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Injuries to Vulnerable Road Users Including Falls in Pedestrians in the EU – A Data Report

APOLLO

Injuries to Vulnerable Road Users Including Falls in Pedestrians in the EU - A Data Report

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Executive summary

Pedestrians, cyclists and motorised two-wheelers are moving in traffic without protections of a surrounding vehicle and in case of a collision they have a higher injury risk. These so called vulnerable road users (VRU) need particular shelter through appropriate interventions in the design of road infrastructure, traffic rules and in influencing traffic behaviour. Especially vulnerable groups like children, adolescent and elderly are in particular taking part in traffic as pedestrians, cyclists or motorised two-wheelers. Due to their physical and psychological development children are not able to cope sufficiently with dangerous situations in traffic. They are at a higher risk of having an injury; adolescent bear a higher risk in traffic as they have little experience in traffic situations and age-specific risk-taking behaviour; elderly are due to their physical frailness and their restraints in perception and mobility more in danger in traffic.

For the development of respective preventative measures for VRU it is needed to know circumstances of their accidents and injury mechanisms. Rationale priority setting requires correct quantification of risks. Traffic statistics of most European Countries do not provide a comprehensive picture on incidence, causes and consequences of injuries to VRU.

Traffic injury statistics:

Usual traffic injury statistics which are run by European Member States are based on police reports and are the most important source of information to govern preventative traffic safety measures and the evaluation of their effects. However, they comprise some systematic shortcomings which are leading to a moderate underreporting of fatal and a profound underreporting of non-fatal injuries (especially cyclists and pedestrians). General traffic statistics only count fatal injury victims which died within a defined time period (mostly thirty days). Single vehicle accidents of motorised two-wheelers and cyclists, collisions of cyclists between each other or with pedestrians are not fully registered by police. Falls of pedestrians (FiP) e.g. because of bad road conditions are not reported at all as they are excluded of the generally used definition of traffic injuries defined by the Organisation of Economic Co-operation and Development (OECD). Following this definition injuries of VRU are injuries of pedestrians, cyclists, motorised two-wheelers and disabled if at least one vehicle in motion is included. Comparisons between different Member States underlie numerous limitations due to different national data collection practices.

Death certificates:

Usually fewer coding variables, in order to register external causes of injury events, are used in death certificates conducted by each Member State than provided by the coding manual of the International Classification of Diseases Version 10 (ICD-10) of the World Health Organisation (WHO) (e.g. only three of four coding digits). Thus a correction of the general underreporting of fatal VRU injuries and an analysis of injury types, modes of transport, type of road or day time is not feasible at the moment. As specific coding variables are missing to connect the location “public road” with FiP the analysis of their fatal injuries on public roads is also not possible.

Hospital Discharge Registers

In many Member States Hospital Discharge Databases are managed. Fewer coding variables for registering external causes of injury events are used than provided by ICD-10. Therefore

mapping of injury consequences, which are coded in more detail with modes of transport and causes of injuries, is barely feasible. Comparisons between Member States do not show a correct picture because the frequency of hospital treated injuries depends on the different national health care systems and multiple treatments need extensive control.

Statistics on external causes

In many Member States statistical surveys using the standards of the European Injury Database (IDB) collect information on external causes, modes of transport, place of occurrence, mechanisms and consequences of non-fatal injuries that have to be treated in- or outpatient in hospitals. In 2004 five countries provided data on injuries that were useful for this study to the IDB. The extrapolated data is giving rough corrections of the underreported injuries to cyclists and FiP especially due to accidents without counterpart.

The number of participating countries increased in the meantime to twelve and now also traffic injuries are collected by the system. Therefore the IDB will be one of the main data providers in the field of injuries and have to be considered to a greater extend in the future.

Main aims and method

1. The first main aim of this study was to give a comprehensive view on injuries to VRU including FiP in the EU and to identify data gaps through the combination of different databases of data of the health and traffic sector.
2. Secondly, on behalf of tailor made injury prevention measures injuries to two-wheelers and pedestrians should be analysed in regards to sex, age, injury mechanism and type of injury.
3. Finally a feasible method should be developed to improve the routine reporting on injuries to VRU in the EU in the future.

Data of the European traffic injury statistics – the Community database on Accidents on the Roads in Europe (CARE) and the International Road Traffic and Accident Database (IRTAD) – and of the European Health statistics – the European Injury Database (IDB) and a Hospital Discharge Database System (HDD) developed under the auspices of APOLLO WP2 “The burden of injuries in Europe” – has been provided to reach these aims, partly combined and analysed. All analysis and results are based on data mainly of the year 2004 and the formerly EU 25. The overview figures of the present executive summary are presented including the former candidate countries Romania (RO) and Bulgaria (BG), which is the EU27 now.

Results

Fatal traffic injuries:
In 2004 estimated 17,800 VRU died by having a traffic injury in the EU27; these were almost 40% of the total fatal injuries on public roads within the same year (around 46,800). This number constitutes the bottom of fatal VRU injuries by reason of the mentioned restrictions of traffic injury statistics. About half of the fatal injured VRU were pedestrians, nearly 40% motorised two-wheelers and more than 15% cyclists. About 80% of the total fatal injured VRU were male.

Injuries due to traffic accidents:
In the same year estimated 1.86 million VRU had injuries due to traffic accidents; these were around 50% of all estimated traffic injuries on public roads in the EU (about 3.7 million),

whereas mainly cyclists (ca. 70%) were affected by these injuries. This number illustrates the bottom of the real injury figure.

Casualties to motorised two-wheelers:
In 2004 more than 6,000 motorised vulnerable road users died on the roads of the EU. More than 90% of the victims were male. The percentage of males among the 300,000 injured is four times higher than of females.

Casualties to pedestrians:
At least 8,000 pedestrians were killed due to collisions with a motorised vehicle in 2004 and about 159,000 were injured. Around 70% of the fatal injured pedestrians or cyclists were males. The percentages of injured males and females were almost equal (55:45). The gender and age distribution could not be provided separately for casualties to pedestrians and cyclists by the traffic injury statistics at the time of establishing this report.

Casualties to cyclists:
While riding a bike at least 3,000 cyclists died. The total number of injured cyclists was estimated at about 1.38 million on the basis of IDB data (five countries). The ratio of males and females is 48:52. The traffic injury statistics registered only 165,600 cyclist injuries (mainly collisions) reported by the police. This equates on average barely 12% of the probable number. The dimension of this correction seems to be so considerable that a change in priority setting in prevention will be absolutely needed.

Casualties to FiP:
On the basis of available statistics no conclusion on the number of fatal injuries due to FiP on public roads is possible. Estimated 1.6 million pedestrians had a non-fatal injury due to a fall. The ratio of males and females is almost equal (52:48). Falls occurred mainly inside urban area, whereas 30% happened on pavements and 29% on roads.

Recommendations

On behalf of an improved prevention the Council Recommendation on Injury Prevention and Safety Promotion which has been approved on 31 May 2007 calls on the Member States to an increased use of all available data on injuries. In differentiation of this Recommendation and in consideration of the present analysis the following is suggested to the Member States:

Co-operation of the health and traffic sector in injury reporting:
Ministries of Health, Traffic and the Interior as well as statistical offices should co-operate in the establishment of national reports on traffic injuries in the future and should combine their data to get an as much correct and comprehensive picture on causes and consequences of injuries to cyclists, motorised two-wheelers and pedestrians (including falls) as possible. The present report provides a general methodological model on this.

Contribution to a concerted traffic injury database:
All Member States which run traffic injury statistics (based on police reports) are invited to provide their data to the Community database on Accidents on the Roads in Europe (CARE) to give an as much complete picture of the injury events on public roads as possible. All Member States should adjust their data to common standards to assure benchmarking in the EU.

Data collection on external causes of non-fatal injuries:
Member States not having an enduring data collection system on external causes of injuries up to now are advised to implement the data collection and reporting system of the European Injury

Database (IDB). Member States should keep the standards of the IDB-network and provide their data to the concerted injury database to assure the comparability of national circumstances.

Improved coding of death certificates:
It is recommended to health ministries and statistical offices of the Member States to guarantee the integration of mortality data fully coded to the fourth digit of ICD 10 coding of external causes in order to be able to use synergies between traffic injury statistics and death certificates.

Recommendations to the Commission of the European Communities:
The responsible Commission services (DG TREN, DG SANCO and ESTAT) should collaborate on the establishment of concerted reports on traffic injuries in the future to get maximum advantage of available information, in particular on correct numbers on incidence and severity of injures to VRU. Further the Member States should be supported (e.g. via trainings and technical guidelines) in their effort to collect comparable national data for a concerted injury database. Death certificates, Hospital Discharge Registers and data collected on external causes of non-fatal injuries (IDB) should be included in the catalogue on health data that have to be obligatorily delivered.

1 Introduction

"Injuries are a leading cause of death among the European Population."[1] They account for about 250 000 fatalities in the European Union each year.[2] The Communication report from the Commission to the European Parliament and the Council on Actions for a Safer Europe made clear that injuries are a major public health issue. The Communication report provides a strategic framework to reduce accidents and injuries in each Member State by defining seven key priorities for actions:[3]

1. Safety of children and adolescents
2. Safety of elderly citizens
3. Safety of vulnerable road users
4. Prevention of sports injuries
5. Prevention of injuries caused by products and services
6. Prevention of self-harm
7. Prevention of interpersonal violence

The Council Recommendation on the prevention of injury and the promotion of safety, which was adopted in May 2007[4] by the Council of the European Union, recommends the following actions on injury prevention to the health sectors of each Member State for each of the above priorities:

- "To quantify the problems through adequate injury surveillance and by building national capacity and infrastructure;
- To support policy actions in the priority areas;
- To monitor progress towards the implementation of national plans".[5]

The present report *Injuries to Vulnerable Road Users Including Falls in Pedestrians in the EU* aims to quantify the problem on VRU and FiP in the EU in order to guide and monitor respective policy actions. This report is one of the deliverables of the work package *Initiatives for interventions by the public health sector to prevent accidents among vulnerable road users,* which is part of the umbrella project *Strategies and best practices for the reduction of injuries (APOLLO)* led by the University of Athens. APOLLO is co-financed by the European Commission, DG

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1 Commission of the European Communities (ed.). Communication from the Commission to the European Parliament and the Council on Actions for a Safer Europe, Brussels 2006.

2 Kuratorium für Verkehrssicherheit KfV (Austrian Road Safety Board): Injuries in the European Union. Statistics summary 2003-2005. Issue II. Austrian Road Safety Board (KfV), Department for Home, Leisure and Sports, Vienna 2007. ISBN: 978-3-7070-0081-8.

3 Commission of the European Communities (ed.). Communication from the Commission to the European Parliament and the Council on Actions for a Safer Europe, Brussels 2006.

4 Commission of the European Communities (ed.). Council Recommendation on Injury Prevention and Safety Promotion. CELEX-Nr. 32007H0718(01), Brussels 2007 [cited May 13, 2008].

5 European Association on Injury Prevention and Safety Promotion (EuroSafe). How to make Europe a safer place, Key areas for consideration in implementing the Council Recommendation on Injury Prevention and Safety Promotion. Draft Working document for the Working Party of Governmental Experts on Accidents and Injury Prevention, Amsterdam 2007.

SANCO within the Public Health Programme 2003-2008 which is made up of three different strands: *health information, health determinants and health promotion*.[6]

The APOLLO work package on VRU is led by the Austrian Road Safety Board, an independent research institute in the field of road traffic safety and public health in co-operation with the entire APOLLO consortium. This work package comprises

- the VRU data report, which is part of the strand *health information*[7]*,* as a basic information tool for further deliverables:
- resource books on good practices at the EU, national and local level
- and a software application to evaluate the cost effectiveness of preventative methods.

The outcome will be communicated to policy makers and safety practitioners in the public health and road traffic sector through various networks, including the APOLLO network and the *EuroSafe Task Force on Vulnerable Road Users*.[8]

For further information on the mission statement, main aims, the deliverables of this APOLLO work package and the description of previous road safety initiatives at the European level, please consult the Appendix.

6 European Commission, Directorate General for Health and Consumer Protection (DG SANCO) (ed.). Health Information [online]. [cited May 13, 2008]. Available from Internet: http://ec.europa.eu/health/ph_information/information_en.htm.

7 See above

8 European Association on Injury Prevention and Safety Promotion (EuroSafe) (ed.). Vulnerable road users [online]. updated May 2008 [cited May 14, 2008]. Available from Internet: http://www.eurosafe.eu.com/csi/eurosafe2006.nsf/wwwVwContent/l2vulnerableroadusers.htm.

2 Background

2.1 Under-reporting of road traffic injuries

Vulnerable Road Users (VRU) are a group who were, until recently mainly dealt with by the transport sector. However given the medical costs of treating traffic-related injuries, this topic also falls into the area of public health. The estimated annual direct and indirect costs of road traffic injuries in the EU15 countries accounted for more than 180 billion euros in 2004, but it is assumed that the real costs exceed this amount[9]. Due to a heavy under-reporting of cyclist injuries in police databases, previous publications and strategy papers have highlighted the need for parallel data collection in this field in order to form a comprehensive picture of these injuries.[10,11]

Databases rely on the collecting purpose of the institution gathering the data. Police data (CARE/IRTAD) is used to prove a person is legally responsible for a casualty and to draw a basic statistical map of road traffic casualties. Hospital registries were principally designed for calculating treatment costs. The primary purpose of respective databases (EUROSTAT health care: resources and patients, HDD developed under the auspices of APOLLO WP2 “The burden of injuries in Europe”) was to derive incidence, patterns of injury and injury severity and disability. Mortality statistics (EURSTAT COD, WHOSIS) were created to serve the needs of statistical and registration offices. The European Injury Database (IDB) was established to collect and monitor injury data, which can then be used for scientific research purposes and as a basis for preventative measures. Only the combination of different data sources leads to a comprehensive overview of the topic.

Police records are the main source for statistical research, but are subject to the following limitations:

”It is very important to be aware of the fact that under-reporting is a considerable problem when comparing national accident figures. The level of under-reporting can vary from country to country and over time, and it varies with the degree of injury inflicted. It is different for various groups of road users. Fatalities have the highest rate of reporting, while slight injuries have the lowest rate.”[12] Most of the published epidemiological research on road traffic injuries is based on data collected by the police. The results of a Swedish study[13] cited in an IRTAD special report[14] demonstrate the under-reporting of data recorded by police authorities in road traffic accidents

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9 European Transport Safety Council (ETSC) (ed.). Social and economic consequences of road traffic injury in Europe, Brussels 2007, page 8.

10 SafetyNet (ed.). European Road Safety Observatory (ERSO), Pedestrians & Cyclists [online] (2006), updated April 2008 [cited May 13, 2008]. Available from Internet: http://www.erso.eu/knowledge/Fixed/40_Pedestrians/pedestrians.pdf, page 9.

11 Derriks, H.M., Mak, P.M.. IRTAD Special Report. Underreporting of Road Traffic Casualties [online]. Ministry of Transport, Public Works and Water management, The Netherlands. 2007 [cited May 13, 2008]. Available from Internet: http://cemt.org/IRTAD/IRTADPublic/publications/special_rep_underreporting.pdf.

12 Public Road Administration (ed.). IRTAD special report “Under-reporting of road traffic accidents recorded by the police at the international level, Norway 1994, preface by Sven Krarup Nielsen.

13 Trafiksakerhetsverket (TSV). „350 000 elevers trafikolyckor“, Uppsala (Sweden) 1985.

14 Public Road Administration (ed.). IRTAD special report “Under-reporting of road traffic accidents recorded by the police at the international level; Norway 1994.

with bodily impact. This study compares medical treatment registers to police records. Casualties involving four wheeled vehicles have the highest level of reporting. Even accidents concerning motorcycles are recorded at a relatively high level in studies. Bicycles have by far the lowest rate, primarily due to the high number of single bicycle accidents. In principle, police authorities in the EU should register all traffic accidents with bodily impact.

A traffic accident with bodily impact is defined by the Vienna Convention as follows:[15,16]

"Accidents which occurred or originated on a way or street open to public traffic; which resulted in one or more persons being killed or injured and in which at least one moving vehicle was involved. These accidents therefore include collisions between vehicles, between vehicles and pedestrians, and between vehicles and animals or stationary objects. Single vehicle accidents, in which one vehicle alone (and no other road user) was involved, are included."

The actual recorded police data does not always correspond to the above definition for a variety of reasons:[17]

- the police are not on the scene or failed to enter the data in the registration file (clerical errors, long procedures for filling out forms, complicated paperwork, time span between accident, notification to the police and medical treatment)
- the involved parties are not aware of the fact that the accident should be reported to the police (e.g. single bicycle accidents)
- the involved parties regard the injury to be so minor that it is not necessary to acknowledge it
- the injury is not apparent at the scene of the accident, but appears some time after the accident (e.g. whiplash injuries, rear end accidents, ...)
- people at the scene of the accident forget to report the accident to the police because they are engaged in trying to rescue the people involved, calling for medical assistance, technical assistance etc., or they assume others will report the accident to the police
- the involved parties do not for some reason want the accident to be reported to the police (e.g. fear of legal prosecution due to drug consumption, reckless or unlawful driving, no driver's licence, criminal activities, etc.)

Experience shows that: [18]

- the more severe an accident is, the more likely it is to be registered
- accidents occurring in urban areas are more frequently reported than in rural areas
- single vehicle accidents are often under-reported
- single bicycle accidents cause misleading results as the under-reporting rate is extremely high
- the highest rate of reporting is for four wheeled motorised vehicles

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15 This definition is almost followed by EU25. However national definitions vary slightly e.g. by defining vehicles as motorised, including material damage or any event causing injuries or fatalities on public areas, not being limited to involving vehicles.

16 Public Road Administration (ed.). IRTAD special report on "under–reporting of road traffic accidents recorded by the police at the international level", Norway 1994.

17 See above

18 See above

The differences in data on injuries occurring in public transport areas collected by police authorities, and figures provided by medical care centres (hospital discharge registers) or mortality statistics have been considered in comparative studies at the national level.

2.1.1 France

Emmanuelle Amoroso[19] compared injury data of French police records and the entries in the Road Trauma Repertory presenting casualties[20] from road crashes[21] occurring in the Rhône region[22] that sought care in health facilities[23] over a period of four years (1997–2001). Police data covered 37.7% of non-fatal road injuries recorded. This study analyses road traffic injuries in general. In conclusion, Amoroso states that under-reporting in police data is strongly associated with injury severity: the lower the severity, the lower the probability of it being reported. The under-reporting has an inverse association with age: the younger the victim, the lower the probability of the injury being reported. With regards to gender distribution, the author states that female casualties are 0.95 times less likely to file a report than male casualties.

Road user type	Without counterpart in %	With counterpart in %	Total in %
Pedestrians		46,4	46,4
Cyclists	2,1	34,9	37,0
Motorcyclists	15,3	48,5	63,8
Car occupants	36,2	46,5	82,7
Van, truck, tram, bus	26,5	54,6	81,1
Unknown (& other)	37,7	57,1	94,8

Table 1 – Probability of being reported to police authorities in France

Under-reporting in police records was strongly associated with the road user type (from 37% of pedestrian casualties and 46.4% of cyclist casualties up to 72.7% casualties of car occupants) and the involvement of a counterpart. Pedestrians without a counterpart are excluded by definition as no vehicle was involved; 46% of accidents involving pedestrians struck by a vehicle were reported to police authorities. Injuries in cyclists without a counterpart were rarely reported (2.1%), whereas incidents involving a counterpart accounted for 34.9%. Nearly half of all motorcycle injuries with a counterpart were reported, while casualties without a counterpart only accounted for 15.3%. Other criteria such as daylight, road type and environment (rural, urban,

[19] Amoros, E., Martin J.-L., Laumon B.. Epidemiologic knowledge of road crash casualties in France: under-reporting characteristics and injury severity misclassification [online]. Institut National de Recherche sur les Transports et leur Sécurité (INRETS), Transport, Work, Environment Epidemiology and Surveillance Laboratory (UMRESTTE). Presented at: Young Researchers Seminar 2005, ECTRI-FEHRL-FERSI. The Hague (Netherlands), 11-13 may 2005 [cited May 13, 2008]. Available from Internet: http://www.ectri.org/YRS05/Papiers/Session-6/amoros.pdf.

[20] Both inpatients and outpatients are considered; fatalities are not taken into account.

[21] A road traffic casualty includes at least one vehicle and happens on the public traffic network. Skateboarders and skaters are considered to be pedestrians. Single casualties (without being struck by a vehicle) of this road user are not considered.

[22] 1.6 million inhabitants, area includes the city Lyon its suburbs and a rural area in the north part.

[23] Including some 150 health care facilities: emergency departments, intensive care unit, surgery; rehabilitation departments of the country Rhône and close surroundings that may receive traffic crash victims.

highway) and the area of authority (gendarmerie, police, highway authority) were also evaluated in this paper.

2.1.2 Switzerland

In a Swiss study[24] on injuries in road traffic, already established extrapolation factors on police data were used to provide exhaustive figures on the issue.

Road user type	%
Pedestrian	37
Cyclist	12
Motorcycle	31
Moped	24
Car	39
Other	20

Table 2 – Probability of being reported to police authorities in Switzerland

As a result of this study it has been recommended to integrate a correction factor to injury figures reported in police data in Switzerland: the correction factor of 12% should be used for cyclists and for pedestrians a correction factor of 37% (see table).

2.1.3 The Netherlands

The Dutch SWOV Institute for Road Safety Research provides reporting rates on different road user types in an interactive web database. The rates for 2004 are as follows:

Road user type	Mortality in %	In-patient in %
Pedestrian	88	49
Cyclist	87	26
Moped	77	57
Motorcycle	92	56
Car/van	95	84
Lorry bus	100	100

Table 3 – Probability of being reported to police authorities in The Netherlands

It is generally assumed that all national road fatalities are recorded by the police. The highest reporting rate in road traffic fatalities is achieved by car/van casualties with 95%; the lowest reporting rate is in mopeds with 77%. Pedestrian fatalities account for 88% and cyclist fatalities for 87%. The reporting rate for in-patients is lower: only 26% of cyclist casualties and 49% of pedestrian casualties who needed in-patient medical care are reported. By comparing national statistics concerning causes of deaths and legal information on fatalities with police registration,

[24] Allenbach, R., Salvisberg, U., Brügger, O.. Schwerpunkte im Unfallgeschehen. Strassenverkehr, Sport, Haus und Freizeit [online]. R 0301. Schweizerische Beratungsstelle für Unfallverhütung (bfu), Bern 2003 [cited May 13, 2008]. Available from Internet: http://old.bfu.ch/forschung/ergebnisse/dokumentation/r0301_d.pdf.

Statistics Netherlands (www.cbs.nl) determines the real number of traffic fatalities. Consequently, it can be stated that even fatalities are not exhaustively reported by the police.

Missing reports on falls in pedestrians in public transport areas

Walking and cycling are modes of transport which improve health without polluting the air. They are "the ultimate 'zero carbon´ and environmentally friendly solution for personal transport" recommended by environmental experts.[25] Due to a higher life expectancy, the number of elderly is increasing in the EU. The mobility of the elderly and healthy activities like walking are key contributing factors to a high quality of life in all ages. Making walking and cycling in public transport areas as safe as possible is clearly an important public health issue.

As the transport sector has its main focus on road traffic injuries (injuries involving a moving vehicle) the definition of VRU used by the road traffic sector excludes FiP and injuries to other non-motorised road users such as inline skaters or wheelchairs on public roads. These injuries receive little recognition and have, therefore, not been included in systematic preventive activities of the road traffic sector so far. The following table illustrates the scope of interest of the road traffic sector:

Accident type	Pedestrians	Two wheelers
Collision with another road user	Yes	Yes
Accident without counterpart	**No**	Yes

Table 4 – Injuries to VRU as defined by the road traffic sector

To know the estimated size of the problem is necessary to improve the prevention of injuries due to FiPs in the future.

2.2 Definitions

Vulnerable Road User (VRU):

The term "vulnerable road user (VRU)" comes from the road traffic sector and has been defined by different organisations in a variety of ways:

Organisation for Economic Cooperation and Development (OECD): ""*Vulnerable road users" is a term applied to those most at risk in traffic. Thus, vulnerable road users are mainly those unprotected by an outside shield, namely pedestrians and two wheelers, as they sustain a greater risk of injury in any collision against a vehicle and are therefore highly in need of protection against such collisions. Among these, pedestrians and cyclists are those most unlikely to inflict*

[25] Chapman, L.. Transport and climate change: a review. School of Geography, Earth and Environmental Science, University of Birmingham, in: Journal of Transport Geography. Volume 15, Issue 5, September 2007, Pages 354-367.

injury on any other road user, while motorised two wheelers, with heavier machines and higher speeds, may present a danger to others."[26]

AVV-Transport Research Centre: "*Vulnerable Road Users" are someone with an increased chance of having an accident, with an increased chance of serious physical injury or death in the event of an accident, who has the feeling of being endangered by other road users, who has no protection, who is at risk of being endangered, without him/herself being a danger, who is dependant on the behaviour of others, who is at risk while not being a risk factor for others".*[27]

Falls in pedestrians (FiP):

The term "Falls in Pedestrians (FiP)" means pedestrian falling and injuring themselves in public transport areas without having a collision involving a vehicle.

Injuries to VRU & FiP:

For the duration of this report the following definition is used to show the estimated scale of casualties of pedestrians and two wheelers occurring on public roads in the EU from a public health point of view:

'Unintentional injuries to pedestrians, two wheelers and other non-motorised road users through collisions and falls in public transport areas.'

Public transport area:

The public transport area includes: pavements, pedestrian malls, cycle ways, motorways, public roads outside urban areas, public roads inside urban areas, unspecified roads, bus stations, railway areas, freight terminals, quays, track ways and vehicle access routes in docks, transport areas ("other" specified and unspecified). The transport area does not include transport areas under construction or transport by air and on water.

Hospital Discharge Database System (HDD): stands for data on in-patients treated in hospitals due to injuries to VRU and have been extrapolated to EU25**.**

Injury Database (IDB): stands for figures extrapolated to the EU scale (25 Member states of EU in 2004) on data provided by the Injury Data Base

[26] Organisation for Economic Co-operation and Development (OECD) (ed.). Safety of Vulnerable Road Users. Scientific Expert Group on the Safety of Vulnerable Road Users (RS7), Directorate for Science, Technology and Industry Programme of Cooperation in the Field of Research on Road Transport and Intermodal Linkages, Paris 1998, page 9.

[27] AVV Transport Research Centre (ed.). Work plan 2003 of the United Road Safety Organisations, Rotterdam 2003.

Police Database (Police DB): stands for data on non-fatal and fatal injuries provided by CARE and IRTAD. This data is gathered by national police authorities. The figures were extrapolated to the 25 Member States of the EU in 2004[28]

European Union: The European Union (EU) is used in this report as the community of 25 Member states which existed in 2004.[29]

2.3 Data sources

CARE[30]

The Community database on Accidents on the Roads in Europe (CARE) is a community database on road accidents resulting in death or injury (no statistics on damage only accidents). The major difference between CARE and most other existing international databases is the high level of desegregation, i.e. CARE is based on detailed data of individual accidents as collected by the Member States. Detailed data (road user type, age, gender, mortality, morbidity, collision type) on road traffic data is available for 2004 for the following countries: AT, BE, DK, ES, FI, FR, GB, GR, IT, NI, SE

EUROSTAT, data on health[31]

Data on health is shown by *public health* and *health and safety at work for about 30 countries* (27 EU and 3 non-EU Member States) beginning in 1994. Data on public health is divided into the following categories relevant for injuries: causes of death and health care: resources and patients (non-expenditure data).

„Data on causes of death (COD) provides information on mortality patterns and form a major element of public health information. COD data refers to the *underlying cause* which – according to the World Health Organisation (WHO) – is "the disease or injury which initiated the train of morbid events leading directly to death, or the circumstances of the accident or violence which produced the fatal injury". Causes of death are classified by the 65 causes listed in the "European shortlist" of causes of death. This shortlist is based on the International Statistical Classification of Diseases and Related Health Problems (ICD). COD data is derived from death certificates. The medical certification of death is mandatory in all Member States. Countries

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[28] Morbidity: BE: CARE, 2004; CZ: CARE, 2004; DK: CARE, 2004; DE: IRTAD, 2004; EE: CARE, 2004; EL: CARE, 2004; ES: CARE, 2004; FR: CARE, 2004; IE: CARE, 2003; IT: CARE, 2004; CY: CARE, 2004; LV: CARE, 2004; LT: CARE, 2004; LU: CARE, 2002; HU: CARE, 2004; MT: CARE, 2004; NL: IRTAD, 2004; AT: CARE, 2004; PL: CARE, 2004; PT: CARE, 2004; SI: CARE, 2004; SK: CARE, 2004; FI: CARE, 2004; SE: CARE, 2004; UK: CARE, 2004
Mortality: BE: CARE, 2004; CZ: CARE, 2004; DK: CARE, 2004; DE: IRTAD, 2004; EE: CARE, 2004; EL: CARE, 2004; ES: CARE, 2004; FR: CARE, 2004; IE: CARE, 2003; IT: CARE, 2004; CY: CARE, 2004; LV: CARE, 2004; LT: CARE, 2004; LU: CARE, 2002; HU: CARE, 2004; MT: CARE, 2004; NL: IRTAD, 2004; AT: CARE, 2004; PL: CARE, 2004; PT: CARE, 2004; SI: CARE, 2004; SK: CARE, 2004; FI: CARE, 2004; SE: CARE, 2004; UK: CARE, 2004

[29] AT, BE, CZ, DK, EE, ES, FI, FR, GE, EL, HU, IR, IT, LV, LT, LU, MT, NL, PL, PT, SL, SE, SK, UK (last data available)

[30] European Commission, Directorate General for Energy and Transport (DG TREN) (ed.). European Road Accident Database (CARE) [database online]. updated May 2008 [cited May 13, 2008]. Available from Internet: http://ec.europa.eu/transport/roadsafety/road_safety_observatory/care_en.htm.

[31] Statistical Office of the European Communities (Eurostat) (ed.). Population and social conditions [database online]. updated May 2008 [cited May 20, 2008].

code the information provided in death certificates using ICD codes defined by rules specified in the ICD."[32]

"Non-expenditure health care data supplies information on institutions providing health care in countries, on resources used and on output produced in the framework of health care provision. The output-related data ('hospital patients') refers to contact between patients and the health care system, and to the treatment received accordingly. Data is available for hospital discharges of in-patients and day cases, the average length of stay of in-patients and medical procedures performed in hospitals. Annual national and regional data is provided in absolute numbers and in population-standardised rates (per 100 000 inhabitants)."[33]

HDD[34]

The Hospital Discharge Database System (HDD) has been developed in the framework of the Apollo project under the Public Health Programme 2004 and contains data on in-patients treated in hospitals due to injuries for 13 countries at present. Data will be available for 22 European Countries, mainly for the year 2004 (if data was not available for 2004, data for 2003 or 2005 has been submitted to the HDD) in the future: AT, BG, BE, CZ, DK, EE, FI, GE, GR, HU, IR, IT, LV, MT, NO, PL, PT, SI, SK, ES, TU, UK. This tool has been developed under the auspices of the EU DG SANCO, in the framework of APOLLO project: grant agreement 2004119.

IDB[35]

The European Injury Database (IDB) is an internet database accessible to the public that was set up by DG SANCO under the Injury Prevention Programme in 1999 in order to provide central access to data collected in European Member States under the EHLASS Programme (European Home and Leisure Accident Surveillance System).

The IDB is the only register that through a set of hospitals provides information about external causes and the circumstances surrounding home and leisure accidents. In 2004 the data was entered systematically by the countries supplying the data: AT, DK, FR, NL, PT and SE.

IDB data contains a wide range of details on the injury: personal data (age and gender) of the injured party and information on how the injury happened: mechanism of the accident, the activity of the victim, information on products influencing the injury (separated into causing product, involved product and other product). The medical treatment provided, the type of injury and the body part injured are also defined.

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32 Statistical Office of the European Communities (Eurostat) (ed.). Causes of death, Eurostat Metadata in SDDS format: Base Page [online]. updated July 2007 [cited May 13, 2008]. Available from Internet: http://europa.eu.int/estatref/info/sdds/en/hlth/hlth_cdeath_base.htm

33 Statistical Office of the European Communities (Eurostat) (ed.). Health Care: resources and patients, Eurostat Metadata in SDDS format: Base Page [online]. updated May 2007 [cited May 13, 2008]. Available from Internet: http://europa.eu.int/estatref/info/sdds/en/hlth/hlth_care_base.htm http://europa.eu.int/estatref/info/sdds/en/hlth/hlth_care_base.htm.

34 University of Navarre Spain (UN) (ed.). Apollo WP2, The Burden of Injuries in the EU, Indicators and recommendations for Prevention and Control [database online]. updated February 2008 [cited May 14, 2008]. Available from Internet: https://www.unav.es/preventiva/apollo/asistente/.

35 European Commission, Directorate General for Health and Consumer Protection (DG SANCO) (ed.). EU Injury Database (IDB) [database online]. updated May 2008 [cited May 14, 2008]. Available from Internet: https://webgate.ec.europa.eu/idb.

A new version of IDB, the so called "all injury" database is running in several countries[36] already. This "all injury" IDB is not limited to just home and leisure accidents, but includes all injury types. In the new version, road traffic injuries and workplace injuries are recorded as well.

IRTAD[37]

The International Road Traffic and Accident Database (IRTAD) is an international database that gathers data on traffic and road accidents from 28 out of the 30 OECD Member countries.

IRTAD operates within the framework of the Joint OECD/ECMT Transport Research Centre. The main part of the database, with around 500 data items, includes aggregated data on injury accidents, road fatalities, vehicle numbers, network length and vehicle mileage from 28 countries (for 1965 and for every year since 1970).

Data on Germany is drawn from IRTAD; figures of other countries are based on CARE data.

WHOSIS[38]

"WHO Statistical Information System (WHOSIS) presents the most current and comprehensive health data on all of the 193 WHO Member States. The data, selected on the basis of quality and availability, relevance to global health and comparability across member nations, covers over 50 core health indicators, which are organized into six major areas: mortality and burden of disease, health service coverage, risk factors, health system inputs, differentials in health outcome and coverage, and basic socio-demographic statistics. These are published in the World Health Statistics that is released in May of each year."

WHO Mortality Database[39]

"The WHO Mortality Database shows the number of registered deaths by cause, sex and age, presented with population and live birth data (bottom of the table). Mortality rates by sex, age group and cause are presented for countries with a population of 500,000 or more. Rates are not computed for mortality data with very low registration levels. The data presented is that reported to WHO in a standardized format including ICD codes. As new data is received in WHO, they will be reflected in subsequent updates."

HFA-DB[40]

"The European Health for All Database (HFA-DB) is a central database of independent, comparable and up-to-date basic health statistics. It has been a key source of information on health in

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[36] AT, CY, LV, MT, NL, IT, IE, UK/Wales in 2007

[37] Organisation for Economic Co-operation and Development (OECD), International Transport Forum (CEMT) (ed.). International Traffic Safety Data (IRTAD) [database online]. updated March 2008 [cited May 13, 2008]. Available from Internet: http://www.cemt.org/irtad/IRTADPublic/index.htm.

[38] World Health Organisation (WHO) (ed.). WHO Statistical Information System (WHOSIS) [database online]. updated 2008 [cited May 14, 2008]. Available from Internet: http://www.who.int/whosis/en/.

[39] World Health Organisation (WHO) (ed.). WHO Statistical Information System (WHOSIS), Numbers and rates of registered deaths [database online]. updated 2006 [cited May 14, 2008]. Available from Internet: http://www.who.int/whosis/database/mort/table1_process.cfm.

[40] World Health Organisation (WHO) (ed.). European health for all database (HFA-DB) [database online]. updated: November 2007 [cited May 13, 2008]. Available from Internet: http://data.euro.who.int/hfadb/param.php.

the European Region since WHO/Europe launched it in the mid-1980s. It contains time series from 1970. HFA-DB is updated biannually and contains about 600 indicators for the 53 European WHO Member States. The indicators cover: basic demographics: health status (mortality, morbidity, maternal health and child health); health determinants (such as lifestyle and environment) and health care (resources and utilization)."

2.4 Limitations in data available

2.4.1 Data from the public health sector

Data on non-fatal injuries in the public health sector is provided by the European Injury Database (IDB)[41] and the Hospital Discharge Database System (HDD).

IDB:

IDB shows information on detailed interviews on the course of events leading to an injury requiring emergency care in selected hospitals. Data on less severe and severe injuries that have to be treated in hospitals is also collected. The interviews are conducted by trained interviewers using an extensive questionnaire and are recorded electronically. IDB estimates are provided at the national level, extrapolating the sample data to the national scale either by population based methods or by patient registry based methods depending on the availability of the data. The reliability of these IDB estimates for a particular country depends on the representativity of the selected hospital patients and the comparability of IDB estimates between countries – as is the case for all health data – it may be affected by differences in the health care system. The representativity of IDB data is affected by the type of the selected hospitals, their catchment area and the statistical distribution of the patients as regards age, gender, social background, etc. Although the IDB management team is continuously improving the framework, the representativity of the selected hospitals, of injuries or of the catchment population is not considered fully representative for all countries. Given this observation, it is recommended to use the IDB figures with necessary caution and - if possible - to consult other data sources for the interpretation of a specific result.

The IDB is the only data source in the EU that contains sufficient detail for developing preventive action against home and leisure accidents, and all injuries in the future, and should therefore be part of any comprehensive injury research.[42] The IDB will not be able to show reliable results on alcohol abuse[43,44] and disabilities[45] for the time being.

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41 European Commission, Directorate General for Health and Consumer Protection (DG SANCO) (ed.). EU Injury Database (IDB) [database online]. updated May 2008 [cited May 14, 2008]. Available from Internet: https://webgate.ec.europa.eu/idb.

42 Austrian Road Safety Board (KfV) (ed.): Calculation of IDB Incidence Rates "IDB Population", Task Force Report, Vienna 2007.

43 A review of IDB data on alcohol use among VRU & FiP shows that only 3% of the casualties occur under influence of alcohol. This number seems too narrow to be taken into account. It can be assumed that the number alcohol abuse is highly under-reported.

44 The Finnish Motor Insurers' Centre analysed fatal accidents in Finland during 1997-2002 investigated by the Finnish road accident investigation teams and noted that two in every three fatal pedestrian and cyclists accidents are caused by the pedestrian or cyclist him/herself. 31% were drunk at the time of the accident. Finnish Motor Insurers' Centre, press release dd. 13 October 2006.

45 In the actual version of IDB no categories of disabilities are available for coding.

HDD:

The data registered in the Hospital Discharge Database System (HDD) developed under the auspices of APOLLO WP2 "The burden of injuries in Europe" is on in-patients only and has been reported by hospital staff due to administrative reasons concerning payment of hospital services for each in-patient. This data shows only more severe injuries (only one part of the total picture) and is not intended primarily for preventive activities. The coding systems that are used for registering hospital data are the ICD 9 and 10 coding systems of the World Health Organisation (WHO).[46,47] The main limitations of the data are the limited level of coding categories relating to mechanisms of injuries used by countries: the four-character subcategories are not used by each member state and are therefore not available for the whole EU. In this report, hospital data of selected countries had to be extrapolated to the EU25. The HDD provides indicators on various causes of injuries for reporting activities. For this report only injuries to pedestrians and two wheelers due to crashes involving motorised vehicles could be selected and analysed. Injuries due to single (vehicle) accidents and crashes involving non-motorised vehicles in public transport areas could not be analysed as these injuries were summarised together with injuries that occurred on non-public roads. Falls in pedestrians could not be selected as these injuries are coded under falls (W03) and are not defined as transport accidents in ICD10. Consequently a high percentage of injuries falling within the scope of this study could not be included in the results.

The following databases from the public health sector could not be used:

EUROSTAT data on health:

"The quality of the data is subject to the way in which health care provision is organised in countries, and which information is available to and collected by the respective institutions."[48]

The sub-category *causes of death* provides the following indicators on accidents and injuries, suicide and violence: accidents (V01-X59), transport accidents (V01-V99), accidental falls (W00-W19), accidental poisoning (X40-X49) suicide and intentional self-harm (X60-X84), homicide, assault (X85-Y09)

The indicator *health care: resources and patients,* shows data on health care staff, health care facilities and hospital patients. Hospital patients are divided into different types of diagnosis include for example *Injury, poisoning and certain other consequences of external causes (S00-T98).*

As only three digits are coded, no distinction between pedestrians and two wheelers is possible. C*auses of death* injuries due to falls can be selected but not the location "transport area". Therefore this data source could not be used for the analysis concerning injuries to VRU and FiP.

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[46] World Health Organisation (WHO) (ed.). The WHO Family of International Classifications [online]. updated 2008 [cited May 20, 2008]. Available from Internet: http://www.who.int/classifications/en/.

[47] World Health Organisation (WHO) (ed.). International Statistical Classification of Diseases and Related Health Problems 10th Revision, Version for 2007 [online]. updated May 2006 [cited May 14, 2008]. Available from Internet: http://www.who.int/classifications/apps/icd/icd10online/.

[48] Statistical Office of the European Communities (Eurostat) (ed.). Health Care: resources and patients, Eurostat Metadata in SDDS format: Base Page [online]. updated May 2007 [cited May 13, 2008]. Available from Internet: http://europa.eu.int/estatref/info/sdds/en/hlth/hlth_care_base.htm.

WHOSIS:

The only available indicator on injuries is the *age-standardized mortality rate for injuries (per 100 000 population).*[49] There is no possibility to get data on VRU or FiP in transport areas by this database.

WHO Mortality Database:

This database provides data on indicators on the basis of the WHO ICD-10 coding system describing injuries due to motor vehicle accidents (V02-V04, V09, V12-V14, V19-V79, V86-V89), other transport accidents (V01, V05-V06, V10, V11, V15-V18, V80-V85, V90-V99) and accidental falls (W00-W19) for the countries of the European Region. These indicators cannot be split into data on injuries to pedestrians and two wheelers as only the ICD-10 three digit codes have been used.[50]

HFA-DB:

The HFA-DB shows indicators on mortality for motor vehicle and transport accidents and morbidity data on injuries and poisoning. There is no information available on injuries to VRU and FIP.[51]

2.4.2 Data from the road traffic sector

Data in the road traffic sector is provided by CARE (Community database on Accidents on the Roads in Europe) and IRTAD (International Road Traffic and Accident Database) on an individual or aggregated scale as collected by Member States. This data on non-fatal and fatal casualties, based on police reports, provides detailed information about accidents involving a (mostly moving motorised) vehicle. Many reports on the under-reporting in police data have been published by various institutions. The number of casualties involving non–motorised road users (bicyclists and pedestrians) and single accidents which are not reported within this Police Database is considerable[52]. Studies on under-reporting in police data[53] point out that the police is not called on scene for non-fatal single bicycle injuries and that these injuries are only sometimes registered under IRTAD or CARE. Police data is gathered by national police authorities of the Member States when called to a road injury. There are significant differences in the quantity and quality of records depending on the procedures used by the different Member States. In general, the more severe an injury is, the more likely it is to be reported in police databases: data on mortality is nearly always registered - Police data shows mortality figures for almost every country and detailed mortality data for twelve countries of the EU - whereas the reporting of non-fatal injures is subject to major variations. Single (vehicle) accidents in VRU are rarely reported.

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49 World Health Organisation (WHO) (ed.). WHO Statistical Information System (WHOSIS), Core Health Indicators [database online]. updated 2006 [cited May 14, 2008]. Available from Internet: http://www.who.int/whosis/database/core/core_select_process.cfm.

50 World Health Organisation (WHO) (ed.). WHO Statistical Information System (WHOSIS), Numbers and rates of registered deaths [database online]. updated 2006 [cited May 14, 2008]. Available from Internet: http://www.who.int/whosis/database/mort/table1_process.cfm.

51 World Health Organisation (WHO) (ed.). European health for all database (HFA-DB) [database online]. updated: November 2007 [cited May 13, 2008]. Available from Internet: http://data.euro.who.int/hfadb/param.php.

52 Hvoslef, H.. Under–Reporting of road traffic accidents recorded by the police, at the international level. Operational Committee of IRTAD and Norwegian Public Roads Administration, Oslo 1994.

53 Public Road Administration (ed.). IRTAD special report “Under-reporting of road traffic accidents recorded by the police at the international level; Norway, 1994.

3 Aims

To date the safety of VRU has only been addressed by the transport sector, it is not yet a priority issue for the health sector so far. From the point of view of public health, there is no sufficient reporting on non-collision accidents, especially those involving pedestrians and cyclists[54] and the vast number of injuries due to falls on public roads has scarcely been acknowledged[55]

To improve this situation, the following main goals have been identified:

- To provide a definition of road injuries to VRU covering all injuries on roads, also including FiP, by taking into consideration existing definitions e.g. by the OECD;
- To establish an overview of the estimated scope of injuries to VRU, including FiP, in public transport areas using IDB, HDD, IRTAD/CARE databases; data on VRU and FiP in pedestrians will be shown by separate tables;
- To define indicators for a better surveillance of these injuries to be included in the ECHI list;
- To define priority areas for tailor-made actions and preventative measures.

This report addresses experts on injury prevention and policy makers in the public health and the transport sector.

[54] Hvoslef, H.. Under-Reporting of road traffic accidents recorded by the police, at the national level, Operational Committee of IRTAD and Norwegian Public Roads Administration, Oslo 1994 in: Kisser, R., Körmer, C., Sengölge. M.. Actions for the public health sector to improve road traffic safety. Task force on road safety of the working party on accident and injuries, Vienna 2005, page 8.

[55] Kisser, R., Körmer, C., Sengölge. M.. Actions for the public health sector to improve road traffic safety. Task force on road safety of the working party on accident and injuries, Vienna 2005, page 8.

4 Methods

To estimate the scope of injuries that happen to pedestrians and two wheelers on public roads in the EU, police data can only supply one part of the whole picture. For a broader view, data sources from the EU level have been combined in this report: the European Injury Database (IDB) by the public health sector which provides detailed information on non-fatal home and leisure injuries; a Hospital Discharge Database System (HDD) developed under the auspices of APOLLO WP2 "The burden of injuries in Europe" which shows more severe injuries to VRU due to accidents with a motorised vehicle that result in a hospital admission; and the International Road Traffic and Accident Database (IRTAD) and the Community Database on Accidents on the Roads in Europe (CARE) which use police data on road traffic injuries and fatalities.

4.1 Data extrapolation to EU25

In order to give an estimated range of injuries to pedestrians, two wheelers and skaters in public transport areas in the EU25, existing figures in data samples have been extrapolated to the population figures of the EU. Data availability varies depending on the type of data and the data sources. Hence, once the figure for the given entity is established, a small data share can also be extrapolated to the population of 25 Member States of the EU. Population rates on age and gender are taken from Eurostat 2004. This method shows a rough estimate of injuries to VRU & FiP in the EU and is referred to by other statistical publications[56].

An extrapolation procedure is a commonly used way to show an estimated number of casualties for a bigger population. In this report the following extrapolation procedure is used: first the average percentage of a data subset is established which is then multiplied with the sum of the dataset in order to find the estimated number of the subset of the total. For example, the number of registered road casualties in the EU shows 43,401 fatalities; several countries give detailed figures on death figures of VRU. The average percentage of fatal VRU injuries to all fatalities of the given countries was calculated. The average percentage of VRU deaths in all road deaths is 38%. This percentage was multiplied by the total sum of fatalities to show that an estimated number of 16,492 VRU were killed on roads in the EU in 2004.[57]

The figures and incidence rates presented rely on calculations and show a rough estimate. The more detailed the data that is available, the more precise the estimation. Police data on mortality relies on the biggest dataset, followed by morbidity data extrapolation. Extrapolation from IDB data shows a higher extrapolation rate.

4.1.1 IDB: Selection criteria and national estimates extrapolated to EU25

IDB data has been observed over several years, proving a stable sample composition. In 2004 six countries provided data on injuries to IDB. The analysed data is provided by five relatively secure old European countries: AT, DK, FR, NL and SE. PT had to be excluded as the data could not be divided into injuries to pedestrians and cyclists. It is presumed that other European countries and especially new Member States show higher rates than estimated. Until further

[56] Kuratorium für Verkehrssicherheit KfV (Austrian Road Safety Board): Injuries in the European Union. Statistics summary 2003-2005. Issue II. Austrian Road Safety Board (KfV), Department for Home, Leisure and Sports, Vienna 2007, ISBN: 978-3-7070-0081-8.

[57] See table 6 in chapter "Results and discussion"

data collections are undertaken in a broader geographical area, the results are limited to this rough estimate on injuries. The figures show exemplary estimations and no exact number of injuries. The IDB is continuously being improved, and more and more countries are joining the database: in 2006/2007 already twelve countries submitted their data so the extrapolations are becoming more precise.

The used IDB data shows the national number of injuries (number of cases multiplied by IDB country factor) occurring in the transport areas as a basic set ("IDB – transport area"). The number of injuries to pedestrians, cyclists and skaters constitutes a subset. Pedestrians, cyclists and skaters have been selected by the following criteria from all IDB entries (V2000 coding) in 2004:

Category	Variable level 1	Code	Variable level 2	Code (detailed)
Location	Transport area	0	All variables in transport areas	01-09
Activity	Play and leisure activity	4	Play	40
			Play and leisure activity, other specified	48
			Play and leisure activity, unspecified	49
	Sports, athletics and exercise	5	Sports, athletics	51
			Sports activity, other specified	58
			Sports activity, other unspecified	59
	Other specified activity	8	General walking around	80
	Unspecified activity		Unspecified activity	99
Sports	Athletic	A	Running	A0
			Jogging	A04
			Walking	A05
			Running, other specified	A08
			Running, other unspecified	A09
	Sports with and without wheels, non-motorised	F	Cycling	F0 (F00-F09)
			Roller-skating, skateboarding etc.	F3 (F30-F39)

Table 5 – IDB selection criteria: injuries to pedestrians, two wheelers and skaters in transport areas

These criteria select data on injuries to pedestrians in AT and FR by "activity = general walking around; play, play and leisure activity, other specified; play and leisure activity, unspecified", cyclists by "sports=cycling" and skaters by=roller-skating; skateboarding etc. As the coding variables in 2004 were different to V2000 in DK, NL and SE, this data comes from the national IDB systems. The analysed injury data for 2004 of DK comes from the so called "Danish Injury Register", the injuries of the NL come from the "Dutch Injury Surveillance System 2004, Consumer Safety Institute" and the data of SE (2004) has been provided by the "Epidemiological Centre, The National Board of Health and Welfare, Sweden". The national estimates of injuries due to falls in pedestrians in non-fatal home and leisure injuries without sport were calculated to the average percentage of these five countries and then extrapolated to the EU25.

The national estimates of injuries to skaters of these five countries were calculated per 1 million inhabitants of each country and also for the total of all five countries. This morbidity rate for the total of all five countries has been used to extrapolate the injuries to skaters to EU25.

As injuries to cyclists in transport areas are defined as “traffic accidents”, DK, NL and SE did not submit this kind of injury to the IDB (which was defined as a home and leisure accident database in 2004). Data on cyclist injuries (including also crashes with motorised road users) of DK, NL and SE has been provided by national IDB systems already recording all injuries (including traffic and occupational accidents as well as injuries due to suicide and violence). FR provided data on cyclists as traffic accidents to the IDB. AT submitted information on injuries to cyclists due to single vehicle accidents and crashes with non-motorised road users to IDB. It has been assumed that only a few cyclist injuries due to crashes with non-motorised road users in transport areas were also reported to the Police DB. In the Austrian IDB system, casualties involving a motorised vehicle are not registered. The percentages of national estimated total cyclist injuries that were reported to the Police DB were calculated by country and for all countries in total. This final figure has been used to extrapolate to the estimated total number of cyclist injuries in the EU25.

Incidence rates by age groups have been calculated per 1 million inhabitants as also done by the road traffic sector.

4.1.2 HDD: Selection criteria and extrapolation to EU25

Data from a Hospital Discharge Database System (HDD) developed under the auspices of APOLLO WP2 “The burden of injuries in Europe” have been used to estimate injuries to motorised two wheelers, cyclists and pedestrians as a result of a crash with a motorised vehicle. These injuries represent one part of traffic injuries involving motorised vehicles on public roads and are defined by WHO ICD-10 coding system (chapter “transport injuries”[58]).[59]

The following indicators have been selected to estimate injuries to motorised two wheelers, cyclists and pedestrians, as explained above:

- Rate of eligible HDD related to motor vehicle traffic, motorcyclist:[60]
- ICD10 coding variables: V20–V28 (.3–.9), V29 (.4–.9), V30–V39 (.4–.9)
- Rate of eligible HDD related to motor vehicle traffic, pedal cyclist:[61]
- ICD10 coding variables: V12–V14 (.3–.9), V19 (.4–.6),
- Rate of eligible HDD related to motor vehicle traffic, pedestrian: [62]
- ICD10 coding variables: V02–V04 (.1, .9), V09.2

The HDD shows injury risk rates calculated per 100,000 inhabitants.

Countries for the extrapolation procedure were selected by data availability (not all countries code the four-character subcategories of external causes of morbidity and mortality) as regards the selected indicators. Mainly data from 2004 has been analysed.

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58 World Health Organisation (WHO) (ed.). Definitions related to transport accidents [online]. updated December 2006 [cited May 14, 2008]. Available from Internet: http://www.who.int/classifications/apps/icd/icd10online/defs.htm.

59 World Health Organisation (WHO) (ed.). International Statistical Classification of Diseases and Related Health Problems 10th Revision, Version for 2007 [online]. updated May 2006 [cited May 14, 2008]. Available from Internet: http://www.who.int/classifications/apps/icd/icd10online/.

60 Based on seven countries: CZ, EE, ES, FI, HU, NL, PT

61 Based on four countries: CZ, FI, HU, NL

62 Based on six countries: CZ, EE, ES, FI, HU, PT

4.1.3 Police DB: data extrapolation to EU25

Road traffic data is composed of non-fatal and fatal casualties. Detailed data on mortality is provided by 21 countries[63] with overview figures being provided by four countries[64]. Detailed data on morbidity is provided by 12 countries[65] and overview figures are given by 13 countries[66]. Detailed data is provided principally by *old* European countries; probably giving a safer picture than that of the new Member States. It still has to be acknowledged though, that the possibility of a high number of unreported injuries exists in all countries. The period of analysis for this report is 2004 or latest available data.

4.1.4 Police DB: data extrapolation to EU25 + 2 Candidate Countries

In the executive summary data on mortality and morbidity to VRU as reported by the Police DB have been extrapolated to the average population of the EU25 + 2 Candidate Countries (Bulgaria/BG and Romania/RO) in 2004 to show the estimated fatalities and injuries also for the current EU27. In 2004 RO reported 2,418 and BG 943 fatalities due to traffic injuries in 2004.[67] The total population on average was 489,765,036 inhabitants in the EU25 + 2 Candidate Countries (BG and RO) in 2004.[68]

[63] BE, CZ, DK, DE, EE, EL, ES, FR, IE, IT, LV, LU, HU, MT, NL, AT, PL, PT, FI, SE, UK

[64] CY, LT, SI, SK

[65] BE, DK, DE, EL, ES, FR, IT, NL, AT, FI, SE, UK

[66] CZ, EE, IE, CY, LV, LT, LU, HU, MT, PL, PT, SI, SK

[67] European Commission, Directorate General for Energy and Transport (DG TREN) (ed.). Energy and Transport in Figures 2007, Part 3: Transport [online]. [cited May 13, 2008]. Available from Internet: http://ec.europa.eu/dgs/energy_transport/figures/pocketbook/doc/2007/2007_transport_en.pdf.

[68] Eurostat Population data, yearly average 2004

5 Results and discussion

The results on injuries to VRU and FiP are shown in different chapters. Detailed tables present extrapolated figures on mortality and morbidity by gender and age group (incidence rates). Road user groups among VRU are presented in separate chapters on motorised VRU (motorised two wheelers) and non-motorised VRU (namely pedestrians and cyclists). Data on gender and age of non-motorised VRU as registered by the Police DB cannot be divided into cyclists and pedestrians at an EU level.

5.1 Vulnerable road users (VRU)

5.1.1 Mortality in VRU by road user

The following table shows the mortality figures provided by the Police DB (gathered by CARE and / or IRTAD) by country in absolute figures and the estimated figure for VRU for the EU25. Mortality figures from the Police DB on road traffic accidents in general are available for all EU25 countries. The numbers of all road traffic fatalities are the basic sets; fatalities to VRU have a double function: VRU act as a subset to all road traffic injuries and as a basic set for the sub–grouping of fatal injuries to VRU non–motorised and VRU motorised.

The risk rate of having a fatal injury is almost two thirds for non–motorised VRU and more than one third for motorised VRU.

Country	Population	All road traffic fatalities	Motorised & non-motorised VRU	IR per 1 million inhabitants	%	Non-motorised VRU	%	Pedestrian	%	Cyclist	%	Motorised VRU	%
AT	8.173.323	878	332	41	38%	190	57%	132	69%	58	31%	142	43%
BE	10.421.137	1.162	333	32	29%	180	54%	101	56%	79	44%	153	46%
CZ	10.216.016	1.382	514	50	37%	412	80%	281	68%	131	32%	102	20%
CY	739.771	117											
DE	82.516.260	5.842	2.293	28	39%	1.313	57%	838	64%	475	36%	980	43%
DK	5.404.523	369	165	31	45%	96	58%	43	45%	53	55%	69	42%
EE	1.349.290	170	71	53	42%	69	97%	59	86%	10	14%	2	3%
EL	11.061.701	1.670	751	68	45%	317	42%	293	92%	24	8%	434	58%
ES	42.691.689	4.741	1.531	36	32%	771	50%	683	89%	88	11%	760	50%
FI	5.228.172	375	109	21	29%	75	69%	49	65%	26	35%	34	31%
FR	62.324.407	5.530	1.957	31	35%	758	39%	581	77%	177	23%	1.199	61%
HU	10.107.146	1.296	581	57	45%	509	88%	326	64%	183	36%	72	12%
IE	4.068.453	379	129	32	34%	74	57%	64	86%	10	14%	55	43%
IT	58.175.310	5.625	1.501	26	27%	1.006	67%	710	71%	296	29%	495	33%
LT	3.435.591	752											
LU	453.300	49	7	15	14%	7	100%	6	86%	1	14%	0	0%
LV	2.312.819	516	249	108	48%	227	91%	197	87%	30	13%	22	9%
MT	401.268	13	6	15	46%	2	33%	2	100%	0	0%	4	67%
NL	16.281.779	804	376	23	47%	225	60%	68	30%	157	70%	151	40%
PL	38.182.222	5.712	2.858	75	50%	2.677	94%	1986	74%	691	26%	181	6%
PT	10.501.970	1.294	582	55	45%	280	48%	233	83%	47	17%	302	52%
SE	8.993.531	480	168	19	35%	94	56%	67	71%	27	29%	74	44%
SI	1.997.012	274											
SK	5.382.438	603											
UK	59.879.864	3.368	1.437	24	43%	830	58%	694	84%	136	16%	607	42%
EU21	448.744.180	41.655	15.950	36	38%	10.112	63%	7.413	73%	2.699	27%	5.838	37%
Min					14%		33%		30%		0%		0%
Max					50%		100%		100%		70%		67%
EU25	460.298.992	43.401	16.492	36	38%	10.390	63%	7.585	73%	2.805	27%	6.102	37%

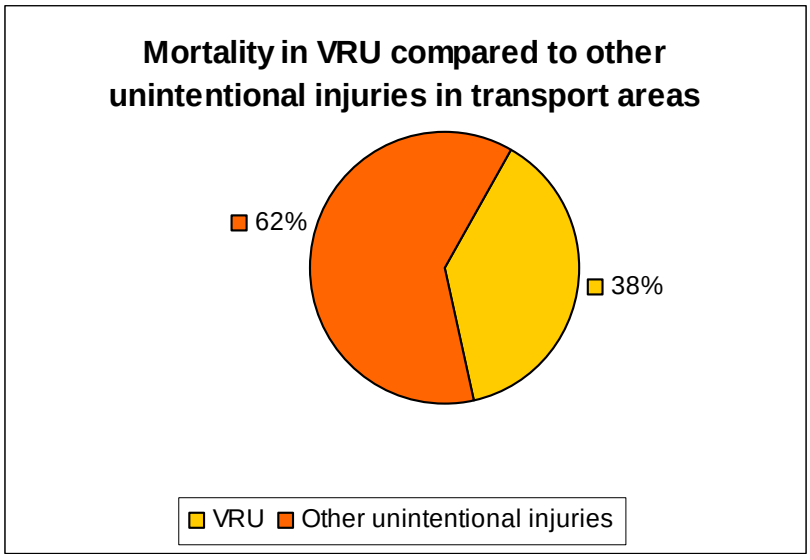
Table 6 – Police DB: mortality data extrapolation to EU25[69]

[69] BE: CARE, 2004; CZ: CARE, 2004; DK: CARE, 2004; DE: IRTAD, 2004; EE: CARE, 2004; EL: CARE, 2004; ES: CARE, 2004; FR: CARE, 2004; IE: CARE, 2003; IT: CARE, 2004; CY: CARE, 2004; LV: CARE, 2004; LT: CARE, 2004; LU: CARE, 2002; HU: CARE, 2004; MT: CARE, 2004; NL: IRTAD, 2004; AT: CARE, 2004; PL: CARE, 2004; PT: CARE, 2004; SI: CARE, 2004; SK: CARE, 2004; FI: CARE, 2004; SE: CARE, 2004; UK: CARE, 2004

The following table and graph show the mortality of VRU and other unintentional fatalities of motorised road users in extrapolated figures and percentages, of which 38% are to VRU. Most fatalities in the transport area are due to motorised traffic casualties.

Fatalities	Police DB	%
VRU fatalities	16.492	38
Other unintentional traffic fatalities	26.909	62
Total	**43.401**	**100**

Table 7 – Mortality in VRU compared to other unintentional traffic fatalities in transport areas

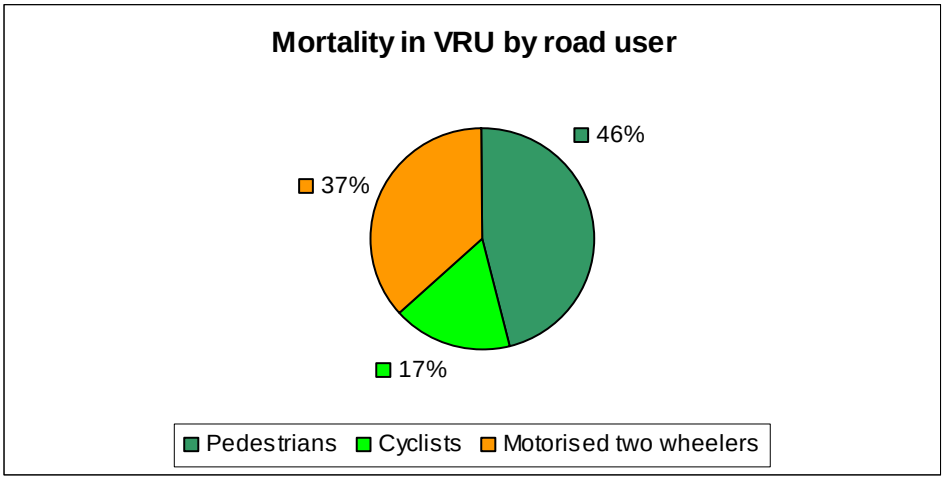


Graph 1 – Mortality in VRU compared to other unintentional injuries in transport areas

The mortality rate among VRU is highest amongst pedestrians, accounting for 46% of the total number, followed by motorised two wheelers with 37%. 17% of all VRU fatalities reported to police concern cyclists.

Road user	Police DB	%
Pedestrians	7.585	46%
Cyclists	2.805	17%
Motorised two wheelers	6.102	37%
Total	**16.492**	**100%**

Table 8 – Mortality in VRU by road user



Graph 2 – Mortality in VRU by road user

5.1.2 Morbidity in VRU by road user

The Police DB shows extrapolated figures on non-motorised and motorised VRU and the percentages of pedestrians and two wheelers. The road-user type “motorised” comprises “mopeds” and “motor cycles” as the police record the difference in vehicles in their surveys. 35% of all road traffic injuries that were collected by police affected VRU. The ratio of non-motorised and motorised VRU is 50:50. Non-motorised VRU are split into 49% pedestrians and 51% cyclists. The rate of injuries to cyclists and to pedestrians is also almost equal: 26% of VRU injuries affect cyclists and 24% involve pedestrians.

Police DB	Road traffic injuries
VRU injuries	610 200
Non-motorised VRU	305 100
Motorised VRU	305 100
Pedestrians	149 500
Cyclists	155 600
Total road traffic injuries (absolute number)	**1.743 512**

Table 9 – Morbidity in VRU by road user

Country	Population	All road traffic injuries	IR per 1 million inhabitants	Motorised & non-motorised VRU	%	Non-motorised VRU	%	Pedestrian	%	Cyclist	%	Motorised VRU	%
AT	8.173.323	55.857	6.834	17.738	32%	9.692	55%	4.270	44%	5.422	56%	8.046	45%
BE	10.421.137	58.805	5.643	19.524	33%	10.975	56%	4.041	37%	6.934	63%	8.549	44%
CZ	10.216.016	34.254	3.353										
CY	739.771	3.176	4.293										
DE	82.516.260	440.126	5.334	159.451	36%	107.239	67%	34.077	32%	73.162	68%	52.212	33%
DK	5.404.523	7.546	1.396	3.453	46%	2.050	59%	674	33%	1.376	67%	1.403	41%
EE	1.349.290	2.875	2.131										
EL	11.061.701	21.849	1.975	10.697	49%	2.930	27%	2.756	94%	174	6%	7.767	73%
ES	42.691.689	138.375	3.241	45.481	33%	13.749	30%	11.438	83%	2.311	17%	31.732	70%
FI	5.228.172	8.791	1.681	2.697	31%	1.617	60%	643	40%	974	60%	1.080	40%
FR	62.324.407	108.727	1.745	49.813	46%	18.227	37%	13.810	76%	4.417	24%	31.586	63%
HU	10.107.146	28.050	2.775										
IE	4.068.453	7.579	1.863										
IT	58.175.310	316.630	5.443	115.762	37%	29.853	26%	18.285	61%	11.568	39%	85.909	74%
LT	3.435.591	7.862	2.288										
LU	453.300	1.079	2.380										
LV	2.312.819	6.416	2.774										
MT	401.268	1.190	2.966										
NL	16.281.779	34.181	2.099	16.728	49%	9039	54%	1.671	18%	7.368	82%	7689	46%
PL	38.182.222	64.661	1.693										
PT	10.501.970	52.009	4.952										
SI	8.993.531	18.723	2.082										
SK	1.997.012	11.190	5.603										
SE	5.382.438	26.582	4.939	6.368	24%	3.744	59%	1.582	42%	2.162	58%	2.624	41%
UK	59.879.864	286.979	4.793	75.780	26%	50.724	67%	34.210	67%	16.514	33%	25.056	33%
EU12	**367.540.603**	**1.504.448**	**4.093**	**523.492**	**35%**	**259.839**	**50%**	**127.457**	**49%**	**132.382**	**51%**	**263.653**	**50%**
MIN					**24%**		**26%**		**18%**		**6%**		**33%**
MAX					**49%**		**67%**		**94%**		**82%**		**74%**
EU25	**460.298.992**	**1.743.512**	**3.788**	**610.229**	**35%**	**305.115**	**50%**	**149.506**	**49%**	**155.608**	**51%**	**305.115**	**50%**

Table 10 – Police DB: morbidity data extrapolation to EU25[70]

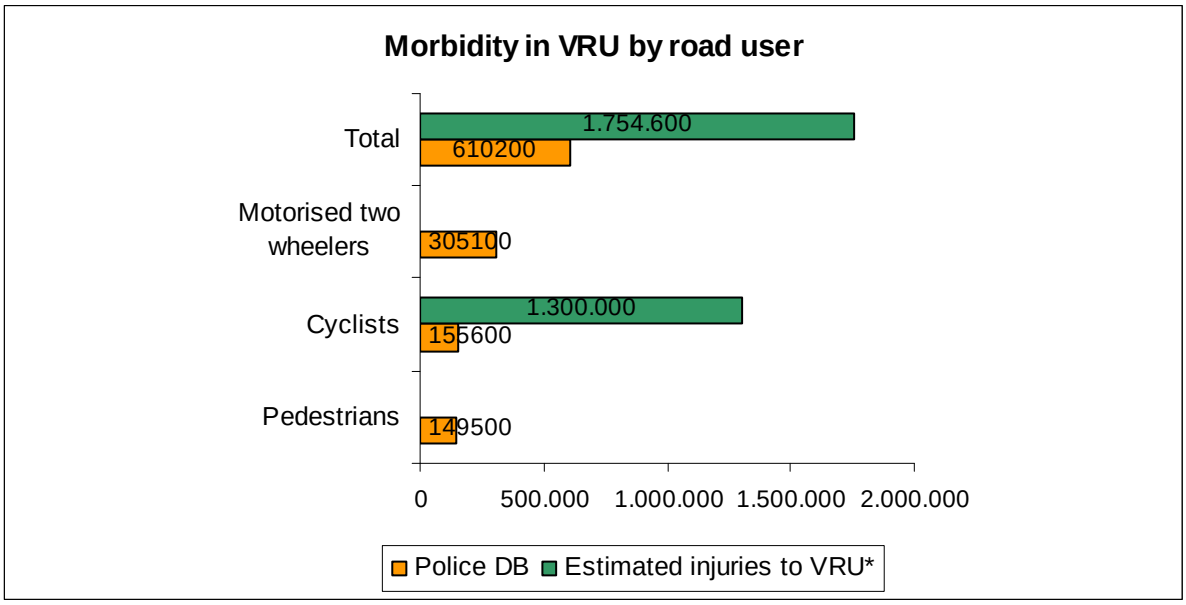
[70] BE: CARE, 2004; CZ: CARE, 2004; DK: CARE, 2004; DE: IRTAD, 2004; EE: CARE, 2004; EL: CARE, 2004; ES: CARE, 2004; FR: CARE, 2004; IE: CARE, 2003; IT: CARE, 2004; CY: CARE, 2004; LV: CARE, 2004; LT: CARE, 2004; LU: CARE, 2002; HU: CARE, 2004; MT: CARE, 2004; NL: IRTAD, 2004; AT: CARE, 2004; PL: CARE, 2004; PT: CARE, 2004; SI: CARE, 2004; SK: CARE, 2004; FI: CARE, 2004; SE: CARE, 2004; UK: CARE, 2004

The following table and graph show the morbidity to VRU by data source and road users in extrapolated figures and percentages of the total road user type. Only 12% of the injuries to cyclists were registered by police databases.

Road user	Police DB	%	Estimated injuries to VRU*	%
Pedestrians	149.500	-	-	100
Cyclists	155.600	12	1.300.000[71]	100
Motorised two wheelers	305.100	-	-	100
Total	610.200	35	1.754.600	100

*Sources: Danish Injury Register, Denmark 2004; Dutch Injury Surveillance System 2004, Consumer Safety Institute; IDB 2004, Epidemiological Centre, The National Board of Health and Welfare, SE; EU IDB 2004

Table 11 – Morbidity in VRU by road user



Graph 3 – Morbidity in VRU by road user

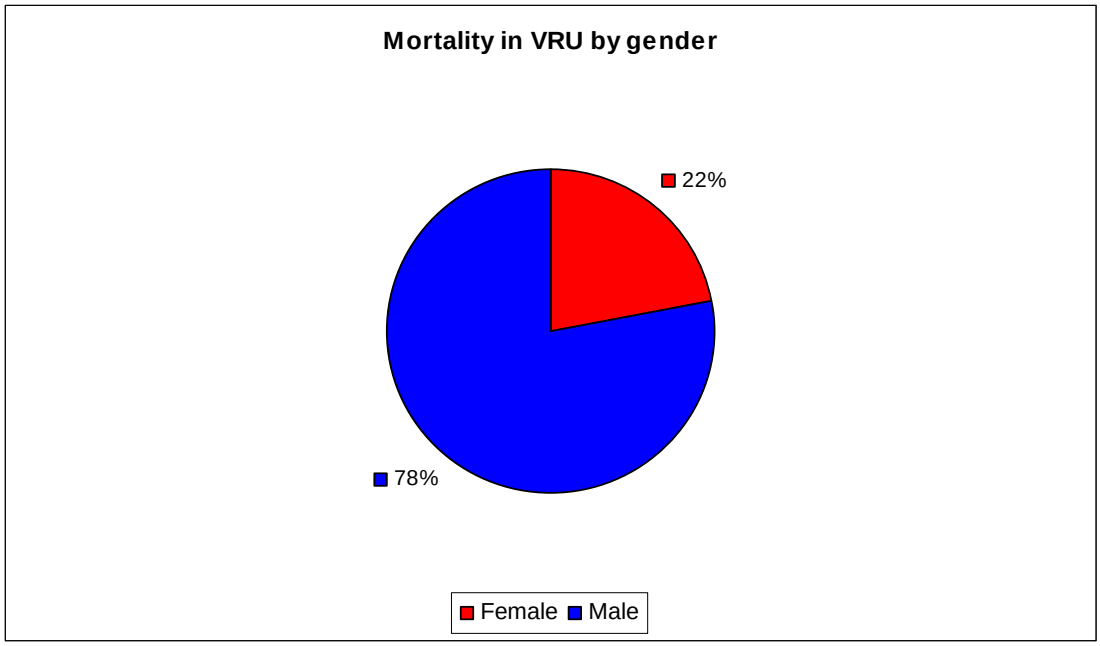
[71] For extrapolation procedure of cyclist injuries see chapter “Cyclists”, page 46, table 28.

Mortality in VRU by gender

As reported by the police authorities almost 80% of all fatal injuries to VRU affect males.

Gender	Police DB	%
Female	3.628	22
Male	12.864	78
Total	**16.492**	**100**

Table 12 – Mortality in VRU by gender



Graph 4 – Mortality in VRU by gender

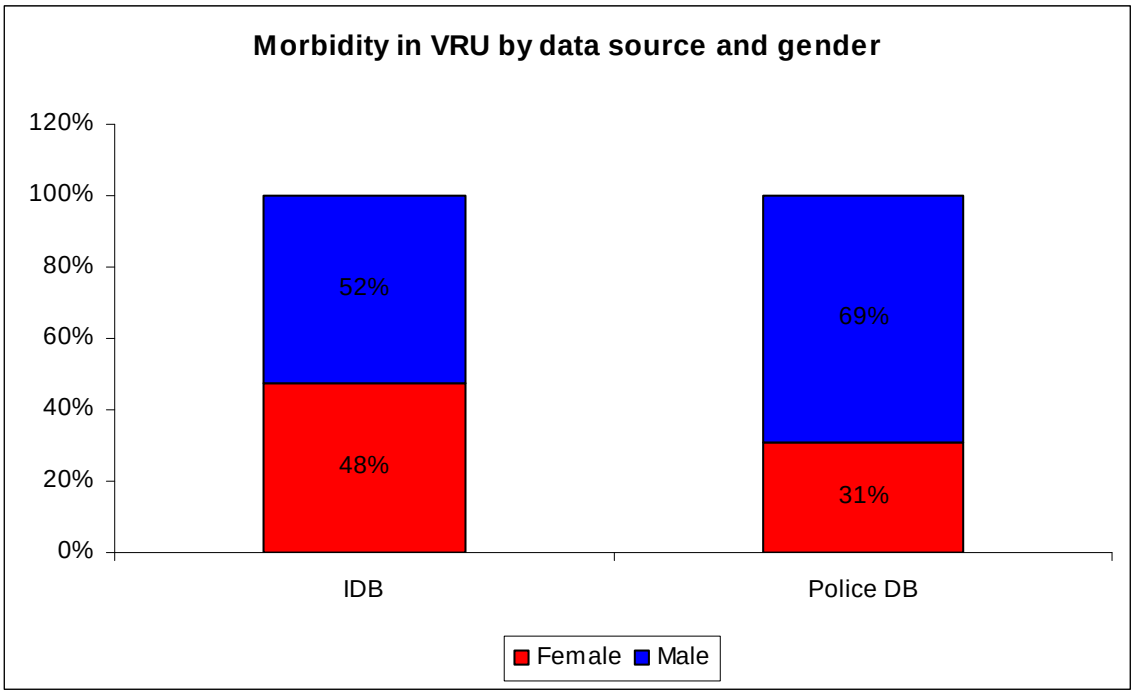
5.1.3 Morbidity in VRU by gender

Looking at morbidity figures in total, almost 60% of all non-fatal injuries to VRU happen to males and about 40% to females.

Gender	IDB*	%	Police DB (excl. cyclist injuries)	%	Total	%
Female	617.546	48%	140.926	31%	758.472	43%
Male	682.454	52%	313.674	69%	996.128	57%
Total	**1.300.000**	**100%**	**454.600**	**100%**	**1.754.600**	**100%**

*Sources: Danish Injury Register, Denmark 2004; Dutch Injury Surveillance System 2004, Consumer Safety Institute; IDB 2004, Epidemiological Centre, The National Board of Health and Welfare, SE; EU IDB 2004

Table 13 – Morbidity in VRU by data source and gender



Graph 5 – Morbidity in VRU by data source and gender

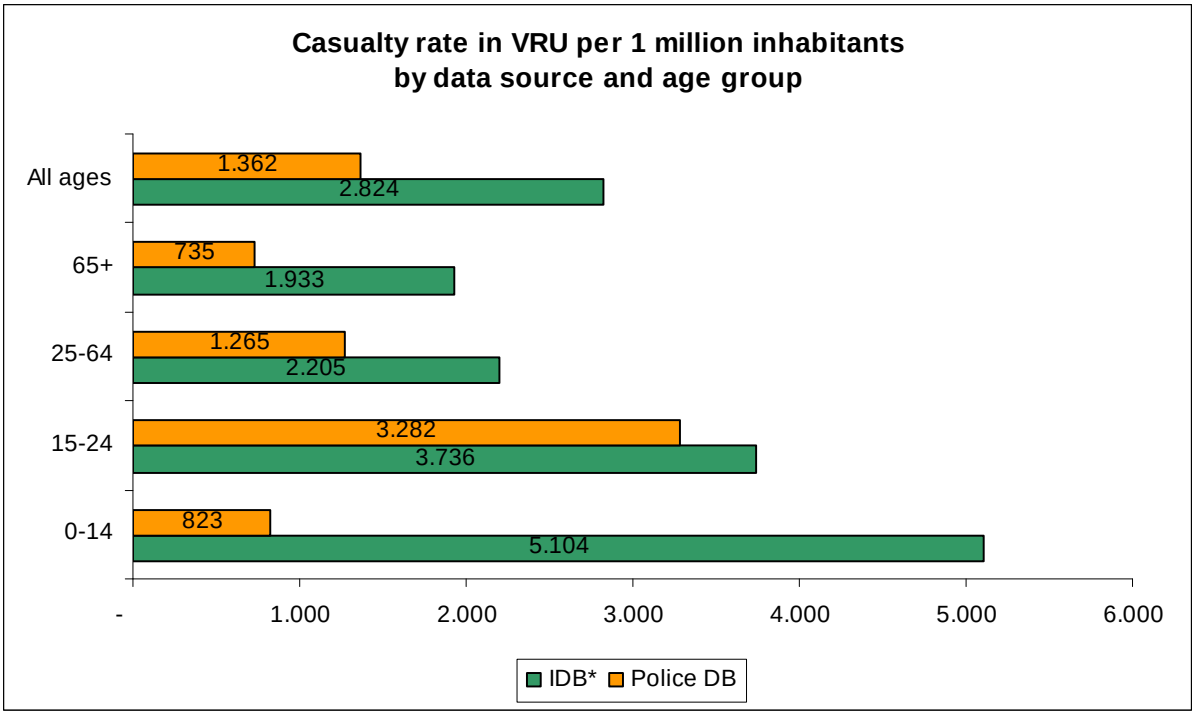
5.1.4 Casualty rates in VRU by age group

By comparing data sources it is noticeable that, in particular, injuries to children (0-14 years) as cyclists are rarely reported to the Police DB.

Age group	IDB*	Police DB (incl. cyclist injuries)
0-14	5.104	823
15-24	3.736	3.282
25-64	2.205	1.265
65+	1.933	735
All ages	**2.824**	**1.362**

*Sources: Danish Injury Register, Denmark 2004; Dutch Injury Surveillance System 2004, Consumer Safety Institute; IDB 2004, Epidemiological Centre, The National Board of Health and Welfare, SE

Table 14 – Casualty rate in VRU per 1 million inhabitants by data source and age group (Police DB incl. cyclist injuries)



Graph 6 – Casualty rate in VRU per 1 million inhabitants by data source and age group

5.1.5 Motorised two wheelers

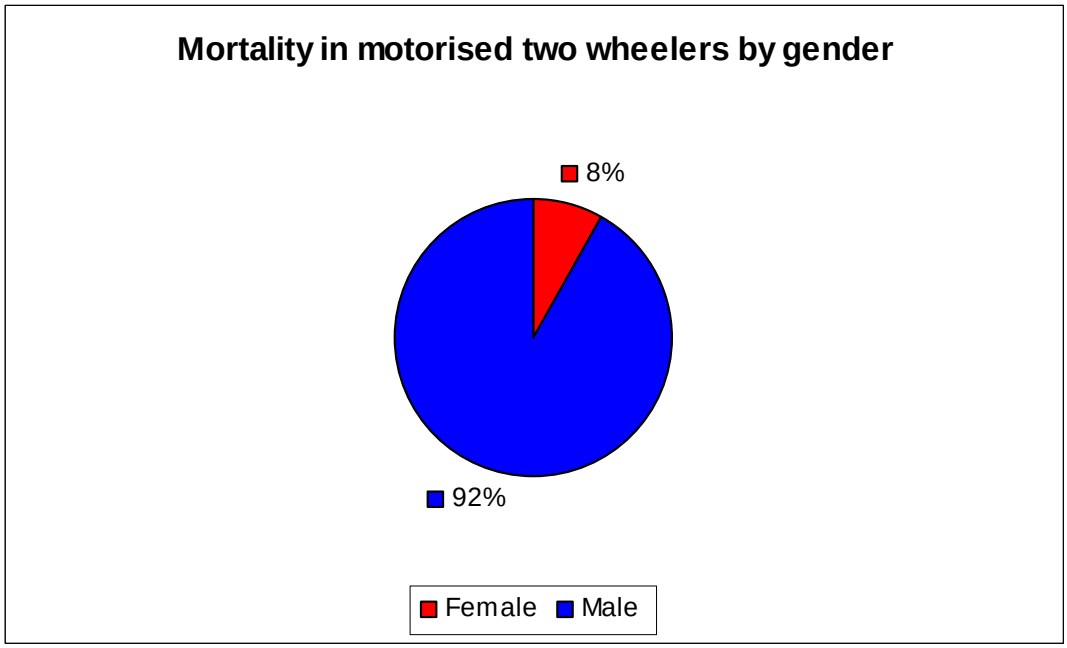
Injuries to motorised two wheelers are reported to police mainly if they are due to a collision or if the injury is more severe.

5.1.5.1 Mortality in motorised two wheelers by gender

In total, more than 6,000 motorised two wheelers die due to a road accident in the EU25. More than 90% of all fatalities affect males.

Gender	Police DB	%
Female	488	8%
Male	5614	92%
Total	**6102**	**100%**

Table 15 – Mortality in motorised two wheelers by gender



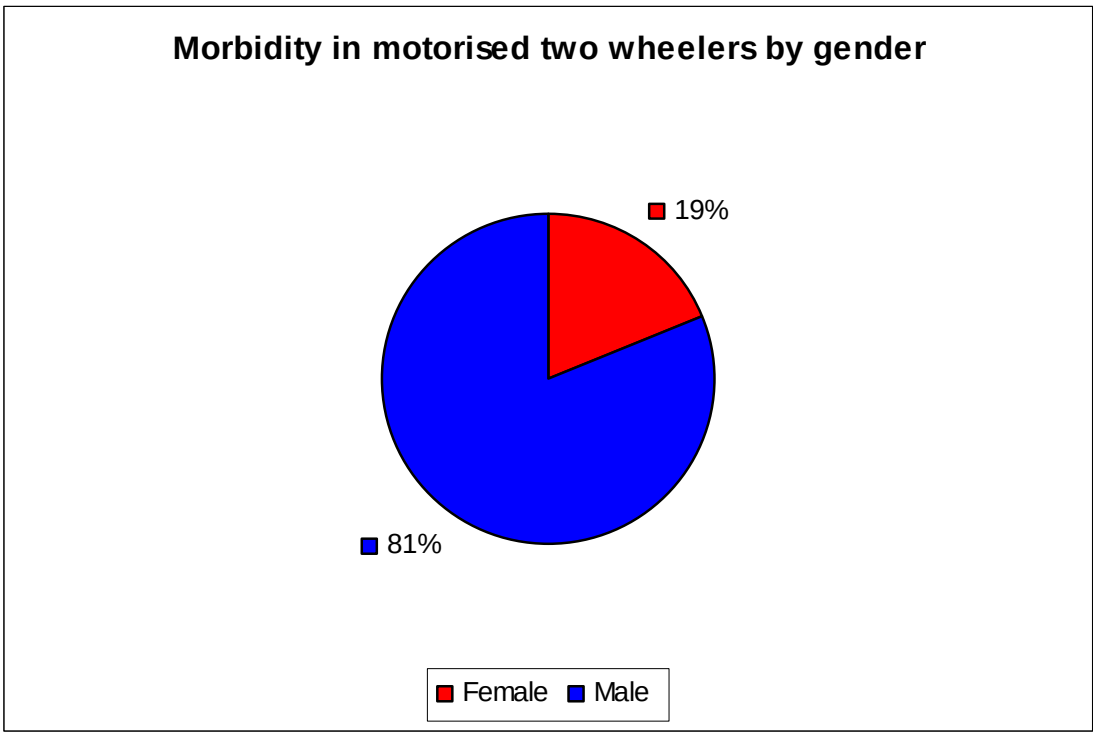
Graph 7 – Mortality in motorised two wheelers by gender

5.1.5.2 Morbidity in motorised two wheelers by gender

The Police DB shows that more than 300,000 injuries concern motorised two wheelers each year in the EU25. The ratio of non-fatal injuries in females in comparison to males is approximately 1:4.

Gender	Police DB	%
Female	57.969	19
Male	247.131	81
Total	**305.100**	**100**

Table 16 – Morbidity in motorised two-wheelers by gender



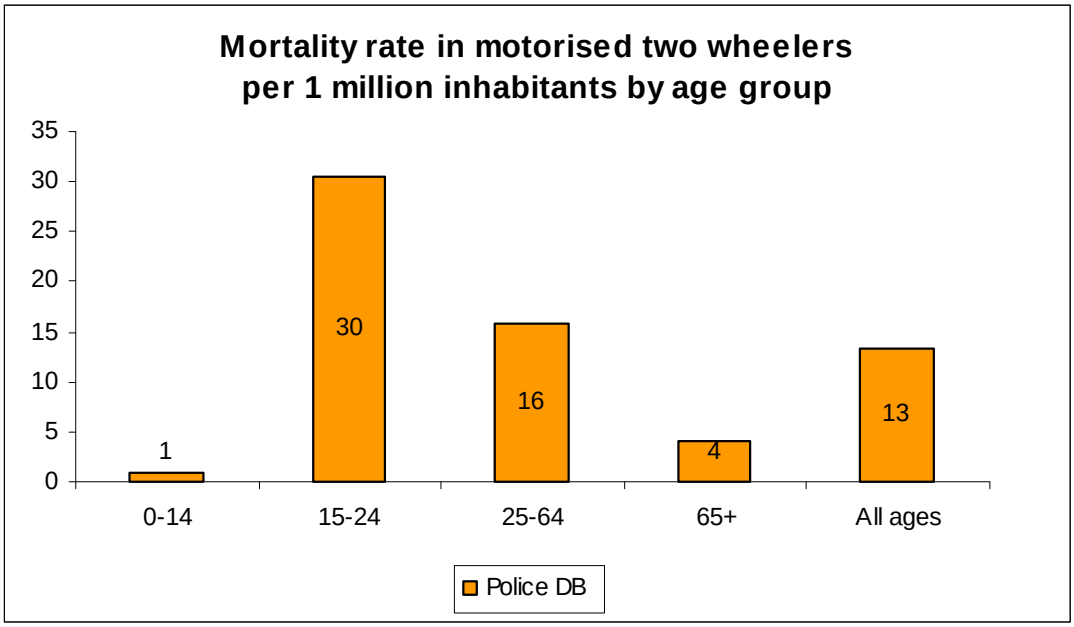
Graph 8 – Morbidity in motorised two wheelers by gender

5.1.5.3 Mortality rates in motorised VRU by age group

Mortality rates for motorised VRU show that mainly young adults (15-24) are affected by fatalities due to road traffic accidents as motorcyclists.

Age group	Police DB
0-14	1
15-24	30
25-64	16
65+	4
All ages	**13**

Table 17 – Mortality rate in motorised VRU per 1 million inhabitants by age group



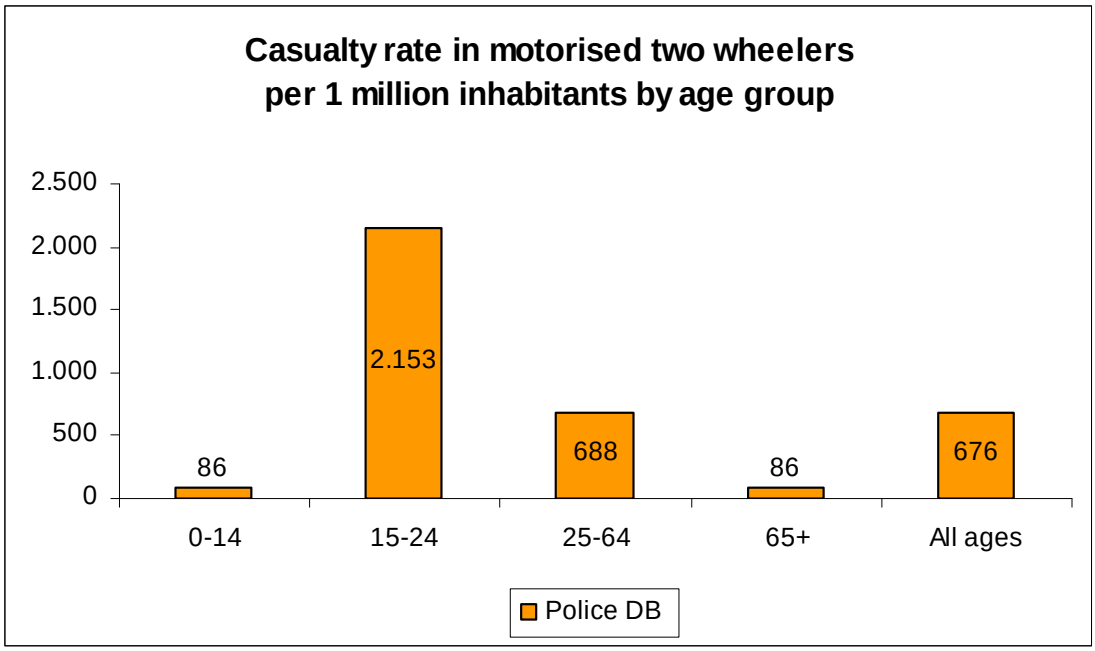
Graph 9 – Mortality rate in motorised VRU per 1 million inhabitants by age group

5.1.5.4 Casualty rate in motorised two wheelers by age group

The age group 15-24 years is particularly affected by fatal and non-fatal injuries to motorised two wheelers, followed by the age group 25-64 years. More than 2,000 young adults per 1 million inhabitants get injured or killed while riding a motorised two wheelers in the EU25 each year.

Age group	Police DB
0-14	86
15-24	2.153
25-64	688
65+	86
All ages	**676**

Table 18 – Casualty rate in motorised two wheelers per 1 million inhabitants by age group



Graph 10 – Casualty rate in motorised two wheelers per 1 million inhabitants by age group

The HDD shows that a high rate of young adults has to be treated as in-patients in hospitals due to an injury while riding a motorised two wheelers.

Age group	HDD
0-14	2
15-24	33
25-64	10
65+	3
All ages	**11**

*Source: Hospital Discharge Database System (HDD): estimated figure of in-patients 2003-2005, indicator on "rate of eligible HDD related to motor vehicle traffic, motorcyclist" based on seven countries: CZ, EE, ES, FI, HU, NL, PT

Table 19 – Rate of in-patient in injured motorised two wheelers per 1 million inhabitants

The following table on morbidity in motorised two wheelers shows that about 16% of injuries reported to the Police DB require treatment in hospital as in-patients.

EU25	Police DB	HDD*	Percentage of HDD in the Police DB
Motorised two wheelers	305.100	49.595	16%

*Source: Hospital Discharge Database System (HDD): estimated figure of in-patients 2003-2005, indicator on "rate of eligible HDD related to motor vehicle traffic, motorcyclist" based on seven countries: CZ, EE, ES, FI, HU, NL, PT

Table 20 – Police DB: Morbidity in motorised two wheelers by data source

5.1.6 Non-motorised VRU

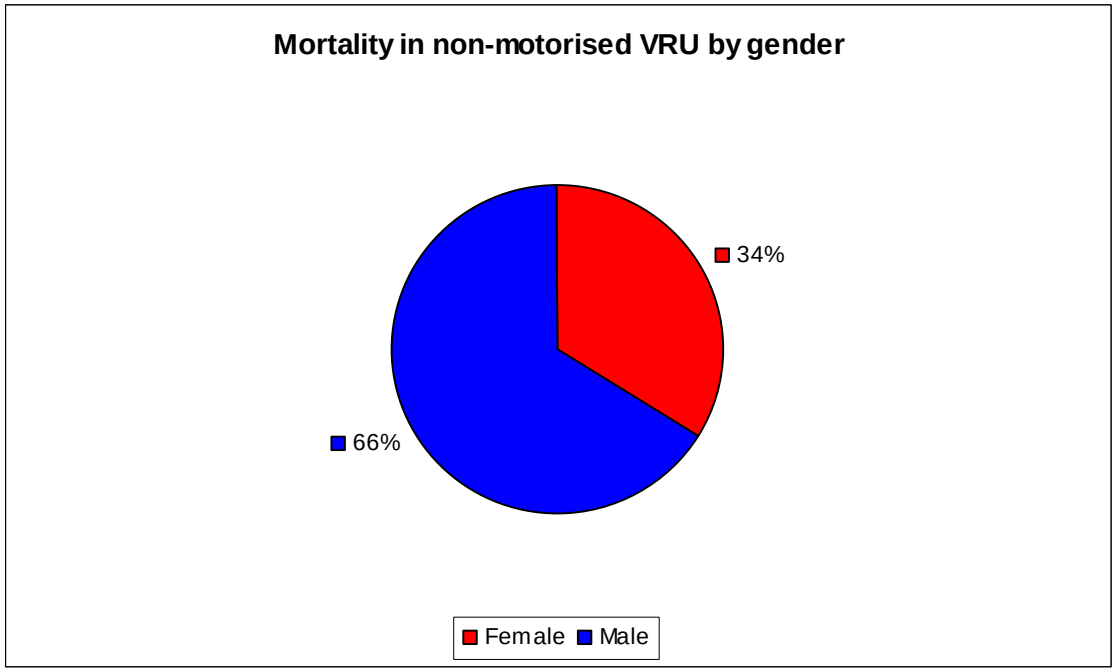
The gender and age distribution could not be provided separately for pedestrians and cyclists by the Police DB at the time of establishing this report. Only the total number of injuries to non-motorised VRU could be assessed. Therefore, an exclusion of cyclist injuries derived from police data would lead to a false picture of the gender distribution in pedestrian injuries. The data of the IDB cannot be included in this overview as it is not possible to exclude cyclist injuries from the data on gender of the Police DB. As a result, the following table shows the percentages of injuries to all non-motorised VRU by gender as given by the Police DB only.

5.1.6.1 Mortality in non-motorised VRU by gender

Men make up two-thirds of the fatalities in non-motorised VRU (defined as being pedestrians and cyclists involved in a traffic accident)

Gender	Police DB	%
Female	3.533	34
Male	6.858	66
Total	**10.390**	**100**

Table 21 – Mortality in non-motorised VRU by gender



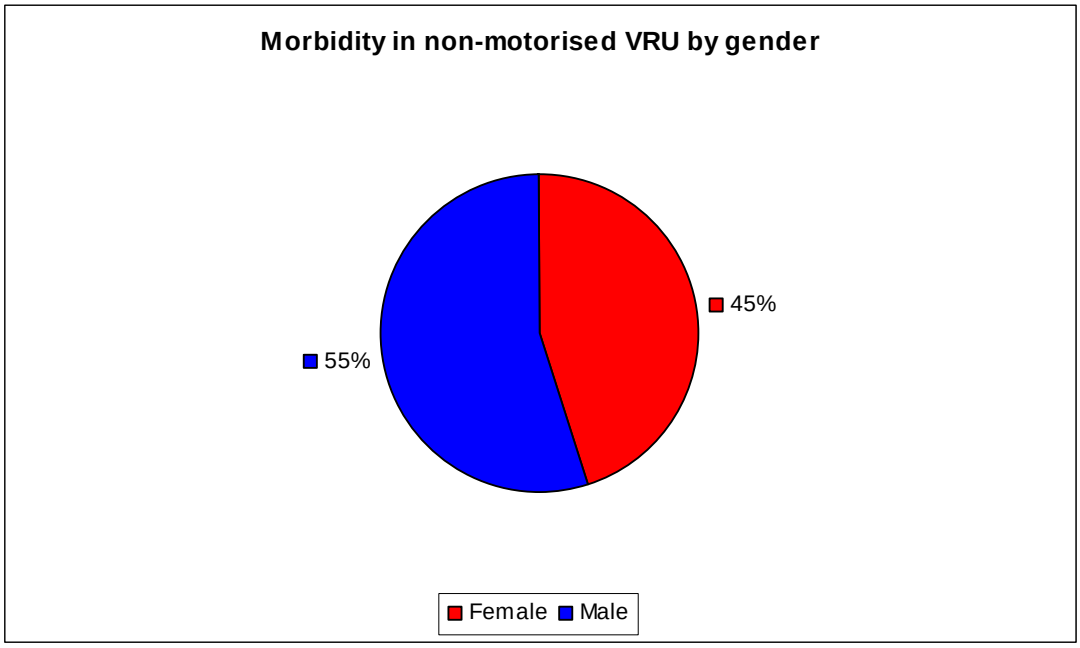
Graph 11 – Mortality in non-motorised VRU by gender

5.1.6.2 Morbidity in non-motorised VRU by gender

Looking at morbidity figures, the ratio of men to women is almost equal: 55% males and 45% females get injured as pedestrians or cyclists, usually due to crashes with a vehicle in public transport areas.

Gender	Police DB	%
Female	137.295	45
Male	167.805	55
Total	**305.100**	**100**

Table 22 – Morbidity in non-motorised VRU by gender



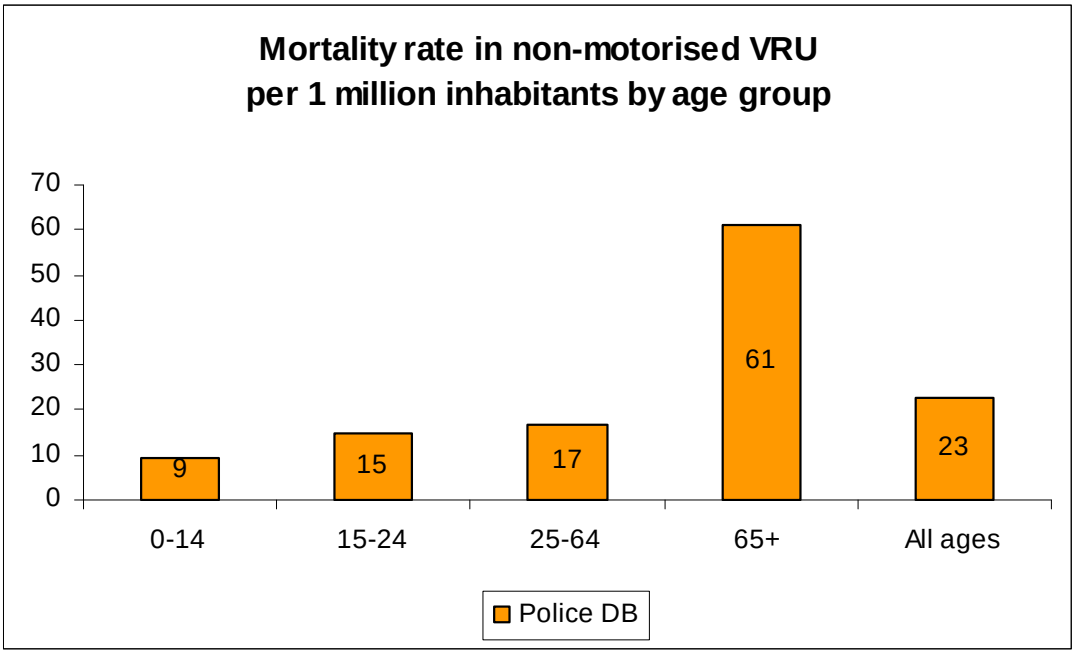
Graph 12 – Morbidity in non-motorised VRU by gender

5.1.6.3 Mortality rates in non-motorised VRU by age group

Mortality rates for non-motorised road users by age group show that the age group 65+ is the most affected by fatal injuries as a cyclist or pedestrian.

Age group	Police DB
0-14	9
15-24	15
25-64	17
65+	61
All ages	**23**

Table 23 – Mortality rate in non-motorised VRU per 1 million inhabitants by age group



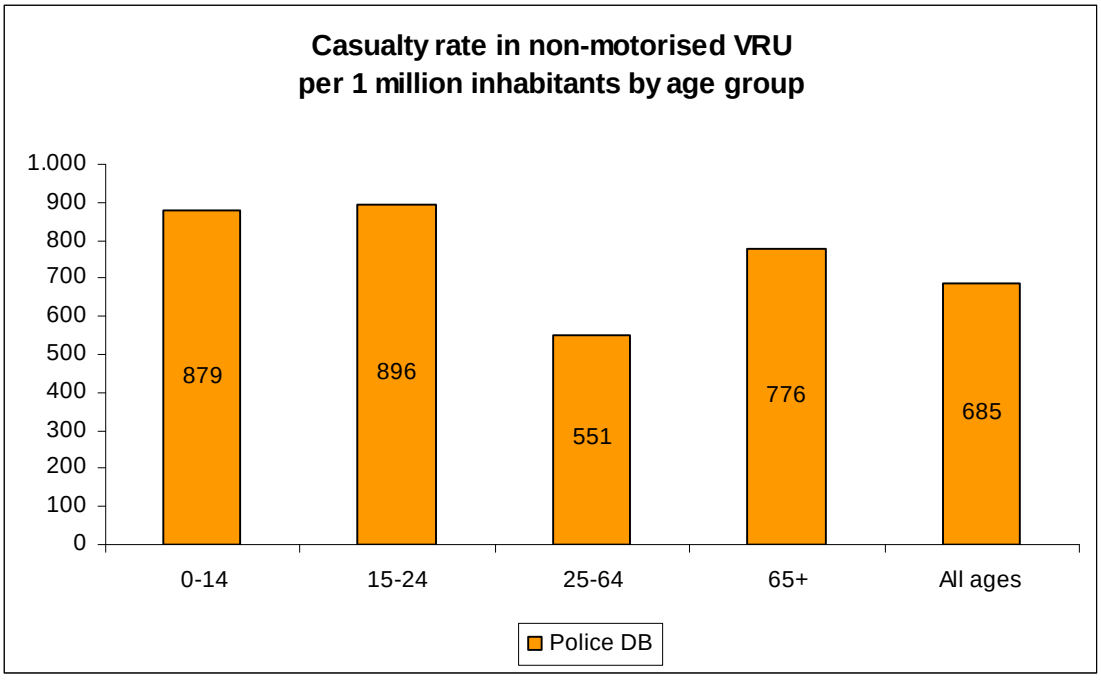
Graph 13 – Mortality rate in non-motorised VRU per 1 million inhabitants by age group

5.1.6.4 Casualty rates in non-motorised VRU by age group

The highest casualty rate in pedestrians and cyclists is among young adults and children. Almost 900 young adults per million inhabitants have an injury as a non-motorised road user due to a collision in public transport areas annually.

Age group	Police DB
0-14	879
15-24	896
25-64	551
65+	776
All ages	685

Table 24 – Casualty rate in non-motorised VRU per 1 million inhabitants by age group



Graph 14 – Casualty rate in non-motorised VRU per 1 million inhabitants by age group

5.1.7 Pedestrian injuries due to collisions involving a motorised vehicle

More seriously injured pedestrians that have to be treated as an in-patient in hospital are registered in the HDD. This data shows that firstly elderly people, then children, are the most affected groups for severe injuries due to a collision with a motorised vehicle.

Age group	HDD
0-14	13
15-24	8
25-64	7
65+	18
All ages	**9**

*Source: Hospital Discharge Database System (HDD): estimated figure of in-patients 2003-2005, indicator on "rate of eligible HDD related to motor vehicle traffic, pedestrian" based on six countries: CZ, EE, ES, FI, HU, PT

Graph 15 – Rate of in-patients in injured pedestrians per 1 million inhabitants

The severity of an injury as recorded by the Police DB is documented in 8 countries. The handling of injury severity varies from country to country and depends on the medical knowledge of the member of the police force reporting the casualty. As the definitions of minor and severe injuries vary significantly between different countries, it can be assumed that these figures are not representative.

By definition, injuries to pedestrians are only reported to the Police DB if a vehicle is involved.

The Police DB shows a ratio of 74:26 for slightly and seriously injured pedestrians.

Treatment	Slightly injured in %	Seriously injured in %
BE	85	15
DK	40	60
EL	85	15
ES	76	24
FR	83	17
AT	68	32
SE	77	23
UK	80	20
Average	**74**	**26**

Table 25 – Police DB: pedestrian injuries by treatment

The number of in-patients treated for injuries by a motorised vehicle as registered by the HDD shows a similar picture: 29% of the total pedestrian injuries reported to police had to be treated as an in-patient in hospital.

EU25	Police DB	HDD*	Percentage of HDD data in the Police DB
Pedestrians (traffic injuries)	149.500	43.669	29%

*Source: Hospital Discharge Database System (HDD): estimated figure of in-patients 2003-2005, indicator on "rate of eligible HDD related to motor vehicle traffic, pedestrian" based on six countries: CZ, EE, ES, FI, HU, PT

Table 26 – Morbidity in pedestrians: Percentage of data on in-patients in police data

5.1.8 Cyclists

5.1.8.1 Morbidity in cyclists by gender

The following table shows the extrapolation of estimated morbidity in cyclists in transport areas in the EU25 based on information from five countries registered in the IDB. It can be estimated that on average only 12% of the cyclist injuries that had to be treated in hospital were reported to the Police DB in 2004. The total number of cyclist injuries is approximately 1.3 million injuries in EU25 transport areas in 2004.

Country	Estimated cyclist injuries due to an accident with non-motorised and without counterpart	Estimated cyclist injuries due to an accident with motorised counterpart	Cyclist injuries reported to the Police DB****	Estimated total number of cyclist injuries	Percentage of cyclist injuries reported to the Police DB and IDB
DK*,[72]	24.724		1.376	24.724	6%
NL**	48.000		7.368	48.000	15%
SE***	27.162		2.162	27.162	8%
AT[73]	24.853		5.422	30.275	18%
FR	40.587		4.417	40.587	11%
Subtotal			**13.947**	**115.749**	**12%**
Min					**6%**
Max					**18%**
EU25	**1.135.815**		**155.608**	**1.291.423**	
EU25 rounded	**1.140.000**		**155.600**	**1.300.000**	

* Source: Danish Injury Register, Denmark 2004

**Source: Dutch Injury Surveillance System 2004, Consumer Safety Institute

***Source: IDB 2004, Epidemiological Centre , The National Board of Health and Welfare, SE

****Source: CARE, IRTAD 2004

Table 27 – IDB extrapolation to EU figures: morbidity in cyclists in transport areas

[72] DK has been excluded to calculate the average percentage of cyclist injuries reported to police as it has the lowest rate of reporting.

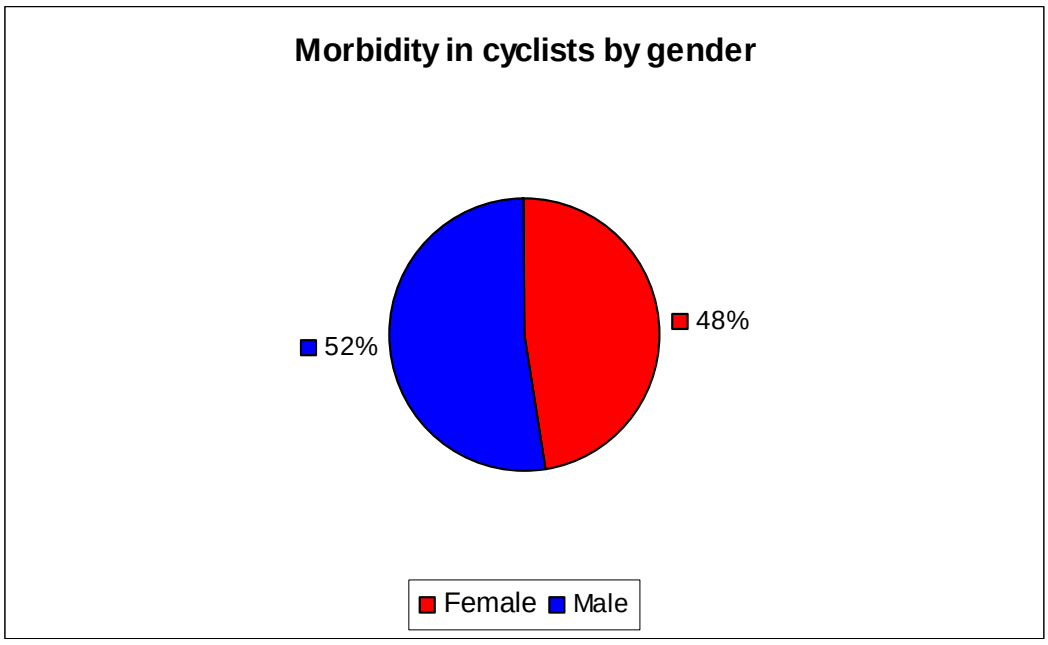
[73] AT has been excluded to calculate the average percentage of cyclist injuries reported to police as it has the highest level of reporting.

On the basis of the IDB systems from three countries, the number of cyclist injuries to males and females has been extrapolated to the EU25. Injuries to male cyclists account for more than half of the total figure.

Country*	Female	%	Male	%	Both genders	%
DK	11.636	47	13.088	53	24.724	100
NL	23.000	48	25.000	52	48.000	100
SE	671	42	930	58	1.601	100
Subtotal	**35.307**	**48**	**39.018**	**52**	**74.325**	**100**
Min		**42**		**52**		
Max		**48**		**58**		
EU25	**617.546**	**48**	**682.454**	**52**	**1.300.000**	**100**

*Sources: Danish Injury Register, Denmark 2004; Dutch Injury Surveillance System 2004, Consumer Safety Institute; IDB 2004, Epidemiological Centre, The National Board of Health and Welfare, SE;

Table 28 – IDB extrapolation to EU figures: injuries to cyclists by gender in transport areas



Graph 16 – Morbidity in cyclists by gender

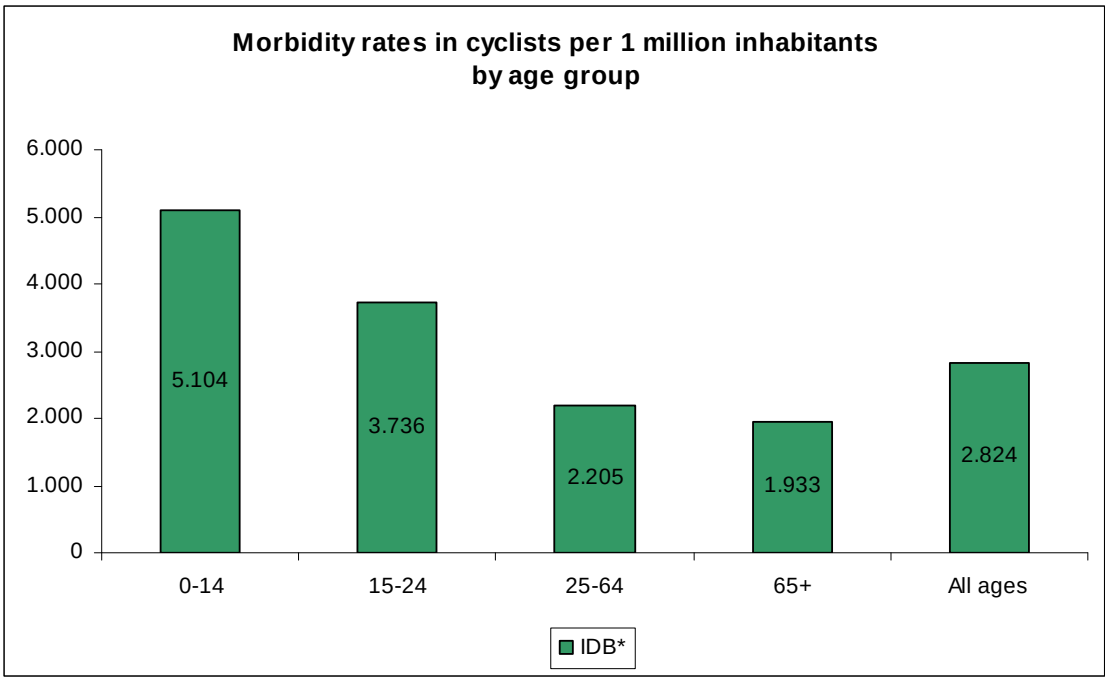
5.1.8.2 Morbidity rate in cyclists by age group

Children are at the highest risk of being injured due to a cycling accident, with more than 5,000 injured per 1 million inhabitants per year. Young adults are the second most vulnerable group with about 3,000 casualties per 1 million inhabitants in the EU25 annually. The age group 65+ runs the lowest risk of being injured while cycling.

Age group	IDB*
0-14	5.104
15-24	3.736
25-64	2.205
65+	1.933
All ages	**2.824**

*Sources: Danish Injury Register, Denmark 2004; Dutch Injury Surveillance System 2004, Consumer Safety Institute; IDB 2004, Epidemiological Centre, The National Board of Health and Welfare, SE

Table 29 – Morbidity rate in cyclists per 1 million inhabitants by age group



Graph 17 – Morbidity rate in cyclists per 1 million inhabitants by age group

5.1.8.3 Cyclist injuries by treatment

The HDD shows that as a cyclist, young adults (15-24), followed by elderly, run the highest risk of hospitalisation due to an accident involving a motorised vehicle.

Age groups	HDD
0-14	37
15-24	61
25-64	51
65+	54
All ages	**52**

*Source: Hospital Discharge Database System (HDD): estimated figure of in-patients 2003-2005, indicator on "rate of eligible HDD related to motor vehicle traffic, pedal cyclist" based on four countries: CZ, FI, HU, NL

Table 30 – Rate of in-patients in injured cyclists per 1 million inhabitants

Data on injury severity provided by the Police DB is documented by seven countries. As already demonstrated for pedestrian injuries, the data quality varies from country to country and depends on the medical knowledge of the member of the police force reporting the casualty.[74] Police data shows prevalence in minor cyclist injuries. Records show that about 22% of the total injured cyclists are seriously injured.

Country	Slightly injured in %	Seriously injured in %
BE	90	10
DK	47	53
EL	83	17
ES	80	20
FR	85	15
AT	69	31
UK	87	13
Average	**78**	**22**

Table 31 – Police DB: cyclist injuries by treatment

[74] The definitions used by road traffic authorities for slight and severe injuries differ from one country to another.

The following data on in-patients from the HDD includes casualties due to a collision between motor vehicles and cyclists. As the Police DB also registers in principle impacts between cyclists and pedestrians and single vehicle accidents in cyclists, the two data sources cannot be accurately compared. Taking these differences into consideration though, the comparison of police data and hospital discharge data on in-patients shows a similar figure as regards minor and serious injuries in cyclists. It can be seen then, that more than 16% of the total injuries reported to the Police DB have to be treated as an in-patient in hospitals.

EU25	Police DB	HDD*	Percentage of HDD in the Police DB
Cyclist injuries	152.107	23.911	16%

*Source: Hospital Discharge Database System (HDD): estimated figure of in-patients 2003-2005, indicator on "rate of eligible HDD related to motor vehicle traffic, pedal cyclist" based on four countries: CZ, FI, HU, NL; extrapolated to EU25

Table 32 – Police DB: Morbidity in cyclists by data source

5.1.8.4 Cyclist injuries by location

The following table shows the place of occurrence where a bicycle injury happens in percentages as reported to IDB[75]. Three quarters of all bicycle accidents take place on roads (unspecified, inside urban area, outside urban area). The regional parameters in- and outside of urban areas show 20% for both areas. 15% of injuries occur on cycle ways and 8% on pavements or in pedestrian malls.

Location	%
Road, unspecified	36
Public road inside urban area	20
Public road outside urban area	20
Cycle way	15
Pavement, pedestrian mall	8
Transport area, other	1
Total	**100**

Table 33 – Cyclist injuries by location

[75] Sources: IDB year 2004 of AT, FR and SE

5.1.8.5 Cyclist injuries by product

The following table shows the products[76] that can be present in bicycle injuries and their involvement in the accident.

The code not applicable (N.A.) indicates that no item has been entered for a product group. In this table the category N.A. is used in order to show three different product categories simultaneously. The table shows percentages of frequency.

Nearly half of all injuries are caused by the road surface. Means of transport reach high frequencies in all product classes. 15% of the involved products are sports equipment. Other road users, humans or animals cause 2% of injuries- 3% as product involved and 1% as other product. One of the key questions of VRU & FiP prevention involves safety equipment. Unfortunately it is not possible in the IDB to execute queries about cycle helmet or other safety equipment use or their protection factor.

Product	Product causing	Product involved	Product other
Stationary equipment. processed or natural surface outside	44%	6%	3%
Means of transport	31%	68%	7%
Chemical products, detergents, pharmaceutical products	5%	2%	2%
Product, other and unspecified	3%	1%	0%
Sports equipment	3%	15%	1%
Furniture and textile	2%	0%	0%
Human being, animals, animals articles, tissue fluids	2%	3%	1%
Raw materials, structural elements and particles	1%	1%	1%
Part of building and stationary furniture	1%	1%	0%
N.A. (not applicable)	8%	1%	84%
Total	**100%**	**100%**	**100%**

Table 34 – Cyclist injuries by product

[76] The IDB distinguishes between products involved in the accident, products causing injury, and other products. Example: A child riding a bicycle collides with a dog, falls and is injured by gravel. This case should be coded as: product involved = dog; product causing the injury = gravel; other product involved = bicycle.

5.1.8.6 Cyclist injuries by body part injured

The following table shows which body parts are hurt due to cycling injuries and to what extent. It can be noted that three main body parts tend to be injured in bicycle accidents: 44% of injuries occur to the upper extremities; a quarter to the lower extremities and a fifth to the head. The remaining 11% covers the other areas of the body.

Body part	%
Upper extremities	44
Lower extremities	25
Head	20
Abdomen, lower back, lumbar spine and pelvis	4
Thorax	3
Neck, throat	2
Multiple body parts/whole body affected	1
Other and unknown body part	1
Total	**100**

Table 35 – Cyclist injuries by body part injured

5.1.8.7 Cyclist injuries by type of injury

The following table shows which type of injuries are caused by cycling accidents in percentages. Three main injury types stand out: fractures (28%), contusion/bruising (25%) and open wounds (17%). Other groups of injuries such as concussion and abrasion cover 8% of injuries; the remaining 12% is split between distortion, sprain, dislocation or lesion of tendon(s) and/or muscle(s).

Type of injury	%
Fracture	28
Contusion, bruise	25
Open wound	17
Concussion	8
Abrasion	8
Distortion, sprain	6
Dislocation	3
Lesion of tendon(s) and/or muscle(s)	2
Total	**100**

Table 36 – Cyclist injuries by type of injury

5.1.8.8 Cyclist injuries by mechanism of injury

The following table shows the circumstances leading to cycling accidents in percentages.

The main mechanism leading to a cycle injury is a fall without counterpart, making up 88% of injuries in cyclists; 9% of cycle injuries are due to a collision with another object, person or animal. Approximately 90% of cyclist injuries occur as single accidents.

Type of injury	%
Struck, hit by fall	88
Struck, hit by contact with other object, person or animal	9
Mechanism of injury, other and unspecified	1
Crushing, cutting, piercing	1
Acute overexertion of body or part of body	1
Total	**100**

Table 37 – Cyclist injuries by type of injury

5.1.8.9 Cyclist injuries by activity

The following table shows the activity taking place during the accident as percentages. The two areas “play and leisure activity” and “sports, athletics and exercise” make up nearly 100% of the results.

Activity	%
Play and leisure activity	51
Sports, athletics, exercise	45
Activity, other and unspecified	4
Total	**100**

Table 38 – Cyclist injuries by activity

5.2 Injuries to pedestrians and skaters in public transport areas as excluded by the definition of the traffic sector

5.2.1 Falls in pedestrians (FiP)

5.2.1.1 Mortality due to FiP

In 2004, approximately 16,500 road users had a fatal accident as a pedestrian, cyclist or motorised two-wheeler in public transport areas in the EU25. It was not possible to estimate fatal injuries in pedestrians due to falls in transport areas in the EU25 as the external causes are not sufficiently coded at a European level[77]. Data on fatalities due to FiP is only available for AT.

[77] See WHOSIS mortality database

In AT 332 persons died due to a road traffic accident as a VRU (pedestrian, cyclist and motorised two-wheeler) in 2004[78]. On average 29 persons die due to falls in public transport areas in AT annually[79]. This means that about 8% of all fatalities to pedestrians and two wheelers in public transport areas affect FiP in AT each year.

5.2.1.2 Morbidity due to FiP

The following tables and graphs rely on data provided by the IDB. On average about 7% of all non-fatal home and leisure accidents (excluding sports injuries) are due to injuries to pedestrians (mainly falls) in public transport areas. It can be estimated that about 1.6 million pedestrians get injured due to falls on public roads in the European Union per year.

Country	Non-fatal home and leisure injuries without sport****	Injuries due to FiP	Percentage of injuries due to FiP in home and leisure injuries
AT	465.750	41.796	9%
DK*[80]	385.560	35.315	9%
FR[81]	3.847.500	96.716	3%
NL**	523.260	32.500	6%
SE***	422.820	24.120	6%
Subtotal	**1.411.830**	**98.416**	**7%**
Min			**3%**
Max			**9%**
EU25****	**22.680.000**	**1.580.980**	
EU25 rounded		**1.580.000**	

* Source: Danish Injury Register 2004

**Source: Dutch Injury Surveillance System 2004, Consumer Safety Institute

***Source: IDB 2004, Epidemiological Centre, The National Board of Health and Welfare, SE

**** Source: IDB Report 2002-2004, excluding sports injuries (19% of the total estimated injuries)

Table 39 – IDB extrapolation to EU figures: morbidity due to falls in pedestrians in transport areas

The figures for injuries due to FiP by gender are almost equal. Females are involved in 52% of the injuries, males in 48%.

[78] Source: CARE 2004

[79] Average 2002-2004, source: Mortality Statistics Austria

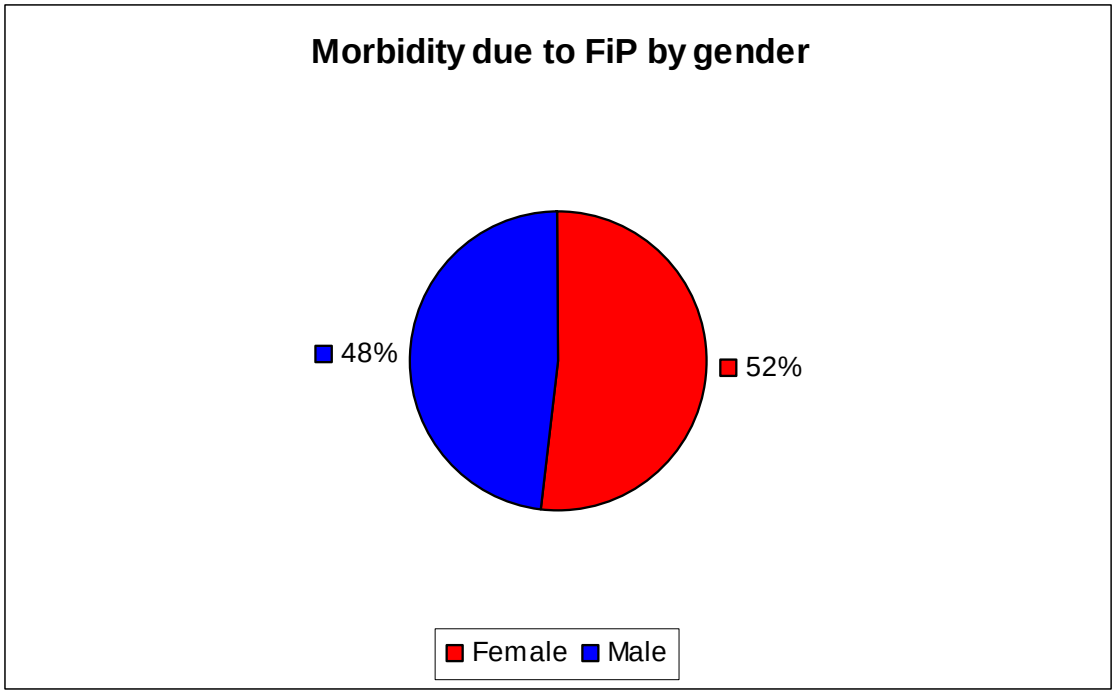
[80] DK has been excluded to calculate the average percentage of injuries due to FiP as it has the highest level to non-fatal home and leisure injuries without sport.

[81] FR has been excluded to calculate the average percentage of injuries due to FiP as it has the lowest rate to non-fatal home and leisure injuries without sport.

Country	Female	%	Male	%	Total	%
AT	23.242	56	18.553	44	41.795	100
DK*	19.289	55	16.026	45	35.315	100
FR	47.320	49	49.396	51	96.716	100
Subtotal	**89.851**	**52**	**83.975**	**48**	**173.826**	**100**
Min		**49**		**44**		
Max		**56**		**51**		
EU25 rounded	**816.702**	**52**	**763.298**	**48**	**1.580.000**	**100**

* Source: Danish Injury Register 2004

Table 40 – IDB extrapolation to EU figures: morbidity due to FiP by gender



Graph 18 – Morbidity due to FiP by gender

5.2.1.3 Morbidity due to FiP by age group

Country	0-14	%	15-24	%	25-64	%	65+	%	All ages
AT	4.269	10	4.732	11	20.008	48	12.787	31	41796
DK*	5.849	17	5.855	17	15.043	43	8.568	24	35315
FR	30.141	31	15.731	16	34.735	36	16.109	17	96716
Total	**40.259**	**23**	**26.318**	**15**	**69.786**	**40**	**37464**	**22**	**173.827**
Min		**10**		**11**		**36**		**17**	
Max		**31**		**17**		**48**		**31**	
EU25 rounded	**365.934**	**23**	**239.217**	**15**	**634.320**	**40**	**340.529**	**22**	**1.580.000**

* Source: Danish Injury Register 2004

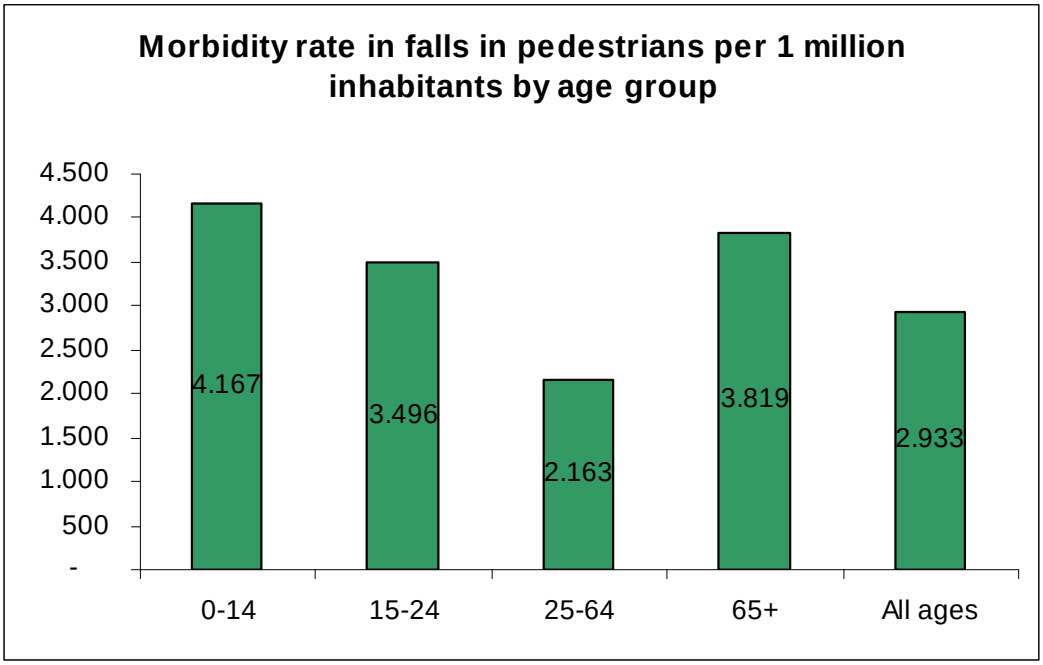
Table 41 – IDB extrapolation to EU figures: morbidity due to FiP by age group

Almost 3,000 victims per 1 million inhabitants get injured per year due to a fall in pedestrians on public roads. Children (0-14) followed by the elderly (65+) are especially affected by such injuries. The following table shows the injury risk rates of FiP by age group per 1 million inhabitants. The age group which has the lowest risk of being injured is adults (25-64 years).

Age group	IDB*
0-14	4.167
15-24	3.496
25-64	2.163
65+	3.819
All ages	**2.933**

*Sources: Danish Injury Register 2004, IDB 2004

Table 42 – Morbidity rate in FiP per 1 million inhabitants by age group



Graph 19 – Morbidity rate in FiP per 1 million inhabitants by age group

5.2.1.4 FiP by location

The following table shows IDB data about the location where pedestrian injuries happen. The figures are shown in percentages[82].

30% of all pedestrian injuries occur on pavements and pedestrian malls. Almost another 30% of all pedestrian injuries occur on public roads in urban areas. 14% of pedestrian injuries happen on cycle paths. Unspecified roads and public roads outside urban areas both account for 9% of injuries.

Location	%
Pavement, pedestrian mall	30
Public road inside urban area	29
Cycle way	14
Road, unspecified	9
Public road outside urban area	9
Transport area, other specified	4
Bus station, railway area, freight terminal, etc.	4
Transport area, unspecified	1
Total	**100**

Table 43 – FiP by location

5.2.1.5 FiP by product

The following table shows how products interact with pedestrian accidents. Up to three types of products are to be recorded per injury: the product causing, the product involved and other product. In every product category the products show differences in frequency.

More than half of all pedestrian injuries state the outdoor surface as causing or involved product. About 5% of injured pedestrians mention human beings, animals, animal articles etc. as the cause of injury; 4% of the accidents take place because a means of transport is involved. In 10% of injuries, a collision with human beings, animals or means of transport is concerned; in 6% means of transport plays a role. Thus it is not supposed that every potential product involved in the accident collides with the party, but they may be involved in the injury in some other way.

[82] Sources: IDB year 2004 of AT, FR and SE

Product	Product causing in %	Product involved in %	Product other in %
Stationary equipment, processed and natural surface outside	66%	53%	1%
Human beings, animals, animals articles, tissue fluids	5%	10%	1%
Means of transport	4%	6%	1%
Raw materials, structural elements and particles	3%	2%	0%
Part of building, stationary furniture	3%	3%	0%
Product, other and unspecified	2%	4%	0%
Chemical products, detergents, pharmaceutical products	2%	4%	0%
Furniture and textile	2%	2%	0%
Food, beverages, tobacco	1%	2%	1%
Natural element, plants and trees	1%	2%	0%
Clothing and personal effects	1%	3%	0%
Sports equipment	0%	1%	0%
Packaging, containers	0%	1%	0%
N.A. (not applicable)	8%	7%	95%
Total	**100%**	**100%**	**100%**

Table 44 – FiP by product

5.2.1.6 FiP by body part injured

About three quarters (74%) of all pedestrians hurt their extremities (lower extremities 42%, upper extremities 32%) in injuries, followed by head injuries at 20%. All other body parts make up the remaining 5%.

Body part	%
Lower extremities	42
Upper extremities	32
Head	20
Thorax	2
Abdomen, lower back, lumbar spine and pelvis	2
Other and unknown body part	1
Neck, throat	1
Total	**100**

Table 45 – FiP by body part injured

5.2.1.7 FiP by type of injury

Fractures happen to about 30% of all injured pedestrians; contusions account for around 20% and distortions for more than 15%. Open wounds contribute to 15% of the total and lesions of tendon(s) and/or muscle(s) for 7%.

Type of injury	%
Fracture	29
Contusion, bruise	21
Distortion, sprain	17
Open wound	15
Lesion of tendon(s) and/or muscle(s)	7
Concussion	3
Dislocation	2
Abrasion	2
Type of injury, other specified	2
No injury diagnosed	1
Total	**100**

Table 46 – FiP by type of injury

5.2.1.8 FiP by mechanism of injury

More than three quarters of pedestrian injuries are caused by an impact that results in a fall. 9% of pedestrian injuries come from an acute overexertion of body or part of body; 8% of pedestrian injuries occur due to contact with another object, animal or person. Thus 92% of pedestrian injuries are single party accidents.

Mechanism of injury	%
Struck, hit by fall	77
Acute overexertion of body or part of body	9
Struck, hit by contact with other object, person or animal	8
Crushing, cutting, piercing	3
Mechanism of injury, other and unspecified	2
Total	**100**

Table 47 – FiP by mechanism of injury

5.2.1.9 FiP by activity

More than three quarters of all pedestrian injuries happen during general walking around. 9% of pedestrian injuries happen during other activities, 6% during play and leisure activities, 4% during sports or athletics activities. 2% of pedestrian injuries happen during shopping, 1% during a vital activity such as eating or drinking.

Activity	%
General walking around	78
Other activity	9
Play and leisure activity	6
Sports or athletics activity	4
Shopping	2
Vital activity	1
Total	**100**

Table 48 – FiP by activity

5.2.2 Injuries to skaters

5.2.2.1 Morbidity in skaters

An estimated 70,000 injuries to skaters happen in public transport areas in the EU25 each year. As this figure is very small at the EU level, this will only be a priority for injury prevention in some countries (e.g. AT) in the future.

Country	Population***	Injuries to skaters	Morbidity rate in skaters per 1 million inhabitants
AT	8.173.323	5.826	713
DK*	5.404.523	1.354	251
FR	62.324.407	8.055	25
NL	16.281.779	1.820	123
SE**	8.993.531	1.235	137
Subtotal	**30.679.833**	**4.409**	**144**
Min			**25**
Max			**713**
EU25****	**460.298.031**		**66.149**
EU25 rounded			**70.000**

* Source: Danish Injury Register 2004

**Source: IDB 2004, Epidemiological Centre , The National Board of Health and Welfare, SE

***Source: Eurostat (yearly average) 2004

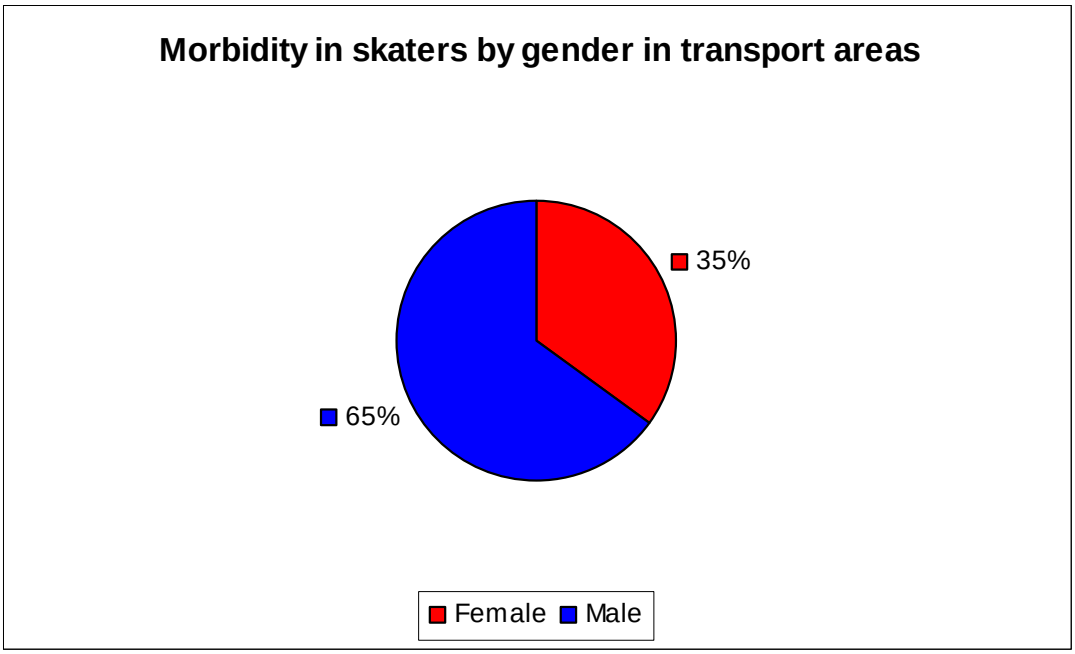
Table 49 – IDB extrapolation to EU figures: morbidity due to injuries in skaters in transport areas

The majority of skaters who get injured are male (65%).

Country	Female	%	Male	%	Total	%
AT	2.412	41	3.414	59	5.826	100
DK*	179	13	1.175	87	1.354	100
FR	2.832	35	5.223	65	8.054	100
SE	349	28	886	72	1.235	100
Subtotal	**5.772**	**35**	**10.698**	**65**	**16.469**	**100**
Min		**13**		**59**		
Max		**41**		**87**		
EU25	**24.532**	**35**	**45.468**	**65**	**70.000**	**100**

* Source: Danish Injury Register 2004

Table 50 – IDB extrapolation to EU figures: morbidity in skaters by gender in transport areas



Graph 20 –Morbidity in skaters by gender in transport areas

The morbidity rate of skaters per 1 million inhabitants shows that especially young adults, followed by children, are injured the most. Almost 400 young adult skaters get injured in the EU25 annually.

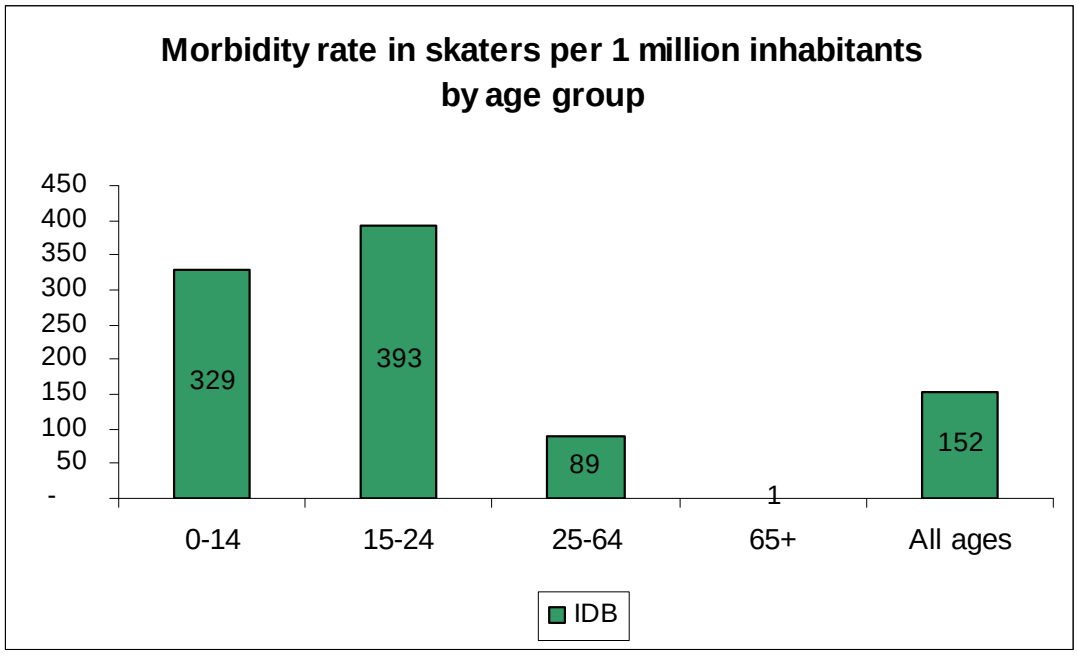
Country	0-14	%	15-24	%	25-64	%	65+	%	All ages
AT	1.330	23	1.972	34	2.524	43	0	0	5.826
DK*	829	61	440	32	85	6	0	0	1.354
FR	3.272	41	2.517	31	2.265	28	0	0	8.054
SE	385	31	480	39	355	29	16	1	1.235
Total	**5.816**	**35**	**5.408**	**33**	**5.229**	**32**	**16**	**0**	**16.469**
Min		**31**		**31**		**6**		**0**	
Max		**61**		**39**		**43**		**1**	
EU25	**24.720**	**35**	**22.987**	**33**	**22.227**	**32**	**66**	**0**	**70.000**

* Source: Danish Injury Register 2004

Table 51 – IDB extrapolation to EU figures: morbidity in skaters by age group in transport areas

Age group	IDB
0-14	329
15-24	393
25-64	89
65+	1
All ages	**152**

Table 52 – Morbidity rate in skaters per 1 million inhabitants by age group



Graph 21 – Morbidity rate in skaters per 1 million inhabitants by age group

6 Conclusions and recommendations

6.1 Vulnerable Road Users (VRU)

6.1.1 Conclusions on VRU

As the road traffic sector relies mainly on data on road traffic casualties that have been reported to the police, it can be surmised that a certain percentage of injuries will be un-reported in each road user type. As demonstrated by this report, injuries to cyclists in public transport areas are heavily under-reported in the Police DB. For the estimation of the number of injuries to VRU in public transport areas in the EU25, the analysis of data from only the Police DB is insufficient.

In 2004, the Police DB registered about 155,000 nonfatal injuries to cyclists in the EU25. The estimate provided by the IDB on cyclist injuries on the basis of injuries that had to be treated in hospital shows that about 1.3 million cyclists got injured in transport areas in the EU25 in 2004. This means that on average only about 12% of the total number of estimated cyclist injuries were reported to police authorities in the EU25 in 2004.

Taking this high percentage of under-reported cyclist injuries into consideration, it can be said that the number of injuries to VRU is much higher than previously assumed when analysing the Police DB: it can be estimated that about 1.8 million VRU were injured in the EU25 in 2004. Not included in this estimation are all the other under-reported injuries to VRU such as single vehicle accidents in motorised two wheelers or injuries to pedestrians due to collisions with vehicles in public transport areas that have not been reported to police authorities but which should be included by definition. In 2004 the IDB did not collect data on these kinds of injuries.

Young adults (15-24) are most at risk of incurring fatal and more severe injuries while cycling and riding motorised two-wheelers. While children (0-14) mainly incur non-fatal injuries while cycling, they are also ranked second in the division of severe injuries as pedestrians due to an impact which requires hospital treatment as an in-patient. Elderly people (65+) were the main group at risk of having a fatal injury as a non-motorised road user (pedestrian or cyclist). They were also more seriously affected by severe injuries as pedestrians due to a collision.

By comparing data from the health (IDB, HDD) and the traffic sector (Police DB), it appears that some road user groups should receive more attention for injury prevention in the future: data from the health sector shows that especially injuries to children and the elderly as cyclists are rarely reported to police authorities.

Looking at mortality data, it is possible to say that under-reporting of fatalities in VRU also occurs. It was not possible to estimate the total amount of under-reported fatal VRU injuries within this report as their injuries are not sufficiently coded by road-user type at the European level[83].

6.1.2 Recommendations for VRU

In order to improve the reporting of VRU casualties and increase their safety in the future, four core recommendations have been made:

- To include safety for VRU within the responsibility of the public health sector in all Member States by including it in public health policies, health information, and health promo-

[83] See WHOSIS mortality database, ICD 10 coding

tion programmes that also focus on cross-cutting issues such as alcohol use and social deprivation.[84]

- To facilitate the collaboration of different political sectors of the European Commission and Member States in order to combine forces concerning the protection of
  - children and the elderly as pedestrians,
  - children and young adults as cyclists,
  - young adults as motorised two wheelers.
- To include available data (IDB, HDD) and indicators (see chapter on indicators) of the health sector on VRU in current road injury statistics of the Member States and the European Commission in order to improve the monitoring of injuries to VRU and thus provide health arguments for advocacy.[85]
- To improve the quality of current data as well as obtain cost data on VRU injuries for more accurate estimates on the financial impact of injuries.

6.1.2.1 Injury database (IDB):

The IDB provides detailed information on under-reported injuries to VRU which are important for tailor-made measures and preventive activities such as:

- Circumstances of the injury
- Injury location
- Activity during the injury
- Products involved in the injury
- Injury consequences
- Treatment

Continue improving the reporting of injuries to VRU and their external causes by supporting further developments of IDB.

Broader range of reported injuries and influencing factors:

- Support the new version of IDB including the “all injury” module
- Improve the collection of data in the area of alcohol consumption
- Improve the collection of data in the area of disabled persons
- Improve the collection of data in the area of unprotected car passengers

Increased number of data and improved data samples:

- Increase the number of countries with IDB data collection
- Increase the representativity of the data sample
- Invite all existing data-providing members to supply gender and age related extrapolation factors for the national number of cases

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[84] European Association on Injury Prevention and Safety Promotion (EuroSafe). How to make Europe a safer place, Key areas for consideration in implementing the Council Recommendation on Injury Prevention and Safety Promotion. Draft Working document for the Working Party of Governmental Experts on Accidents and Injury Prevention, Amsterdam 2007.

[85] See above

- Clarify and unify the parameters of data collection

6.1.2.2 Mortality data:

- Mandate the integration of mortality data fully coded to the fourth digit of ICD 10 coding in order to select all fatalities that involve VRU

6.1.2.3 Data analysis

- IDB “all injury” and Police DB: establish a project for an analysis to ascertain the under-reporting factors between these two data sources
- Disability data: include a model to estimate disabilities due to injuries to VRU in the IDB
- Cost estimations: improve the data on cost estimates of injuries to VRU & FiP to the Member States in the IDB; initiate cost indicators in the range of road user types

6.2 Falls in pedestrians (FiP)

6.2.1 Conclusions on FiP

Injuries due to FiP in public transport areas have been analysed for the first time at an EU level. Accidents in pedestrians (also skaters, users of wheelchairs etc.) without a counterpart on public roads are not focused on by the road traffic sector and, up until now, have not needed to be reported to police authorities by definition. Therefore, they are a neglected issue. It can be assumed though, that many of these injures could be prevented e.g. better maintenance and illumination of pavements which is an area that falls within the jurisdiction of the traffic sector.

In 2004, an estimated 1.6 million injuries due to FiP happened in public transport areas in the EU25. Mainly children (0-14), followed by the elderly suffered these injuries.

Data on mortality from these injuries could not be analysed at the EU level as they are not defined and coded as transport injuries in ICD 10. The Austrian example shows that 8% of the total fatalities of VRU are due to FiP in public transport areas.[86]

6.2.2 Recommendations for FiP

Incorporate injuries due to FiP in public transport areas (as provided by the IDB of the public health sector) into the responsibility of the public health and traffic sector by:

- Providing data on the number of these injuries to the road traffic sector for the inclusion in road injury reporting
- Analysing data concerning these injuries to establish tailor-made actions for prevention
- Implementing indicators to monitor injuries due to FiP at an EU level
- Mortality data: establish a project for the analysis of national mortality statistics (fully coded to the fourth-digit of IDC-10 coding) in order to provide a clearer picture of mortality data due to FiP.

[86] See p. 95 in the appendix

7 Dissemination of results

The present report[87] is one deliverable of the Apollo project on injuries of vulnerable road users and falls in pedestrians. Other products are the "Report on good and promising practices,"[88] two reports about the evaluation of specific interventions regarding child pedestrians and young bikers[89], and two reports about decision making models for identifying the most promising interventions regarding pedestrians and two-wheelers[90]. Although the Apollo project itself (work package 6 "Dissemination") has made great efforts for the dissemination of its results, more is necessary and planned in order to make decision-makers familiar with the project findings and recommendations.

An expert discussion of the project results took place during the Second European Conference for Injury Prevention and Safety Promotion in Paris, 9th and 10th of October 2009 and the official launch of the deliverables happened during the European Road Safety Day, 13th of October 2008, by means of an EU-wide media information campaign which included a "Fact Sheet" and a "Policy Briefing" on vulnerable road users[91].

Within the Apollo project, work package 6, a network of European NGOs has been created which has committed itself to further collaboration for injury prevention and safety promotion in general, and to the further dissemination of Apollo project results in particular. The group has expressed its commitment in the form of a joint declaration[92]. This network is one institution which will provide a sustainable basis for the further dissemination of project findings like the present "Inventory and Policy Guidebook".

The European Association for Injury Prevention and Safety Promotion ("EuroSafe") [93] is the leading umbrella organization of national institutes and experts and serves as a sustainable platform for European collaboration and the dissemination of experiences and project results. All Apollo project results can be found on the EuroSafe webpage www.eurosafe.eu.com.

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87 Körmer C & Smolka D. Injuries to vulnerable road users including falls in pedestrians in the EU – A data report. Vienna: Austrian Road Safety Board (2009).

88 Planitzer, S. & Körmer, C. (2008). Good and promising interventions for the prevention of injuries to pedestrians and two-wheelers – Inventory and guidebook for the health sector. Vienna: Austrian Road Safety Board (2009).

89 Risser A & Reiter D. Safe school ways by implementing school travel plans in primary schools in Vienna – An evaluation report. Vienna: Austrian Road Safety Board (2009).

Germeni E., Kalampoki V., Terzidis A., Petridou E. Development, implementation and evaluation of a school-based helmet promotion program. Athens: CEREPRI, Athens University Medical School (2008).

90 Chalabi Z, Roberts I, Edwards P, Dowie J. Traffic and the risk of vehicle-related pedestrian injury: a decision analytical support tool. Injury Prevention 14, 196-201 (2008).

Chalabi Z, Roberts I, Edwards P, Dowie J. A mathematical modelling framework for motorised two-wheeler injury rate". Research bulletin (paper submitted for publication). London: London School of Hygiene and Tropical Medicine (2009).

91 Sethi D (2008) Road traffic injuries among vulnerable road users. Apollo Policy Briefing No. 4. Amsterdam: European Association for Injury Prevention and Safety Promotion "EuroSafe".

92 European NGOs dedicated to injury prevention. Declaration on injury prevention and safety promotion in the European Union. Amsterdam: European Association on Injury Prevention and Safety Promotion (EuroSafe) (2008).

93 European Association on Injury Prevention and Safety Promotion (EuroSafe) (ed.). Eurosafe homepage: Together we can make a difference [online]. updated May 2008 [cited May 14, 2008]. Available from Internet: http://www.eurosafe.eu.com/csi/eurosafe2006.nsf.

EuroSafe has committed itself to a continuous support of the implementation of the repeatedly quoted Council Recommendation on Injury Prevention. Therefore, EuroSafe has established working groups ("task forces") within its own organization, one of these being the Task Force on Vulnerable Road Users, led by the Austrian Road Safety Board. The Austrian Road Safety Board has committed itself to the provision of capacity for the further operation of this group. The main aims are to:

- Build a sustainable network of partners and stakeholders (researchers, policy makers, safety practitioners) interested in the further development of actions for the safety of vulnerable road users and the prevention of falls in pedestrians;
- Disseminate research results and recommendations regarding preventive interventions for pedestrians and two-wheelers;
- Initiate collaborative actions and campaigns for the safety of vulnerable road users (including falls in pedestrians) which are complementary to existing programmes and policies.

Specifically, the task force plans to present the project findings to the administrators of the responsible political departments in the Commission services, namely DG Tren and DG Sanco, and to explore the opportunities for establishing a productive collaboration. Plans for scientific publications and presentations at relevant conferences are under discussion.

Also, the Apollo partners will take further actions for the dissemination of project results, for example, the project reports will be found on the web pages of the Apollo project partners, e.g. of the University of Athens (www.euroipn.org/apollo/) or of the Austrian Road Safety Board (www.kfv.at).

The Apollo results were made available quite timely in order to support the implementation of the Council Recommendation in 2007 which calls for actions by the EU Member States. The findings of the Apollo project and its work package on vulnerable road users will be further disseminated towards stakeholders and a thorough discussion on the recommendations will be initiated.

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9 Glossary

Age groups

All data is shown in the following age groups: 0–14 years: children, 15–24 years: young adults, 25–64 years: adults, 65+: elderly. The term “all ages” means all age groups in total.

Bicyclist

A cyclist is a person riding a bicycle or is a passenger on a bicycle.[94]

CARE

Community database on Accidents on the Roads in Europe (CARE) is a Community database on road accidents resulting in death or injury (no statistics on damage only accidents). The major difference between CARE and most other existing international databases is the high level of disaggregating, i.e. CARE is based on detailed data of individual accidents as collected by the Member States. Further information and results from CARE are available at http://ec.europa.eu/transport/roadsafety/road_safety_observatory/care_en.htm.

Detailed data (road user type, age, gender, mortality, morbidity, collision type…) of road traffic data is available for 2004 from the following countries: AT, BE, DK, ES, FI, FR, GB, GR, IT, NI, SE

Casualty

In this report the meaning of casualty comprises the totality of morbidity and mortality data. Separated data on morbidity and mortality is presented in sub–tables and graphs.

[94] Deutsches Institut für Medizinische Dokumentation und Information (DIMDI) (Hrsg.). ICD 10: Definitionen zu Transportmittelunfällen. updated October 2005 [cited May 13, 2008]. Available from Internet: http://www.dimdi.de/static/de/klassi/diagnosen/icd10/htmlamtl2006/defs.htm.

Country codes

The country codes and the sorting of the country codes used in the report rely on EU regulations; the two–letter ISO code is used (ISO 3166 alpha–2), except for Greece and the United Kingdom, for which the abbreviations EL and UK are used. The listing of Member States is based on the alphabetical order of their geographical names in the original language.

Short name in original language (geographical name)	Short name in English (geographical name)	Country Code
Belgique/België	Belgium	BE
Česká republika	Czech Republic	CZ
Danmark	Denmark	DK
Deutschland	Germany	DE
Eesti	Estonia	EE
Ελλάδα (*)	Greece	EL
España	Spain	ES
France	France	FR
Ireland	Ireland	IE
Italia	Italy	IT
Κύπρος/Kıbrıs (*)	Cyprus	CY
Latvija	Latvia	LV
Lietuva	Lithuania	LT
Luxembourg	Luxembourg	LU
Magyarország	Hungary	HU
Malta	Malta	MT
Nederland	Netherlands	NL
Österreich	Austria	AT
Polska	Poland	PL
Portugal	Portugal	PT
Slovenija	Slovenia	SI
Slovensko	Slovakia	SK
Suomi/Finland	Finland	FI
Sverige	Sweden	SE
United Kingdom	United Kingdom	UK

Table 53 – Country codes in the EU

Data sources

The data sources used in this report to draw the broader picture of the impact of injuries to VRU & FiP in the transport area are: CARE, HDD, IDB, IRTAD, Statistics Austria, and EUROSTAT for incidence rates per inhabitants.

Statistics Austria (AT) provides data on fatal injuries to pedestrians due to falls on public roads in AT. CARE, IRTAD data are shown as the Police DB. (For extrapolation calculations on gender and age group of the Police DB the CEREPRI processed CARE data were utilised.)

IDB

The European Injury Database (IDB) is an internet database publicly available at https://webgate.ec.europa.eu/idbpa/ set up by DG SANCO under the Injury Prevention Programme in 1999, in order to provide central access to data collected in European Member States under the EHLASS Programme (European Home and Leisure Accident Surveillance System).

The IDB is the only register that through a set of hospitals provides information about external causes and circumstances of home and leisure accidents. In 2004 the data was entered systematically by the data supplying countries AT, DK, FR, NL and SE.

In particular, IDB data contains a wide set of details on the injury: personal data (age and gender) of the injured and information on the course of event of the injury: mechanism of the accident, the activity of the victim, information on products influencing the injury (separated into causing product, involved product and other product). The medical treatment provided, the type of injury and the body part injured are also defined.

Although high levels of details are recorded, some information that may be of interest to safety experts is not included e.g. it is not possible to analyse the impact of safety equipment on injuries. Also the impact of cycle paths on the safety of road users cannot be analysed.

A new version of IDB, the so–called “all–injury” database is running in test versions in some countries. This all–injury IDB will not be limited to home and leisure accidents but will include “all injury” sections. In the new version, road traffic injuries and workplace injuries will be recorded as well. In 2007 it was planned to implement this feature in all EU countries providing already IDB data.

Until now no data has been published. Thus, no comparative studies with data provided by other injury sectors such as the road traffic sector are actually available.

Injuries to VRU & FiP:

‘Unintentional injuries to pedestrians, two wheelers and other non-motorised road users through collisions and falls in public transport areas.’

IRTAD

International Road Traffic and Accident Database (IRTAD) is an international database that gathers data on traffic and road accidents from 28 out of the 30 OECD Member countries.

IRTAD operates within the framework of the Joint OECD/ECMT Transport Research Centre. The main part of the database, with around 500 data items, includes aggregated data on injury accidents, road fatalities, vehicle population, network length, vehicle mileages from 28 countries (for 1965 and for every year since 1970).

For further information please visit: http://www.cemt.org/irtad/IRTADPublic/index.htm

It is referred to IRTAD for data on Germany; figures of other countries reflect CARE data.

Pedestrian

A pedestrian is a person that is neither using a motorised vehicle nor another vehicle such as a bicycle or public transport.[95]

Police Database

The Police DB is based on figures extrapolated to the EU level from CARE and IRTAD data:

BE: CARE, 2004; CZ: CARE, 2004; DK: CARE, 2004; DE: IRTAD, 2004; EE: CARE, 2004; EL: CARE, 2004; ES: CARE, 2004; FR: CARE, 2004; IE: CARE, 2003; IT: CARE, 2004; CY: CARE, 2004; LV: CARE, 2004; LT: CARE, 2004; LU: CARE, 2002; HU: CARE, 2004; MT: CARE, 2004; NL: IRTAD, 2004; AT: CARE, 2004; PL: CARE, 2004; PT: CARE, 2004; SI: CARE, 2004; SK: CARE, 2004; FI: CARE, 2004; SE: CARE, 2004; UK: CARE, 2004

Road traffic accident

The traffic sector gathers data on casualties referring to the definition of road accidents by the Vienna Convention:

Accidents which occurred or originated on a way or street open to public traffic, which resulted in one or more persons being killed or injured and in which at least one moving vehicle was involved. These accidents therefore include collisions between vehicles, between vehicles and pedestrians, and between vehicles and animals or fixed obstacles. Single vehicle accidents, in which one vehicle alone (and no other road user) was involved, are included.[96,97.]

Road traffic crash

"A collision or incident that may or may not lead to injury, occurring on a public road and involving at least one moving vehicle."[98]

Road traffic injury

The most common definition of a road traffic injury requires the involvement of a vehicle and the bodily impact of a person. Although the national definitions change from one country to another a vehicle – (GB), a moving vehicle (AT, DK, FI, DE, EL, NL, NO, PL, PT, ES, SE), collision of vehicle (IE, LU), circulating vehicle (IT), or a vehicle operation (CZ) - has to be involved. None of them explicitly excludes non-motorised vehicles from the definition. Nevertheless single vehicle accidents including bicycles only are very rarely reported to the police. It is recommended in the road traffic sector to thoroughly discuss the exclusion of single non-motorised vehicle acci-

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95 Deutsches Institut für Medizinische Dokumentation und Information (DIMDI) (Hrsg.). ICD 10: Definitionen zu Transportmittelunfällen. updated October 2005 [cited May 13, 2008]. Available from Internet: http://www.dimdi.de/static/de/klassi/diagnosen/icd10/htmlamtl2006/defs.htm.

96 This definition is almost followed by EU25. However national definitions vary slightly e.g. by defining vehicles as motorised, including material damage or any event causing injuries or fatalities on public areas, not being limited to involving vehicles.

97 Public Road Administration (ed.). IRTAD special report "Under-reporting of road traffic accidents recorded by the police at the international level; Norway, 1994.

98 Peden, M., Scurfield, R., Sleet, D., Mohan, D., Hyder, A., Jarawan, E. and Mathers, C. (eds.). World report on road traffic injury prevention. World Health Organization (WHO), Geneva 2004, p. 201.

dents and accidents between bicycles and vehicles as their reporting rates are very erratic and lead to misinterpretation of the figures.[99]

Road user type

Different road-user types in general: car driver, bus passenger, etc. For the needs of this report road-user type is limited to VRU types such as pedestrians, cyclists, skateboarders, riders of mopeds and of motorcycles. Another assortment of VRU types distinguishes between non–motorised and motorised VRU types.

An overview table comprises all VRU types; some tables enumerate the road-user types separately. Specific chapters are dedicated to pedestrians and cyclists showing detailed analyses.

Single accident

Injuries without counterpart, meaning no one else is involved, are called *single accidents*: e.g. falls on streets, stumbling over something, losing balance, etc.

There are also casualties with a counterpart that account for single accidents: e.g. a single crash is a collision with a static counterpart like a parked car, a tree, or a traffic sign or the counterpart is an animal.

Skater

A person who is using roller-skates, rollerblades, inline-skates, roller-skies or a skateboard and is not walking or riding a bicycle or using a motorised vehicle in public transport areas.[100]

Motorised two-wheeler

A motorcycle is a two-wheeled, one or two-seated motorised vehicle.[101]

Public Health

The World Health Organization (WHO), the United Nations body that sets standards and provides global surveillance of disease, defines public health as “the science and art of promoting health, preventing disease, and prolonging life through the organized efforts of society.”[102]

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[99] Public Road Administration (ed.). IRTAD special report “Under-reporting of road traffic accidents recorded by the police at the international level; Norway, 1994 and Bundesanstalt für Straßenwesen (BAST) (ed.). IRTAD special report “Definitions and Data availability”, Germany 1998.

[100] National Institute of Public Health, Denmark (ed.). Coding Manual V2000 for Home and Leisure Accidents including product related accidents, ISS Database version 2002, August 2002 [online]. edited 2007 [cited May 13, 2008]. Available from Internet: https://webgate.ec.europa.eu/idb/documents/HLA-Coding%20Manual_V2000_03.pdf.

[101] Public Road Administration (ed.). IRTAD special report “Under-reporting of road traffic accidents recorded by the police at the international level; Norway, 1994 and Bundesanstalt für Straßenwesen (BAST) (ed.). IRTAD special report “Definitions and Data availability”, Germany 1998.

[102] World Health Organisation (WHO) (ed.). European Observatory on Health Systems and Policies [database online]. updated March 2007 [cited May 14, 2008]. Available from Internet: http://www.euro.who.int/observatory/Glossary/TopPage?phrase=Public+health.

10 Tables and graphs

11 Annexes

11.1 European Community Health Indices

In 1997, the European Commission established the European Commission Health Monitoring Programme (HMP) to promote safety prevention and to raise awareness of these issues. The purposes of the HMP are:

- to measure the health status, its determinants and trends in the EU
- to facilitate the planning, monitoring and evaluation of community programmes and actions; and
- to provide Member States with appropriate health information for comparison and to support their national health policies

The integrated approach to establish European Community Health Indicators (ECHI) was launched to establish community health indicators and to measure the health status, its determinants and trends in the EU. The initial objectives of ECHI (ECHI–1) were to propose a coherent set of European Community Health Indicators serving the three purposes formulated for the HMP, selected on the basis of explicit criteria, and supported by all Member States.[103]

The main categories in formulating health indicators were defined by the ECHI project as follows:[104]

- Demographic and socio–economic factors (such as indicators on population and socio–economic factors)
- Health status (comprises indicators on mortality, morbidity, generic health status and composite health status)
- Determinants of health (indicators on personal and biological factors, health behaviours, living and working conditions)
- Health systems (indicators on prevention, health protection and health promotion; health care resources, health care utilisation, health care expenditures and health care quality)

Within the ECHI–2 project, a web–based application for the comparable presentation of the definitions of ECHI indicators and indicators used by Eurostat, WHO Europe and OECD was created, as a follow up of WHO–Europe's *International Compendium of Health Indicators (ICHI)*[105] and can be referenced under http://www.healthindicators.org.

11.1.1 The ECHI comprehensive Indicator List (Long List)

The product of the ECHI project is a long list of indicators referring to an operational definition showing the available and needed data for a *Community health monitoring system* that meas-

[103] Kramers, P.G.N. (ed.). Part I, Health Indicators for the European Community, abridged version of the ECHI–1 final report, Annex 1 to the ECHI–2 report. RIVM National Institute of Public Health and Environment, Bilthoven (The Netherlands) 2005, page 2.

[104] Kramers, P.G.N. (ed.). Part I, Health Indicators for the European Community, abridged version of the ECHI–1 final report, Annex 1 to the ECHI–2 report. RIVM National Institute of Public Health and Environment, Bilthoven (The Netherlands) 2005, page 4.

[105] Kramers, P.G.N. (ed.). Public Health Indicators for Europe: Context, selection, definition, Final Report by the ECHI Project Phase II. RIVM National Institute of Public Health and Environment, Bilthoven (The Netherlands) 2005, page 9.

ures the health status, its determinants and trends in the EU.[106] A target of the Apollo Work Package 5 is to improve the monitoring of injuries to VRU & FiP in the EU. The ECHI list offers a European platform to present the newly established figures and rates of VRU & FiP. As a first step, the main categories of the ECHI long list relevant to the proposal of indicators for injuries to VRU & FiP were selected. Indicators of transport injuries are included in the ECHI long list under the sections *Health Status*, *Determinants of Health* and *Health systems*.[107] Below are the proposed categories to be integrated into the ECHI long list:

11.1.1.1 Indicators to be integrated into the category 'Health Status'

"Mortality transport accidents" are included under the category *Mortality, cause specific→ external causes* of the ECHI long list.

The proposal according to the results of this report is to also include:

- Mortality figures (absolute numbers) among motorised and non–motorised VRU & FiP
- Mortality rates of motorised and non–motorised VRU & FiP by specific age groups (0–14, 65+).
- Mortality rates of motorised and non–motorised VRU & FiP by region.

Sources: CARE mortality data, EUROSTAT data on cases of death (COD): if coded to the fourth digit of ICD10, Injury Statistics Portal (ISP)[108]

Under the category *Morbidity, cause specific → external causes* it is proposed to include:

- Extrapolated numbers on morbidity among motorised and non–motorised VRU & FiP.
- Morbidity rates to motorised and non–motorised VRU & FiP by specific age groups (0–14, 15-24, 65+).
- Morbidity rates to motorised and non–motorised VRU & FiP by injuries causing a disability

Sources: IDB, CARE morbidity data

11.1.1.2 Indicators to be integrated into the category 'Determinants of Health'

"Traffic behaviour" is mentioned under the category *Health behaviours→ other health related behaviour*. Based on the results of this report it is proposed to also include indicators on:

- Usage of helmets (already included) as inline skater, cyclist and motorcyclist
- Usage of protective equipment as inline skater, cyclist and motorcyclist
- Quality standards for safety equipment for bicycles, skateboard, inline skaters and motorcycles
- Exposure data on VRU & FiP

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[106] Kramers, P.G.N. (ed.). Public Health Indicators for Europe: Context, selection, definition, Final Report by the ECHI Project Phase II. RIVM National Institute of Public Health and Environment, Bilthoven (The Netherlands) 2005, page 15.

[107] Kramers, P.G.N. (ed.). Annex 5 to the ECHI–2 report, The ECHI Comprehensive Indicator List (Long List), Version of July 7, RIVM National Institute of Public Health and Environment, Bilthoven (The Netherlands) 2005.

[108] Center for Research and Prevention of Injuries (CEREPRI) (ed.). Injury Statistics Portal (ISP). Mortality data, WHO & CARE [database online]. [cited May 13, 2008]. Available from Internet: http://www.euroipn.org/stats_portal.

Sources: IDB, CARE, European Road Safety Observatory (ERSO)[109]

11.1.1.3 Indicators to be integrated into the category 'Health Promotion'

Under the category *Health promotion* it is proposed to include:

- Health promotion for interventions in kindergartens and schools for VRU & FiP
- Health promotion for interventions for the elderly as VRU & FiP
- Health promotion for interventions for non–motorised and motorised two–wheelers
- "... national strategy with specific targets and timelines related to pedestrian injuries
- ... national strategy with specific targets and timelines related to bicycle injuries
- ... national media campaign at least once in past five years targeting prevention of pedestrians
- ... national media campaign at least once in past five years targeting prevention of cyclists
- ... national policy providing incentives to support vehicle redesign to reduce risk of pedestrian injury (e.g. pedestrian friendly bumper heights)"[110]

Source: WHO[111]

11.1.1.4 Indicators to be integrated into the category 'Health Protection'

Under the category *Health protection* it is proposed to include:

- Regulation on the use of cycle helmets (already included)[112]
- Regulation on reduced speed in residential areas (e.g. schools, playgrounds, retirement homes)[113]
- Regulation on the use of safety equipment for bicycles and motorcycles
- Regulation on barrier–free footways

Source: ERSO[114]

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[109] SafetyNet (ed.). European Road Safety Observatory (ERSO), Country profiles and comparisons [online]. updated April 2008 [cited May 13, 2008]. Available from Internet: http://www.erso.eu/data/content/country_profiles_and_comparisons.htm.,
Vis, M.A., Van Gent, A.L. (Eds.). Road Safety Performance Indicators: Country Profiles. Deliverable D3.7b of the EU FP6 project SafetyNet [online]. 2007 [cited May 13, 2008]. Available from Internet: http://www.erso.eu/safetynet/fixed/WP3/sn_wp3_d3p7b_spi_country_profiles.pdf.,
SafetyNet (ed.). European Road Safety Observatory (ERSO), Road Safety Risk [online]. updated April 2008 [cited May 13, 2008]. Available from Internet: http://www.erso.eu/data/content/road_safety_risk.htm#_Road_Safety_Risk.

[110] European Child Safety Alliance (ed.). Child Safety Action Plan Project. Amsterdam 2007. Available from Internet: www.childsafetyeurope.org.

[111] World Health Organisation (WHO) (ed.). Road safety strategies and action plans [online]. updated 2008 [cited May 14, 2008]. Available from Internet: http://www.who.int/violence_injury_prevention/road_traffic/strategies/en/index.html.

[112] European Child Safety Alliance (ed.). Child Safety Action Plan Project. Amsterdam 2007. Available from Internet: www.childsafetyeurope.org.

[113] see above

[114] SafetyNet (ed.). European Road Safety Observatory (ERSO), Country profiles and comparisons [online]. updated April 2008 [cited May 13, 2008]. Available from Internet: http://www.erso.eu/data/content/country_profiles_and_comparisons.htm.

11.1.2 The ECHI Short List

Within the ECHI–2 work plan it was decided to create a first phase set of core indicators so as to be more effective concerning the harmonisation of data collection and to be able to establish a working information system in the short term.[115]

Indicators on injuries to VRU & FiP should be included in the ECHI short list under the following topics:[116]

11.1.2.1 Indicators to be integrated into the category 'Health Status'

Under the category *Health status* it is proposed to include:

- Injuries: VRU (motorised + non–motorised); fatality and morbidity rates per 1 million inhabitants
- Injuries to motorised two-wheelers, pedal cyclists and pedestrians related to motorised traffic vehicles that have to be treated as an in-patient in hospital; injury risk rates of more severe injuries per 100,000 inhabitants
- Injuries: FiP; morbidity rates per 1 million inhabitants

Sources: CARE, IDB, HDD

11.1.2.2 Indicators to be integrated into the category 'Health interventions: Health Promotion'

It is proposed to include the following areas in the category *Health interventions: health promotion*:

- Policies and practices for safety of VRU & FiP

Sources: ERSO[117], WHO[118], ISP[119]

[115] Kramers, P.G.N. (ed.). Annex 7 to the ECHI–2 report, The ECHI short list, selection procedures as agreed in May 2003. RIVM National Institute of Public Health and Environment, Bilthoven (The Netherlands) 2005, page 2f.

[116] Kramers, P.G.N. (ed.). Annex 6 to the ECHI–2 report, ECHI short list, Final version of April 30, 2005. RIVM National Institute of Public Health and Environment, Bilthoven (The Netherlands) 2005.

[117] SafetyNet (ed.). European Road Safety Observatory (ERSO), Knowledge about data [online]. updated April 2008 [cited May 13, 2008]. Available from Internet: http://www.erso.eu/data/content/knowledge_about_data.htm.

[118] World Health Organisation (WHO) (ed.). Road safety strategies and action plans [online]. updated 2008 [cited May 14, 2008]. Available from Internet: http://www.who.int/violence_injury_prevention/road_traffic/strategies/en/index.html.

[119] Center for Research and Prevention of Injuries (CEREPRI) (ed.). Injury Statistics Portal (ISP). Mortality data, WHO & CARE [database online]. [cited May 13, 2008]. Available from Internet: http://www.euroipn.org/stats_portal.

11.2 Description of previous road safety initiatives at the European level

The group of VRU was already subject to research projects of the transport sector mainly co–financed by the Directorate General for Transportation. Each of the projects mentioned below were important steps for improving the safety of VRU. Some of them focus directly on best practices targeting the prevention of injuries among VRU with a vehicle such as *PROMISING*, *ROSE25* and *SUPREME*. Others such as *ROSEBUD* and *SafetyNet* focus on networking, storing and dissemination of knowledge concerning injury prevention to VRU. *WALCYNG* and *HOTEL* aim to enhance walking and cycling by making these modes of transport safer and by developing and implementing indicators for quality of life in connection with transport and mobility in the public space. These approaches correspond with the broader perspective of this report by focussing on the estimation of the number of injuries to VRU and FiP in the public transport area. They also include single vehicle accidents, reconsider priority setting and define indicators measuring the potential impact of injuries to VRU (also including single accidents) in the future. For example, the *VOICE Network* of the ETSC has already included the safety of VRU on pavements as a responsibility of the traffic sector.

The following overview gives short descriptions of these projects:

ADONIS[120]

The aims of ADONIS were to present "…an overview of best practice for promoting cycling and walking instead of car–driving in cities by giving an overview of cycle friendly and pedestrian friendly infrastructure elements and other measures to promote cycling and walking, and by comparing measures to support cycling and walking implemented in cycle/pedestrian–minded and non–minded cities. Provide new knowledge on road users' modal choice for short trips in urban traffic by collecting and studying behavioural factors affecting transport behaviour (modal choice) and by collecting and studying daily travel patterns. Provide new knowledge about attitudes and behaviour leading to urban traffic accidents with two parties (car–cyclist and car–pedestrian) by in–depth interviews with those involved, as it is assumed that improving safety of cycling and walking could play an important role in the efforts of increasing their role in the urban modal split. Further, it aimed to present general recommendations and guidelines to decision makers regarding directions for efforts to promote walking and cycling instead of short car trips in cities and for further initiatives in this field. "

DUMAS[121]**:**

"The objective of the DUMAS project has been to produce a framework for the design and evaluation of urban safety initiatives. DUMAS brings together the existing knowledge on the effects of safety measures with the overall planning and management of urban safety programmes; particularly the interactions between engineers, politicians and the public, and the interactions with other urban initiatives."

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[120] Bernhoft, I. M. (ed.). Analysis and Development Of New Insight into Substitution of short car trips by cycling and walking (ADONIS) [online]. Danish Council of Road Safety Research (RfT), updated April 1999 [cited May 13, 2008]. Available from Internet: http://cordis.europa.eu/transport/src/adonis.htm.

[121] Transport Research Laboratory (ed.). DUMAS: Developing Urban Management And Safety, Final Report, Work Package 10, November 2000, page 3.

HOTEL[122]

*"HOTEL – "*How to analyse life quality" has three aims: to improve the understanding of the assessment of citizens´ Qualtiy of Life (QoL) by politicians, planners, technicians and other experts; to develop a "toolbox" for the assessment of QoL in connection with city planning, transport and mobility; and to start a databank where results of QoL assessment at different occasions are stored and can be compared."

PROMISING[123]**:**

"The aim of the PROMISING project was to develop measures that reduce the risk of injury to vulnerable and young road users as much as possible in a non–restrictive way. That is to say that safety and mobility must be improved together; the improvement of safety should not take place at the cost of reduced mobility. The aim was to present measures within an implementation framework, with the main focus on technical, non–restrictive aspects."

ROSE25[124]**:**

"The ROSE–project emphasises the need to collect and exchange good practice in order to launch the discussion on Road Safety Education (RSE) Guidelines at European level. The main purposes of the project in brief are to collect measures of good practice in Road Safety Education (RSE) for children and teenagers in the Member States of EU–25, and to compile European guidelines for best practice."

ROSEBUD[125]**:**

"…, ROSEBUD was funded by the European Commission as a thematic network to support users at all levels of government (European Union, national, regional, local) with information about road safety related efficiency assessment solutions. To this end, ROSEBUD brought together researchers, policy makers, decision makers and other relevant parties into a co–operative network."

SafetyNet[126]

"A key element in the programme concerned the development of a new "European Road Safety Observatory" to gather data and knowledge to create future safety policies. The activity is categorised into three main areas with the work being conducted across seven Work Packages. Macroscopic data address issues concerning national level data and international comparisons,

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[122] Risser, R.. HOTEL – How to analyse quality of life. Final report. FACTUM OHG Traffic and Social Analysis, Vienna 2004, page 5. Available from Internet: www.factum.at/hotel.

[123] Institute for Road Safety Research (SWOV) (ed.). PROMISING: Promotion of Measures for Vulnerable Road Users. Final report, Leidschendam 2001, page 7.

[124] Austrian Road Safety Board (KfV) (ed.). ROSE 25: Inventory and compiling of a European Good Practice Guide on Road Safety Education targeted at young people. Final Report, Vienna 2005, page 1.

[125] Federal Highway Research Institute (BAST) (ed.): ROSEBUD. Road Safety and Environmental Benefit–Cost and Cost–Effectiveness Analysis for Use in Decision–Making. Recommendations. Deliverable WP5, May 2006, page 7.

[126] SafetyNet (ed.). European Road Safety Observatory (ERSO) [online]. Paper to the 10th PRI International Road Safety World Congress, Abu Dabi, United Arab Emirates, May 2006 [cited May 13, 2008], page 1f. Available from Internet: http://www.erso.eu/safetynet/content/safetynet.htm.

in–depth data provides much greater detail on accident causation and supports new priority identification while the Data Application will provide a gateway to the accident information over the web and develop statistical approaches."

SUPREME[127]

"The aims of SUPREME are to collect, analyse, summarise and publish best practices in road safety in the Member States of the European Union + Switzerland + Norway; to see the measures implemented by as many partners as possible; measures should be introduced at various levels (national, regional and local authorities, industry, road operators and private organisations)."

VOICE[128]

"Vulnerable road user organisations in cooperation across Europe (VOICE)" is a Europe–wide campaign to protect VRU. "The principle aim of this activity of this "European Transport Safety Council (ETSC)" activity is to raise awareness of the needs of VRU among EU policy makers such that they more readily accept responsibility for the implementation of the measures necessary for the protection of cyclists and pedestrians."

WALCYNG[129]

"The main aim of the project was to develop guidelines for enhancing walking and cycling, in order to replace shorter car trips and to make the walking and cycling modes safer. This will be done following marketing principles and includes a. o. the following steps: – definition and quantification of potential user groups; – collection and evaluation (from the customer point of view) of existing 'products' for pedestrians and cyclists; – definition of possible gaps in the existing 'product' range, development of new 'products', – description of supporting soft policy measures (advertising, lobbying etc.)."

[127] Austrian Road Safety Board (KfV) (ed.). SUPREME: Summary and Publication of Best Practices in Road Safety in the Member States. Methodology [online], Vienna 2007 [cited May 13, 2008]. Available from Internet: http://ec.europa.eu/transport/roadsafety_library/publications/supreme_a_methodology.pdf.

[128] European Transport Safety Council (ETSC) (ed.). "Vulnerable road user organisations in cooperation across Europe (VOICE)" - A Europe-wide campaign to protect vulnerable road users [online]. Updated March 2008 [cited May 13, 2008]. Available from Internet: http://www.etsc.be/Voice.php.

[129] Hyden, C. (ed.). How to enhance WALking and CYcliNG instead of shorter car trips and to make these modes safer (WALCYNG) [online]. Department of Traffic Planning and Engineering, Lund University, Sweden, updated April 1999 [cited May 13, 2008]. Available from Internet: http://cordis.europa.eu/transport/src/walcyng.htm or http://cordis.europa.eu/transport/src/walcyngrep.htm.