information about the journeys that were made, the respondent is asked for some background information such as age, gender, town, composition of the household, and possession of vehicles and driving licence.

In road safety research it is of utmost importance to not only have data on the numbers of crashes and casualties, but also information about mobility. After all, mobility can be used as a measure of exposure to (potentially hazardous) traffic and can thus be of assistance in gaining more insight into road safety developments. When data from OVG/MON/OViN is used in research, one should be aware of the fact that the information is not always entirely reliable and/or complete:

- About 80% of the mobility in the Netherlands is estimated to be covered by the OVG/MON/OViN. data.
- Mobility involving freight traffic, delivery vehicles or holiday traffic are not included in this mobility survey.
- Mobility of Dutch citizens outside the Netherlands and mobility of foreigners in the Netherlands are not included in the survey.
- Before 1994, children in the ages 0-11 were not included in the study. Therefore, until 1994 approximately 14 billion kilometres are missing from the total distance travelled compared with later years.
- Data about the mobility per road category is not available from this source due to the design of the survey.

- In the course of time, changes in research method (e.g. formulation of questions and sampling frame) caused several method deviations (see below). Correction has made available comparable series of data for the period 1985-2008, but the period 1978-1984 is not comparable with the later period. The data from 1985 onward have therefore been taken as the starting point for the present text.
- Since 1999, the (light) moped is no longer available to the respondents as an option in one of the pre-printed answer categories, but can be indicated in the explanation box under 'other modes of transport'. Sometimes the term 'scooter' is used, which does not make clear what is meant: a light moped, a moped, or a motorbike. Afterwards, the age of the respondent is used to classify the vehicle as a moped (younger than 35 years old) or a light moped (older than 34 years old).

12.2. **Method**

Since the first survey into the mobility of persons in 1978, many larger and smaller changes have taken place, among others in the phrasing of questions and possible answers, in the manner of approach, and in the sample frame. Broadly speaking, however, we may say that the survey is a questionnaire among a sample of the inhabitants of the Netherlands who are asked to participate in the survey. Before 2010, the study was a household survey (all members of a household were approached simultaneously), but from 2010 onward the study has been carried out as a personal survey. In 1985, 1994 and 1999 there have been major changes in the design and the execution of the study. These have resulted in deviations from the trend or method, resulting in the series in the periods between these years not being comparable. However, the data of the period 1985-1998 has been corrected so that they became comparable with the series from 1999 onward. This means there is a 'good' series of data available from 1985 onward, but some prudence is advised concerning the data of the period 1985-1998.

Sample size
In 1985, the response percentage (the ratio of approached and participating households) of the households asked to participate in the survey was just over 50%. In the following years the percentage declined gradually to less than 40% in the mid-1990s. This was reason to adapt the research method and to change to the so-called Neu Kontiv Design (Kadrouch & Moritz, 1998) in 1999. During the last ten years the response percentage has remained fairly stable at about 70% of the approached households. As the sample became smaller when the study was taken over by DVS in 2004, the sample was adapted somewhat; more surveys are now carried out on workdays and in small provinces and, consequently, less frequently on weekends and in larger provinces.

File size
The sample size has been subject to many changes since the first year the survey was carried out. Furthermore, the changing response percentages also have an effect on the size of the ultimate annual data file. *Figure 12.1* indicates how many people were entered into the file each year from 1985 onward, and how many of these people made at least one journey on the day they had been assigned for the survey. The number of journeys per person is rather constant over time and is approximately 3.2 per day.

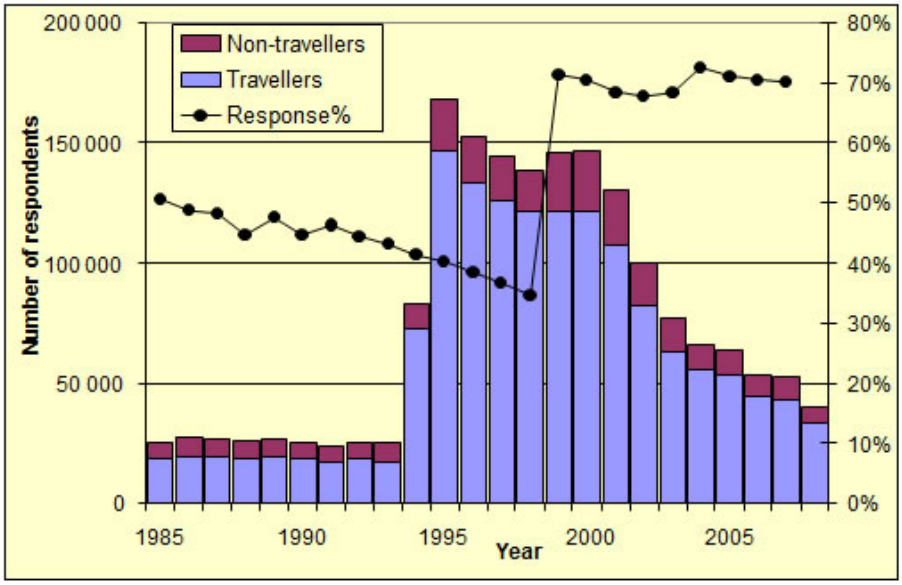

Figure 12.1. *Numbers of travellers and non-travellers among the OVG/MON respondents in the period 1985-2008. The response percentage is also shown. Source CBS-OVG; DVS-MON.*

Multiplication and weighting
Translation of the questionnaire sample data to the entire Dutch population is required for use of the questionnaire data in further research. This translation is made by a method of weighting and multiplication. Weighting compensates for over- or underrepresentation of certain groups, and multiplication translates the data and distances of the sample into data and distances for the entire population and the entire year. The trend correction for the data of the period 1985-1998, for example, has resulted in a new manner of weighting and multiplication of the data. Data of households, persons and journeys each has its own multiplication factor.

12.3. Availability data

Around April of every year, the OVG/MON/OViN file over the preceding year is made available.

12.4. Reliability, accuracy and completeness

As in each survey among a sample of the population, two types of error are made also in the study of travel behaviour in the Netherlands: sample errors and systematic bias. These are characterized by two error types that determine the sample error: bias due to the group of respondents not being representative of the Dutch population, and variance being a measure for the dispersion around the mean. The systematic bias is caused by a faulty travel report handed in by the respondents. People can (accidentally or not) forget to fill in certain journeys, e.g. before and after transport, or make an incorrect estimate of the number of kilometres travelled. These days the latter is prevented by checking whether the distance travelled with the reported mode of transport can reasonably be made within the reported time frame.

Especially in the case of stratification, for instance by mode of transport, accidental fluctuations must be considered because the samples for the subgroups may be small. For a number of transport modes/subgroups the number of journeys is very low, which leads to large reliability margins (larger than 20%). This mainly concerns journeys by motorcycle, (light) moped and public transport, and subgroups of different ages and individual provinces.

12.5. Variables

The considerable number of variables cover information about the respondent's household, the respondent him/herself, his journeys and the trips that were made.

The most important variables that are available on the SWOV website are:

- Kilometres travelled by age group, gender, mode of transport, province of departure, month, weekday, time of departure, motive.
- Driving licence possession by age group, gender and province.
- Vehicle possession (bicycle, light moped and moped) by gender. For this data it must be noted that comparison with recent data provided by the Vehicle Technology and Information Centre showed that the absolute figure for (light) mopeds is lower than the actual fleet figure. This difference is probably related to the relatively low response percentage of youths and inhabitants of urban areas. The changes in the vehicle fleet seem to be a reliable indicator of the actual developments and may be useful as the data of the Vehicle Technology and Information Centre only cover a brief time span.

12.6. Literature and sources

Kadrouch, S. & Moritz, G. (1998). *Redesign onderzoek verplaatsingsgedrag OVG: verschillen tussen het onderzoek verplaatsingsgedrag OVG en het Neu KONTIV Design NKD.* CBS, Heerlen.

Statistics Netherlands, more information about OViN (Dutch) or data via Statline.

The data on the SWOV website is data from the Survey Travel Behaviour (OVG) and the Mobility Study Netherlands (MON). In 2010, the name has been changed into Study of Mobility in the Netherlands (OViN).

The data can be reproduced and used with acknowledgement of Statistics Netherlands for OVD and OViN data, and the Centre for Transport and Navigation (DVS) for MON data.

13. Study ‘Driving under the Influence’ (ROI)

Since 1970 the consumption of alcohol by drivers has been investigated systematically by means of a random sample from the road traffic. Between 1991 and 2008 this was done annually; from 2008 onward the frequency changed to biannually. Data is, among others, made available about the share of drivers that drive under the influence of alcohol, categorized by blood alcohol content (BAC) per province, and, since 1991, also by age, gender, location where the alcohol has been consumed, police region, and time of day. The BAC is expressed in grams per liter (g/ℓ), alternatively ‰ is used. Since 2007, data of novice drivers is also recorded in the Netherlands; this is done in relation with the lower legal alcohol limit of 0,2 g/ℓ for novice drivers that was introduced in January 2006.

The purpose of the registration is to establish the use of alcohol among drivers. To this end, every year a minimum of 1 500 drivers per province are examined for alcohol use on weekend nights in autumn (*Figure 13.1*).

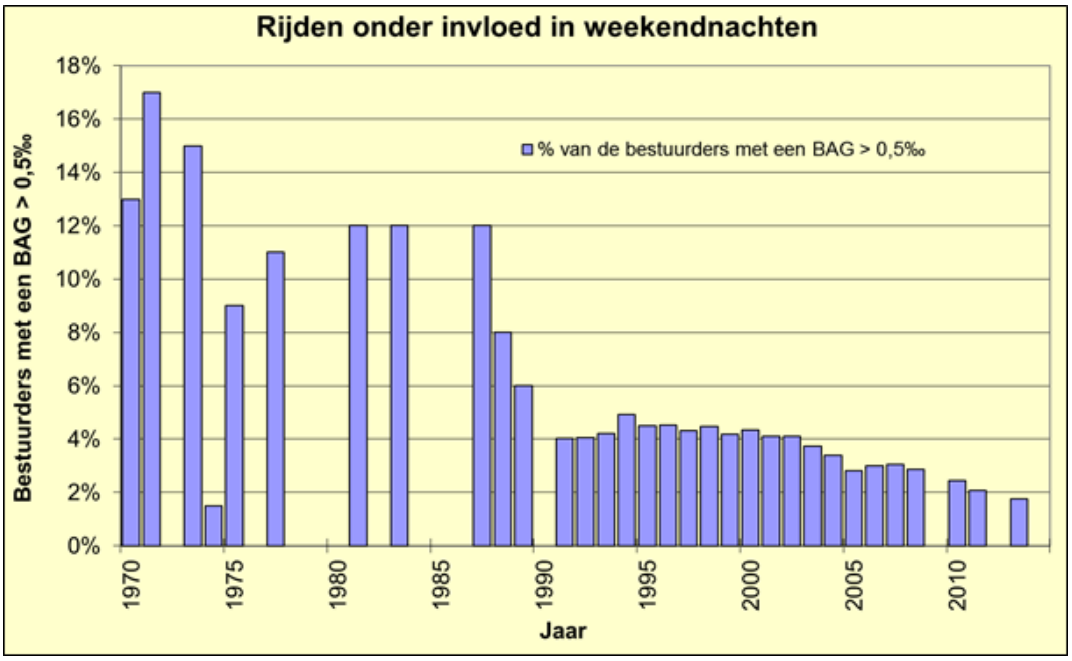

Figure 13.1. *Proportion of drivers under the influence in weekend nights from 1970. Source: SWOV; DVS – Driving under the Influence.*

13.1. Application in road safety research

Driving under the influence of alcohol leads to a higher risk of injury crashes, see SWOV Fact sheet *Driving under the influence of alcohol*.

For many years, the data from the study ‘Driving under the Influence’ have been the basis for research of the developments regarding alcohol use by drivers in the Netherlands. The sample used in the study is sufficiently large to make statements about national and provincial developments.

In 1991, the size of the total sample was increased considerably, to make it possible to also make statements at the level of police regions. However, from that moment on, only the drivers who were in violation were asked in detail about their driving and drinking habits. Of the other drivers, the police regions recorded only the test result and time of the breath test in addition to age and gender. Since 2007, data of novice drives is also included in the study.

The collected data is used to measure the effects and to define the focus groups for policy. Furthermore, the study provides useful data of police enforcement (enforcement strategies, procedures, and technical aids) and the data collection itself is an efficient way of testing for alcohol.

The data exclusively concern alcohol use among drivers. Therefore, they do not provide insight in for instance knowledge of and attitude towards alcohol in traffic.

13.2. **Method**

The measurements involve a random sample of drivers who participate in traffic during the night of Friday to Saturday (Friday night) and during the night of Saturday to Sunday (Saturday night) between the hours of 22:00 and 04:00 h. In order to obtain a representative picture for the Netherlands, each police region carries out between two and four measurements per year. This number is determined by the size of the police region. The measurements are carried in the period April up to and including December, with the exception of the holiday months of July and August. If this is possible, cancelled measurements are rescheduled in January.

In the Netherlands, a person is legally in violation when he/she scores higher than the current alcohol limit of 0.50‰ (experienced drivers) or 0.20‰ (novice drivers). In addition to BAC or breath alcohol content (BrAC), day, time of day, gender, age, location where the alcohol has been consumed, main region, province, and size of the municipality are registered.

Before 1999, the study was carried out by SWOV and in 1999 this was done together with the then Centre for Transport and Navigation (DVS) of Rijkswaterstaat. Since 2000, the study is carried out by Rijkswaterstaat Water, Traffic and Environment (RWS-WVL) commissioned by the Directorate-General for Mobility and Transport (DGB) of the Ministry of Infrastructure and the Environment and the Public Prosecution Service - National Office Traffic Team (OM - LPTV).

Sample size
Figure 13.2 shows that the sample size (i.e. the number of tested drivers) has quadrupled between1991 and 2008. In 1991 the sample size was about 8 700 drivers. Between 1991 and 1999 this number increased to reach about 27 000 drivers. From 1999 onward, the sample size has remained more or less constant.

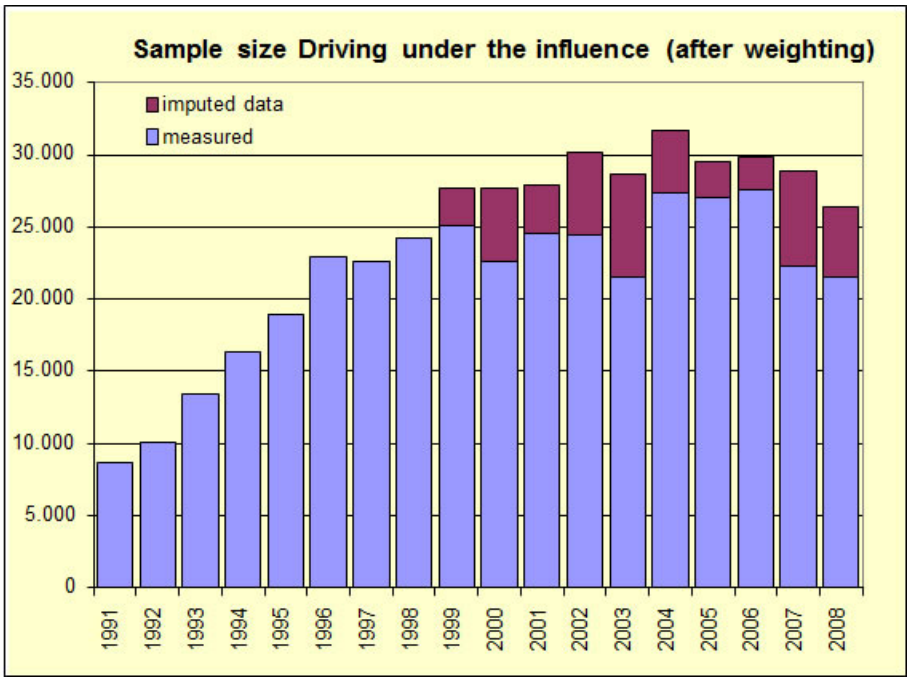

Figure 13.2. *Sample size of study 'Driving under the Influence'. Source: SWOV; DVS – Driving under the Influence.*

Multiplication and weighting
The sample distribution that is obtained is weighted in two ways to obtain national data. The first weighting is by region. In the study, police regions with a large number of inhabitants examine the same number of drivers as police regions with a small number of inhabitants. For the calculation of a national figure, the densely populated regions must be given extra weight. Therefore, weighting is carried out according to number of inhabitants per police region (annual data provided by Statistics Netherlands).

In addition weighting is carried out according to day of the week and time of day. The alcohol measurements are not evenly distributed for Friday and Saturday nights. The traffic flow is not constant during the night either. In the early phases of the measurement, not every driver will be stopped, whereas this will be the case during the later phases. Later at night the proportion of intoxicated drivers is also greater. Therefore a weighting for the two nights is done which results in figures that are representative for an average weekend night. This way it is possible to draw conclusions about the alcohol use in an average weekend night at an average time.

13.3. Availability data

The data is made available on an annual or biannual basis, depending on the period..

13.4. Reliability, accuracy and completeness

The data is collected with registration forms and is then entered into a database. The supplementary data for the measurements that have not been carried out are entered into the database based on the data of the previous year. Occasionally, only part of a measurement was cancelled. In

that case the data is supplemented with (part of the) data of the measurement at the same location in the same period of the previous year or, in some cases, of the following year. The advantage of this so-called 'imputing' data of a different year is that it remains possible to work with time series. The disadvantage, however, is that the data contains information that has not actually been measured.

In the period 1991-1993, data of one year or of multiple years is missing for the provinces of Groningen, Friesland, Drenthe, Overijssel, Zeeland, Limburg, and Flevoland. This is the result of measurements for the 'Driving under the Influence study' not having been carried out in all provinces in the Netherlands during that period. From 1994 onwards, however, the data of all Dutch provinces is available.

13.5. Variables

The SWOV website provides information about the numbers and proportion of drivers caught with a BAC > 0.5‰, to be subdivided by the following variables:

- Age driver (age groups:18-24, 25-34, 35-49, and 50+);
- Year (1991-2013);
- Gender;
- BAC in classes (0-0.2‰, 0.21-0.5‰, 0.51-0.8‰, 0.81-1.3‰, and > 1.3‰);
- Location (where has the alcohol been consumed?): Catering/Sports canteen/Party, With friends, Family/ Work/At home/ Elsewhere/Unknown. Note: this is only known of persons who consumed alcohol;
- Province;
- Police region;
- Offender;
- Novice driver.

A driver with a BAC > 0.5‰ in the table does not correspond with the judicial indicator 'Offender' (>0.54‰ as the outcome of a breath test at the police station, after a waiting period to exclude potential mouth alcohol effects). The variable 'Offender' also take novice drivers into account who have a lower alcohol limit (0.2‰).

13.6. Literature and sources

DVS (2009). *Rijden onder invloed in Nederland 1999-2008: Ontwikkeling van het alcoholgebruik van automobilisten in weekendnachten.* Dienst Verkeer en Scheepvaart (DVS), Delft.

Mathijssen, M.P.M. (1998). *Rijden onder invloed in Nederland, 1996-1997: ontwikkeling van het alcoholgebruik van automobilisten in weekendnachten.* R-98-37 Stichting Wetenschappelijk Onderzoek Verkeersveiligheid (SWOV), Leidschendam.

Mathijssen, M.P.M. (1999). *Drug-, medicijn- en alcoholgebruik van automobilisten in Nederland, 1997/1998: verslag van een veldonderzoek, uitgevoerd in weekendnachten van het najaar.* R-99-05. Stichting Wetenschappelijk Onderzoek Verkeersveiligheid (SWOV), Leidschendam.

WVL (2014). *Rijden onder invloed in Nederland in 2002-2013 : ontwikkeling van het alcoholgebruik van automobilisten in weekendnachten.* Ministerie van Infrastructuur en Milieu, DG Rijkswaterstaat, Water, Verkeer en Leefomgeving (WVL). ‘s Gravenhage.

The data on the SWOV website up to and including 1998 have been taken from the SWOV study 'Driving under the Influence'; the data from 1999 onward have been provided by DVS.

This data can be used with due acknowledgment: "Source: SWOV; DVS - Driving under the Influence".

14. Road Statistics (Statistics Netherlands)

Road Statistics is a Statistics Netherlands publication which contains data of road length, road type, and distance travelled per mode of transport and road type for the years 1980-1999. The most recent data is no longer published in a printed version, but is made available digitally via Statline.

The data is collected from different sources.

14.1. Road length

Until 1997, a survey was held once every four years among the road authorities in the Netherlands:

- National authorities;
- Municipalities;
- Provinces;
- Water boards.

The survey included questions regarding the length of roads, bicycle paths and home zones.

Since 2001, Statistics Netherlands has been generating this data from the National Roads Database maintained by Rijkswaterstaat Water, Traffic and Environment. Bicycle paths and footpaths are not included. The data is generated with, among others, the most recent maps of Top10Vector (Digital map of the Netherlands 1: 10.000 of The Netherlands' Cadastre, Land Registry and Mapping Agency - in short: Kadaster).

14.2. Motorvehicle kilometres travelled

The sources which provide the data on which the vehicle kilometres for the different modes of transport are based:

- Passenger car panel (PAP; Statistics Netherlands).
- Company vehicle survey (BVE) / Possession and use of company vehicles.
- The way of calculating lorry kilometres was revised in 1999, which made more accurate estimates possible of the distance travelled in the Netherlands by foreign lorries. The annual data from 1983 onward have been corrected based on the new model (Statistics Netherlands, 1999). A drawback of the revision is that the time series of vehicle kilometres and kilometres travelled by mode of transport cannot always be compared.
- Motorcycle survey (MFE).
- A survey among a sample of 4500 motorcycle owners which until1992 was carried out once every four years.
- Counts.

The rural distance travelled is calculated using data provided by road authorities. This is mainly data of road length and traffic volume per count section. Multiplying the count section length and the traffic volume gives the

vehicle kilometres. Based on visual traffic counts the subdivision by vehicle category was also determined.

These sources are combined to result in the total distance travelled in the Netherlands. This total, minus the calculated value for rural distance travelled gives the urban distance travelled. This process is particularly prone to accidental errors in the surveys and in the traffic counts.

Data is available for the period 1980-1998. Subdivisions by road type are available for the period 1984 - 1996.

14.3. Index rural traffic volume

Every month, the percentage deviation from the reference year 2000 is determined for the separate road categories. The data used as a basis for this reference year index are the traffic volumes at about 700 permanent count sections on national and provincial rural roads.

Before the year 2000, the reference year was 1986 (=100). From 2000 onward, Statistics Netherlands has been making a new series with the year 2000 as the reference year. Volume data has been recalculated as far back as 1990.

14.4. Literature and sources

Statistics Netherlands - CBS - Statistiek van de wegen - 1996.

Statistics Netherlands (1999). Maandstatistiek verkeer en vervoer, mei 1995, p. 6.

The Road Statistics is a Statistics Netherlands publication. The Road Statistics data on the SWOV website can be used with due acknowledgment.

15. Passenger Transport Statistics (Statistics Netherlands)

The Passenger Transport Statistics is a Statistics Netherlands (CBS) publication and contains figures about professional and private passenger transport, vehicle possession and vehicle kilometres. The passenger kilometres for road and rail transport are based on these statistics. Since 1995, the private kilometres are based on a revised weighting methodology.

Statistics Netherlands uses different sources to compile this data:

- National Traffic Survey (OVG).
- Dutch Motor Vehicle Fleet Statistics.
- Road Statistics.
- PAP, a random sample of approximately 1200 owners of passenger cars who recorded the odometer mileage of their cars for a number of consecutive months. This way the kilometres travelled by different categories of individuals and passenger cars could be registered per motive (business, commuting, holidays, private) and per fuel type (petrol, diesel, LPG).
- Professional passenger transport.
- Data on private bus transport is provided by companies with private bus transport. The kilometres travelled by public bus transport have no longer been registered after the introduction of a new ticket system in 1979 and are estimated.
- Data on passenger transport by train are provided by Dutch Rail NS.
- Motorcycle questionnaire (MFE)
- A survey among a random sample of approximately 4500 motorcycle owners which was carried out in 1988 and 1992. Currently, no repeat survey is being planned.

15.1. Literature and sources

Statistics Netherlands (1999). Statistiek van het personenvervoer 1999. CBS, Voorburg/Heerlen

16. Dutch Motor Vehicle Fleet Statistics (Statistics Netherlands)

This data source provides detailed data of the size and composition of the fleet of motor vehicles in the Netherlands. Statistics Netherlands uses the licence register maintained by RDW, Vehicle Technology and Information Centre as the source for the number of vehicles. Using this register, all vehicles are counted that are currently licenced and are included in the register on 1 January of a particular year.

16.1. Application in road safety research

The data of the motor vehicle fleet is the reference for several studies of topics in the area of traffic, transport and road safety. Examples are the reference for choosing the sample and for incrementation in determining flows of people and goods, regional allocation of mobility studies, the measure of exposure for casualties by mode of transport, etc. However, this data does not tell us anything about how these vehicles are used; see: Road Statistics.

16.2. Method

The data is based on the licence register maintained by RDW, Vehicle Technology and Information Centre. Using this register, all vehicles are counted that are currently licenced (ownership requirement) and included in the register on 1 January of each year.

The following vehicles are excluded when the active vehicle fleet is determined:

- The special licences (e.g. those for members of the Royal Family and foreign diplomats) as formulated in Chapter 2, Article 4 of the Kentekenreglement, (Licence regulations) with the exception of the ZZ licences.
- Licences of vehicles that are used by the Dutch army and by military organizations that are based in the Netherlands (e.g. NATO, AFNORTH).
- Licences with a status in the register that indicates that a vehicle is not active. These are the licences with a valid certificate of indemnification, the licences of which the ownership requirement has temporarily been suspended, and the licences of vehicles that have been stolen or are missing.
- New vehicles that are part of the trading stock.
- Vehicles for which no licence is required, e.g. agricultural tractors.

16.3. Availability data

The fleet data has been available since 1986. The new data is published annually. In the second quarter this data is published on the SWOV website by mass and year of manufacture and in the fourth quarter by region and municipality.

16.4. Reliability, accuracy and completeness

Until 1997, the number of motor vehicles was determined on the basis of a valid part III of the licence on 1 August. However, because export and scrapping were not always reported, there was a difference between the administrative number and the number of vehicles that were actually being used (the active fleet). From 1997 onward, the active fleet can be determined reliably, among others because the vehicle registration and deregistration of vehicles are linked to the road tax. A correction of the data of the years 1986-1996 has provided the data of the active vehicle fleet on 1 January of each of these years (Statistics Netherlands, rounded to 1000s for 1986-1989).

The data on the active vehicle fleet for the period 1986-1996 are not known per municipality. Based on the administrative numbers per municipality that are known and on the data of total active vehicle fleet (per type of vehicle per province) municipal numbers have been derived. The administrative numbers have been have been revised downwards by 8%, which makes the sum total of all municipalities equal to the provincial active vehicle fleet. The corrections for delivery vehicles and motorcycles are of a slightly higher percentage.

Furthermore, the data of the active fleet distributed by mass are unknown for the period 1986-1996. However, the administrative numbers distributed by mass are available. In order to keep the sum total of the numbers in one year within this period equal to the sum total of the numbers of the active fleet of that same year when distribution by mass is carried out, a correction was made for the mass category ‘unknown’. This can sometimes result in a negative value in this category.

In 2005, licencing of (light) mopeds commenced and from 1 January 2007 the licence for this category is mandatory. As in statistics the construction year of the vehicle is derived from the year the vehicle was first registered (these years do usually agree), all vehicles in this category of a construction year earlier than 2005 were allotted construction year 2005.

16.5. Available characteristics

Vehicle types:

- Passenger cars: motor vehicles suitable for the transport of a maximum of 8 passengers (not including the driver).
- Lorries and delivery vehicles. This category is subdivided into:
  - Delivery vehicles: 3- and 4-wheel freight vehicles of which the unladen weight plus its capacity total no more than 3500 kilograms;
  - Lorries: 4-wheel and multiple-wheel non-articulated lorries of which the unladen weight plus its capacity totals more than 3500 kilograms;
- Special vehicles: company vehicles for special purposes like fire engines, cleansing vehicles, breakdown lorries, et cetera;
- Articulated lorries: motor vehicles suitable for pulling trailers;
- Buses: motor vehicles suitable for the transport of 9 or more passengers (not including the driver);
- Motorcycles;

- (Light) mopeds (from 2007 onward). This category is subdivided into:
  - Light mopeds (<25km/h);
  - Mopeds (<50cc, <45km/h);
- Microcars;
- Other vehicles with a moped licence.

The numbers of licenced mopeds are considerably greater than the numbers estimated based on the Netherlands Mobility Survey.

Statistics Netherlands also has data of the numbers of trailers and semitrailers. These are not included in the data on the SWOV website.

Weight category
The weight category is based on the unladen weight, i.e. the mass of a vehicle in functional condition including a half-full fuel tank, spare parts and tools that are part of its normal equipment, but not including load, driver and other passengers who are transported in the vehicle. The data in this category has been available from the year 2000 onward and from 1986 for passenger vehicles based on the administrative fleet.

The weight of the vehicle is less relevant for powered two-wheelers (motorcycles and mopeds). These vehicles are distinguished by their cylinder capacity.

Construction year and age vehicle
The age is defined as construction year minus reference year +1. This means that on the reference date 1 January 2010 the age of all vehicles with construction year 2009 was 0. This data in this category has been available from the year 2000 onward.

16.6. Literature and sources

The Statistics Netherlands (CBS) website, theme Traffic and Transport.
CBS onderzoeksbeschrijving (not available in English)
RDW, Vehicle Technology and Information Centre.

The data on the SWOV website has been provided by Statistics Netherlands/RDW.

Data may be used with due acknowledgement:
'Source: Statistics Netherlands/ RDW, Vehicle Technology and Information Centre'

17. Road Deaths Statistics (Statistics Netherlands)

A road death is a person who dies from the consequences of a road crash within 30 days of the crash having occurred. The Road Deaths Statistics is composed by Statistics Netherlands (CBS)and presents an overview of the number of road deaths by different characteristics.

Since 1986, the number of road deaths is determined annually by Statistics Netherlands in cooperation with the Ministry of Infrastructure and the Environment. Three sources are used:

- Cause of Death Statistics;
- Court reports;
- the national road crash register BRON.

Based on police reports many details about registered crashes are available in BRON. Missing cases are supplemented by making use of the other two above statistics. Unfortunately not much information is known about these additional road deaths. The CBS Road Deaths Statistics therefore only contains the data for a limited number of variables.

17.1. Application in road safety research

Preferably, the real number of road deaths is used in road safety research. As was explained above, these road deaths can only be subdivided by a limited number of characteristics. Studies that require more characteristics, therefore use the numbers registered in BRON and discuss the underregistration of the specific group. If necessary, the data is sometimes corrected by using a multiplication factor.

17.2. Method

Different methods are used to register road deaths:

- A doctor who determines the cause of death, passes this information on to Statistics Netherlands and to the Register Office in the municipality where the death occurred. This is where the Municipal Basic Administration Personal Details (GBA) is adapted if the fatality is an inhabitant of the Netherlands and the cause of death certificate is sent to Statistics Netherlands. Based on this data Statistics Netherlands composes the Cause of Death Statistics. The Cause of Death Statistics contains no observations for cases in which the fatality is a non-inhabitant of the Netherlands. Foreigners who have been registered in the GBA, on the other hand, are included in the Cause of Death Statistics. Inhabitants of the Netherlands who die in a crash in a country other than the Netherlands, are not included in the statistics.
- In the case of a non-natural death, the police carries out an investigation and draws up an official report. The court issues a decision. Statistics Netherlands consults the reports and combines them with the Cause of Death Statistics to produce the Statistics of Non-natural Deaths.
- Generally, the police are involved in serious crashes. This is not only done for traffic handling or insurance purposes, but also to determine the cause and to draw up the official report that is to be used by the court.

Of course this data is also used for research into preventive measures and for monitoring and evaluation of developments or measures. When serious injury is involved, bystanders and those involved often first ask for medical assistance. In those cases it is not always possible for the police to accurately register the circumstances of the crash. This may therefore result in the absence of an official report or registration set for the national road crash register. This is more often the case when the casualty dies some time after the crash or when no motor vehicle is involved.

The statistical year is the year in which the crash occurred, and need not be the year in which the casualty died. The same is the case for day, time, and province; these variables indicate place and time of the crash.

The medical register (LBZ) also contains information about road crash casualties who have died in hospital. As this data is not available until later in the year, it is not used for the Road Deaths Statistics.

17.3. Availability data

The data is supplemented in the second quarter of each year. The data is available from 1996.

17.4. Reliability, accuracy and completeness

The number of road deaths in the Netherlands is determined as accurately as possible by combining different data sources. When these sources are in contradiction, the most reliable source is the leading source. For personal characteristics (age, gender) the Road Deaths Statistics is the leading source as this is based on the official municipal administration. For crash characteristics the BRON data file is the leading source (date, time and place of the crash, transport mode, crash opponent).

Each of the sources is rather complete on its own. However, there may be a few cases that are not registered in any of the three sources. In road safety research which is based on road fatalities we therefore only use the cases on which information is available.

17.5. Literature and sources

CBS Statistiek Verkeersdoden – korte onderzoeksbeschrijving.

CBS Doodsoorzakenstatistiek – korte onderzoeksbeschrijving.

CBS Verkeersdoden naar leeftijd, geslacht en vervoerwijze.

CBS Verkeersdoden naar leeftijd, geslacht en provincie.

See also Doodsoorzaken, Niet-natuurlijke dood en Verkeersdoden onder ingezetenen per maand.

The data from the Road Deaths Statistics on the SWOV website has been provided by Statistics Netherlands. The data concerning road deaths may be used with due acknowledgement of Road Deaths Statistics and Statistics Netherlands.

18. Traffic offences

The number of traffic offences may be an indication of road user behaviour. However, the data is strongly affected by the level of police enforcement. Since 1995, the Central Fine Collection Agency (CJIB) has been making data available of the numbers of observed traffic offences. This data involves speeding, red light running, parking/stopping and other offences (e.g. helmet use, wearing a seat belt, faulty bicycle lights, handheld phone use, and driving without insurance or MOT).

18.1. Method

Many traffic offences are seen as small misdemeanours that can be dealt with administratively without the intervention of the courts. Since 1990, in the Netherlands this has been laid down in the 'Law Administrative Enforcement Traffic Offences' (WAHV, also known as the 'Mulder Law'). The vehicle is stopped in nearly 10% of the cases; there are considerable differences between the types of offence (ranging from 1% for speeding to almost 100% for seat belt wearing, compulsory helmet use, handheld phone use, and bicycle lights) and between police regions (from 2 to 25%). The major part of the offences are therefore given on licence number; the owner of the vehicle receives the fine by a giro in the mail.

Very serious offences (e.g. more than 40 km/h faster than the limit on motorways or more than 30 km/h faster than the limit on other road types are not dealt with by Mulder Law, but by the Public Prosecution Service. This is also the case for driving under the influence. Since 2006, conducting handheld phone calls is also dealt with by Mulder Law.

The Mulder Law determines which less serious traffic offences can be dealt with administratively. The process is in the hands of the Central Fine Collection Agency, which is part of the Directorate General Administration of Justice and Law Enforcement of the Ministry of Security and Justice.

Implementation of these sanctions begins when the data of the traffic offences that have been established by the Police or by RDW, Vehicle Technology and Information Centre are electronically transferred to the Central Fine Collection Agency. Based on this offence data, the fines are prepared in an automated process and sent to the offender.

18.2. Fines

In 2013, a total value of more than 10 million euro was imposed in administrative sanctions. This is the number of offences reported to the Central Fine Collection Agency (CJIB). Until 2007, the number of recorded offences grew by about 10% per year. During the following period the number has been decreasing slightly, see *Figure 18.1*.

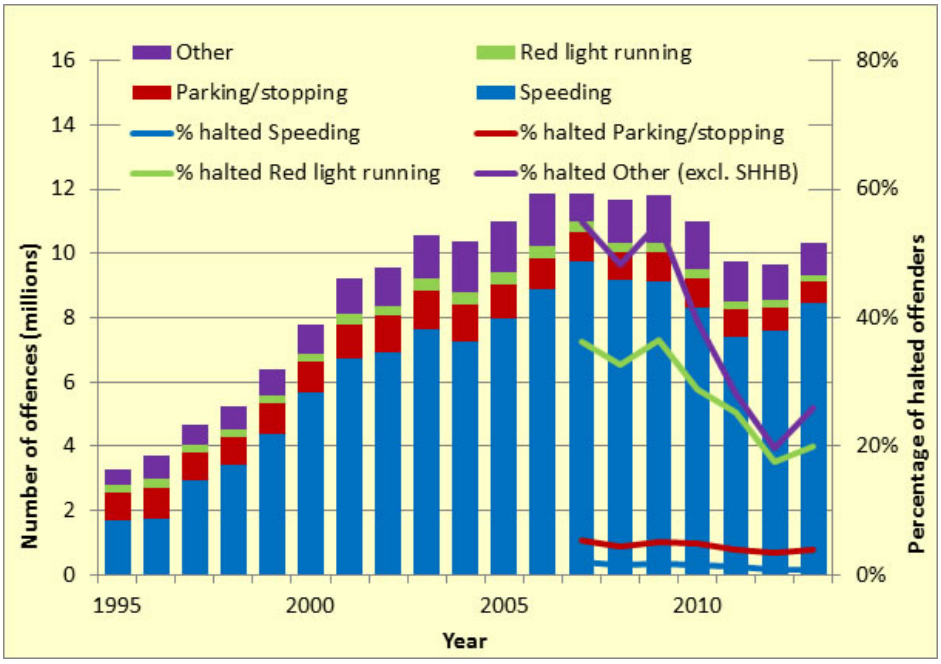

Figure 18.1. *Number of offences by type and the percentage of halted offenders. In the group Other the groups seat belt wearing, helmet use, handheld phone use and bicycle lights (SHHB) have not been included.*

The majority of the fines involve speeding offences. The increase is the result of policy measures like enforcement projects concerning the use of helmets and seat belts, red light running, alcohol and speeding offences, and intensified enforcement especially on motorways (average speed check). These measures were not only taken for road safety reasons. Environmental reasons (fuel consumption, CO2 emission and noise) also prompted the government to deal with speed offenders severely. Therefore the figures do not so much indicate the actual number of committed offences, but rather reflect the police enforcement efforts. In 2006, the number of reported offences declined in all categories except for speeding offences on motorways. This is an effect of the increase in average speed checks.

18.3. Availability of data

Data has been taken from Central Fine Collection Agency CJIB Annual Reports (1995 t/m 2005).Since 2006, the data is sent directly to SWOV. Up to and including 2006 this is the annual data per police region per type of offence. From 2007 onward, monthly data is available and it is also known whether the offence was recorded by stopping the offender or by recording licence number.

18.4. Reliability, accuracy and completeness

The following variables are available:

- Police district: all 25 districts (divided into 10 units with the introduction of the national police force per 1-1-2013), supplemented with the National

Police Services Agency (KLPD), the Royal Netherlands Marechaussee and others (the Vehicle Technology and Information Centre RDW).
- Month: the month the data reached the CJIB (from 2007).
- Manner in which the offence was recorded: by stopping the offender or by recording licence number.
- Type of offence: speeding, parking/stopping, red light running, other offences. Since 2007, the groups seat belt use, helmet use, and handheld phone use are distinguished within the other offences, and since 2010 this is also the case for bicycle lights.

Some offence types are discussed in more detail below.

Speeding offences
The SWOV Fact sheets provide more detailed information on the road safety effects of speeding.

The majority of speeding offences are relatively small. Two thirds are 4-10 km/h faster than the limit (after correction). Another 18% resp. 9% break the limit by 11-15 km/h resp. 16-20 km/h, see *Figure 18.2*.

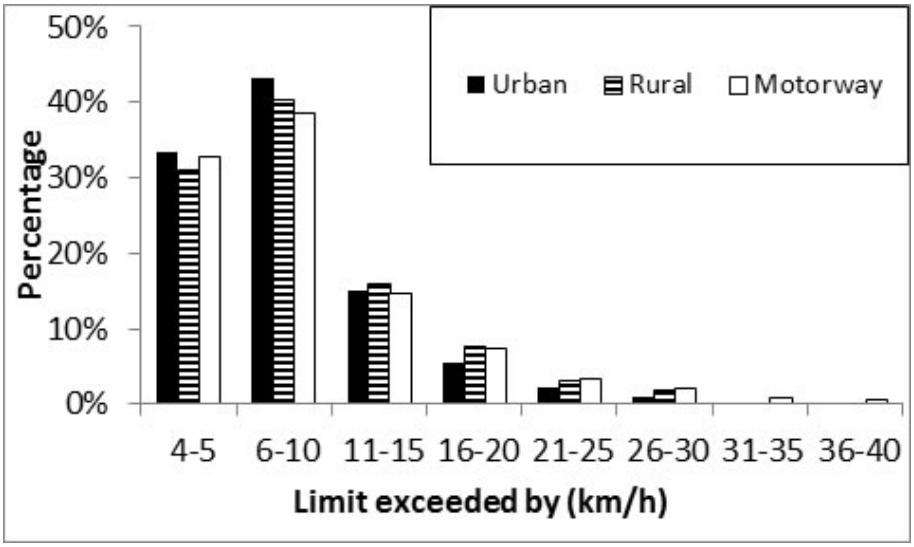

Figure 18.2. *Distribution of speeding offences for the road types urban, rural and motorway by the extent of violation in km/h, average over the years 2010 - 2012. Source CJIB-WAHV.*

Most speeding offences occur on urban roads with a 50 km/h speed limit. It is unknown whether this is due to a high percentage of offenders at those locations. The data has not been corrected for road length, traffic volume, or the number of camera's at that specific road type.

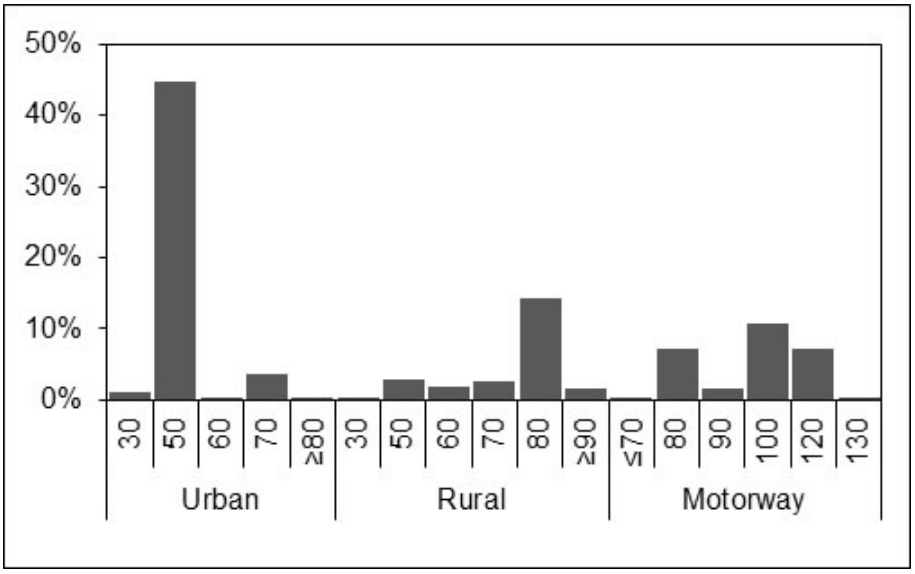

Figure 18.3. *Distribution of speeding offences by speed limit, averages 2010 - 2012. The offences on roads with a 130km/h limit is exclusively based onthe enforcement in 2012; In that year the proportion was 0.4%. Source: CJIB-WAHV.*

Other offences
Based on data of 2006, the most frequent of the other offences are illegal parking (32%), red light running (12%), driving without wearing a seat belt (ca. 10%), no valid MOT certificate (motor vehicle up to 3500 kg) (ca. 10%), cycling without lights (6%) and handheld phone use (4%).

18.5. Literature and sources

The data on the SWOV website has been provided by the Central Fine Collection Agency (CJIB). This data can be used with due acknowledgment: "Source: CJIB-WAHV".

19. The registration rate of casualties and crashes

For various reasons the police do not register all road traffic crashes and casualties. Other registers like the Statistics Netherlands Cause of Death Statistics or the national hospital register (LBZ) are not complete either. Each of the data sources has its own 'blind spots'. Based on an individual data source it is therefore impossible to obtain a clear picture of the actual numbers of crashes and casualties. The actual numbers can however be estimated by combining the individual sources. This may then provide insight into the degree of completeness of each individual data source.

19.1. Registration rate and available tables

The degree of completeness of a data source is expressed in the registration rate: the registered number divided by the estimated actual size (as a percentage).

The registration rate is especially low for the less serious crashes (property damage only or slight injury), for single vehicle crashes and for crashes in which no motor vehicle is involved. *Table 19.1* gives an idea of the registration rate of casualties by injury severity in BRON.

There is no reason to assume that the road type plays a role in a correct registration. The type of transport mode that makes use of the road type, will indirectly be responsible for differences in completeness between road types. See below for the numbers and an explanation.

Severity	Registered number in 2008	Registration rate in BRON
Road deaths	677	90%
Serious road injuries (motor vehicle involved in the crash)	4 887	ca. 50%
Serious road injuries (no motor vehicle involved in the crash)	274	<10%
Slightly injured	22 667	<10%
Property damage only (mainly motor vehicles)	80 977	ca. 20%

Table 19.1. *The registration rate by injury severity in BRON*

The SWOV website gives access to a number of tables with registration rates for fatalities and serious road injuries. These tables present time series of the registered numbers, the estimated actual numbers and the calculated registration rate, broken down by a different relevant characteristic in each table.

19.2. What does the registration rate in the tables reflect?

Until 2010, the police registration of road deaths and serious road injuries in crashes involving a motor vehicle was reasonably complete. The LBZ is much more complete in registering casualties in non-fatal crashes in which no motor vehicles are involved (e.g. cyclists falling or cyclist-cyclist

collisions). To determine the registration rate, the tables on the SWOV website therefore distinguish between:

a. Fatalities;
b. Serious road injuries in crashes in which a motor vehicle was involved; and
c. Serious road injuries in crashes in which no motor vehicle was involved.

In the third case the registration rate is determined by comparing the estimated actual number with the number who are registered as serious road injuries in de national hospital register (LBZ). In the other two cases the numbers who are registered in BRON are taken as a starting point. Therefore the registration rates in fact indicate the accuracy of the police registration for the categories a. and b. and the accuracy of the LBZ in the registration of serious road injuries in category c.

19.3. How is the registration rate by road type determined?

The distribution by road type is only known for road traffic casualties (fatalities and serious road injuries) who are registered by the police. The distribution is unknown for the other casualty types, which means that in fact the registration rate by road type cannot be determined.

To make an estimate of the distribution anyway, we assume that the non-registered casualties per mode of transport and per age group are divided about the road types in the same way as the registered casualties. The number of non-registered casualties for these characteristics is known.

Below you will find a step-by-step description of how the registration rate by road type is determined.

Step 1 is making a table containing the numbers of registered casualties by mode of transport, by age group, and by road type, for a somewhat longer period of time (2005-2009). *Table 19.2* shows this distribution. A period longer than one year is used to minimize the effect of random fluctuations.

Step 2 in the estimation process is to determine the distribution of the number of non-registered casualties by mode of transport and age. *Table 19.3* shows this distribution for the years 2005-2009.

Distribution		Road deaths				Serious road injuries (MAIS 2+)			
		0-17	18-29	30-59	60+	0-17	18-29	30-59	60+
Pedestrian	U	29	22	58	127	560	169	400	653
	R	8	15	29	25	56	49	56	43
	N	5	8	19	9	2	14	18	6
Bicycle	U	66	41	106	264	1169	679	2039	2012
	R	53	16	51	150	327	132	468	451
	N	2	1	4	6	10	9	22	18
(Light) moped	U	36	38	35	45	1346	922	1222	393
	R	27	28	27	33	528	267	315	109
	N	4	1	3	0	35	17	14	2
Motorcycle	U	2	34	47	2	18	276	670	52
	R	0	45	120	11	13	247	710	62
	N	0	14	54	4	1	86	291	22
Car/delivery veh.	U	10	98	88	67	118	823	1 114	519
	R	39	355	396	221	195	1 450	1 479	646
	N	18	135	168	82	69	532	859	319
Other	U	4	0	12	31	21	29	103	106
	R	3	3	11	14	11	30	78	41
	N	0	4	27	0	4	28	51	7

Table 19.2. *The numbers of registered casualties by mode of transport, age group, and road type (Source: BRON 2005-2009). U = Urban, R = Rural, N = National road).*

	Road deaths				Serious road injuries (MAIS2+)			
	0-17	18-29	30-59	60+	0-17	18-29	30-59	60+
Pedestrian	2	-1	10	18	740	250	570	780
Bicycle	1	3	55	133	6 790	3 030	13 690	15 240
(Light) moped	3	1	7	13	2 870	1 750	2 320	710
Motorcycle	0	0	4	2	40	820	2 170	180
Car/delivery veh.	2	16	24	32	260	1 740	2 190	970
Other	0	1	14	41	120	260	720	420
TOTAL	8	20	114	239	10 840	7 860	21 650	18 290

Table 19.3. *Numbers of non-registered road deaths (Source: CBS) and serious road injuries (Source: SWOV) by age and mode of transport.*

Step 3 in the estimation process involves that per cell in *Table 19.3* the numbers, like in *Table 19.2*, are distributed over the three road types.

Step 4, the last step in the process, is the equation of the registered number of casualties per age group and per road type with the real number of casualties (i.e. registered plus non-registered number). This provides the

registration rate, as shown in *Table 19.4* for road deaths and for serious road injuries in *Table 19.5*.

For example, *Table 19.4* shows that road deaths have a registration rate of 86% in built-up areas; for serious road injuries this is 27% (*Table 19.5*). For national roads the registration rates are 94% and 51% respectively. The registration degree for rural roads is in between, just slightly above the average of all roads together.

Road deaths	**0-17**	**18-29**	**30-59**	**60+**	**Total all ages**
urban	97%	98%	87%	79%	86%
rural	98%	98%	94%	84%	92%
national	97%	98%	94%	91%	94%
Total all road types	97%	98%	92%	82%	**90%**

Table 19.4. *Registration rate of road deaths registered in BRON by road type.*

Serious road injuries	**0-17**	**18-29**	**30-59**	**60+**	**Total all ages**
urban	28%	37%	27%	21%	27%
rural	31%	49%	38%	27%	36%
national	43%	53%	50%	50%	51%
Total all road types	29%	42%	31%	23%	**30%**

Table 19.5. *Registration rate of serious road injuries registered in BRON by road type.*

19.4. Literature and sources

Sources: Statistics Netherlands, Ministry of Infrastructure and the Environment, Dutch Hospital Data and SWOV.