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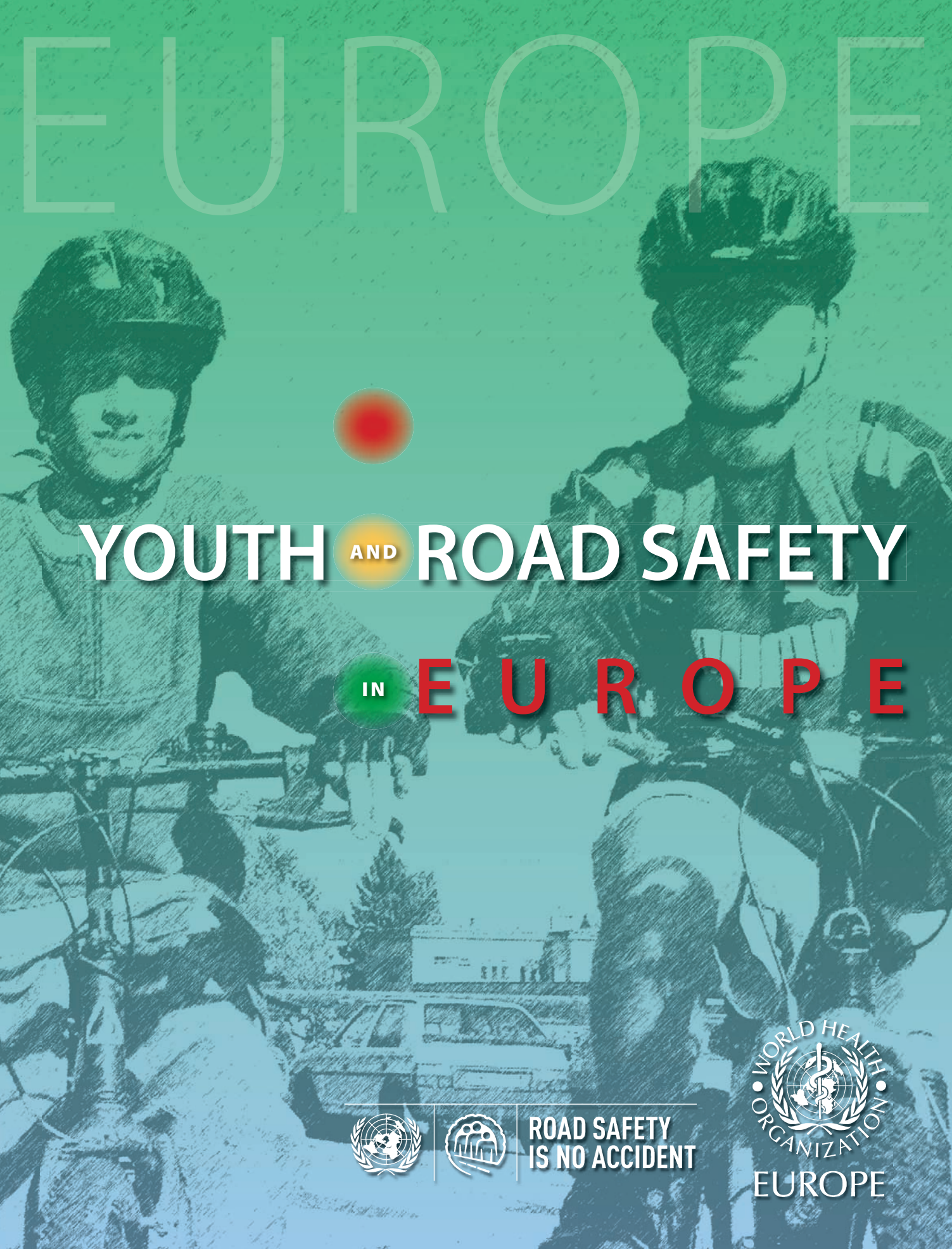

YOUTH AND ROAD SAFETY IN EUROPE

ROAD SAFETY IS NO ACCIDENT

WORLD HEALTH ORGANIZATION
EUROPE

YOUTH AND ROAD SAFETY IN EUROPE

POLICY BRIEFING

The World Health Organization was established in 1948 as the specialized agency of the United Nations responsible for directing and coordinating authority for international health matters and public health. One of WHO's constitutional functions is to provide objective and reliable information and advice in the field of human health. It fulfils this responsibility in part through its publications programmes, seeking to help countries make policies that benefit public health and address their most pressing public health concerns. The WHO Regional Office for Europe is one of six regional offices throughout the world, each with its own programme geared to the particular health problems of the countries it serves. The European Region embraces some 880 million people living in an area stretching from the Arctic Ocean in the north and the Mediterranean Sea in the south and from the Atlantic Ocean in the west to the Pacific Ocean in the east. The European programme of WHO supports all countries in the Region in developing and sustaining their own health policies, systems and programmes; preventing and overcoming threats to health; preparing for future health challenges; and advocating and implementing public health activities. To ensure the widest possible availability of authoritative information and guidance on health matters, WHO secures broad international distribution of its publications and encourages their translation and adaptation. By helping to promote and protect health and prevent and control disease, WHO's books contribute to achieving the Organization's principal objective – the attainment by all people of the highest possible level of health.

YOUTH AND ROAD SAFETY IN EUROPE

POLICY BRIEFING

By:
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Youth and road safety in Europe, Policy briefing.

Abstract
Each year 32 000 people younger than 25 years in the WHO European Region lose their lives to road traffic injuries, making this the third leading cause of death. Among them, about half those younger than 15 years die as pedestrians, whereas those 15–24 years old predominantly die as car or motorcycle users. Children and young adults need special consideration as vulnerable and inexperienced road users. This booklet highlights some of the factors that put young people at increased risk of serious road crashes. These include speed, alcohol, not being conspicuous, not using crash helmets, seat-belts and child passenger restraints and road and vehicle designs that do not have built-in safety features increase the likelihood. To counteract this relentless daily toll, many cost-effective interventions have been proposed. There are a wealth of experience in the European Region and opportunities to learn from it.

Keywords
1. accidents, traffic - prevention and control
2. wounds and injuries - prevention and control
3. safety
4. adolescent
5. child
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DINESH SETHI, FRANCESCA RACIOPPI and **FRANCESCO MITIS**

ACRONYMS

CIS	Commonwealth of Independent States
ECMT	European Conference of Ministers of Transport
ETSC	European Transport Safety Council
EU	European Union
FEVR	European Federation of Road Traffic Victims
ICD	International Classification of Diseases
OECD	Organisation for Economic Co-operation and Development
UNECE	United Nations Economic Commission for Europe

FOREWORD

Spectacular public health successes were achieved during the 20th century in fighting infectious disease, the historical killer of children and young adults in Europe. However, at the dawn of the new millennium, society confronts another threat to the well-being of people younger than 25 years, who make up one third of the population of the WHO European Region. Road traffic injuries kill as many as 32 000 people younger than 25 years old in the Region every year and injure or maim millions more. This burden is not equally distributed and is a source of growing inequality in health in the Region, both between countries and within countries, with socioeconomically disadvantaged groups being more at risk. These deaths and the millions of injuries and disabilities experienced by survivors are largely preventable. Children and young adults have the right to safety on the streets. In order to safeguard this, society needs to confront this growing challenge and coordinate its efforts to defeat this public health threat.

This policy briefing is being published during the First United Nations Global Road Safety Week (23–29 April 2007), a week dedicated to young road users. The briefing has been written to complement the global report *Youth and road safety* and highlights the European problem and proposes solutions for the European context. It aims to provide its European audience of policy-makers and practitioners from the health, transport and other sectors, nongovernmental organizations and other members of civil society with a tool to advocate for the road safety of young people in Europe.

We hope that, by highlighting the magnitude of the problem and the opportunities for prevention, this publication can be useful to those demanding action to protect the safety of young people in Europe. Such advocacy will add to the debate that started on World Health Day in 2004, which was dedicated to road safety. WHO proposed a public health and multisectoral approach to preventing road traffic injuries. The current publication highlights the burden among young people in Europe and proposes actions to protect their safety on our roads. By tackling road safety, we can make our society more equitable.

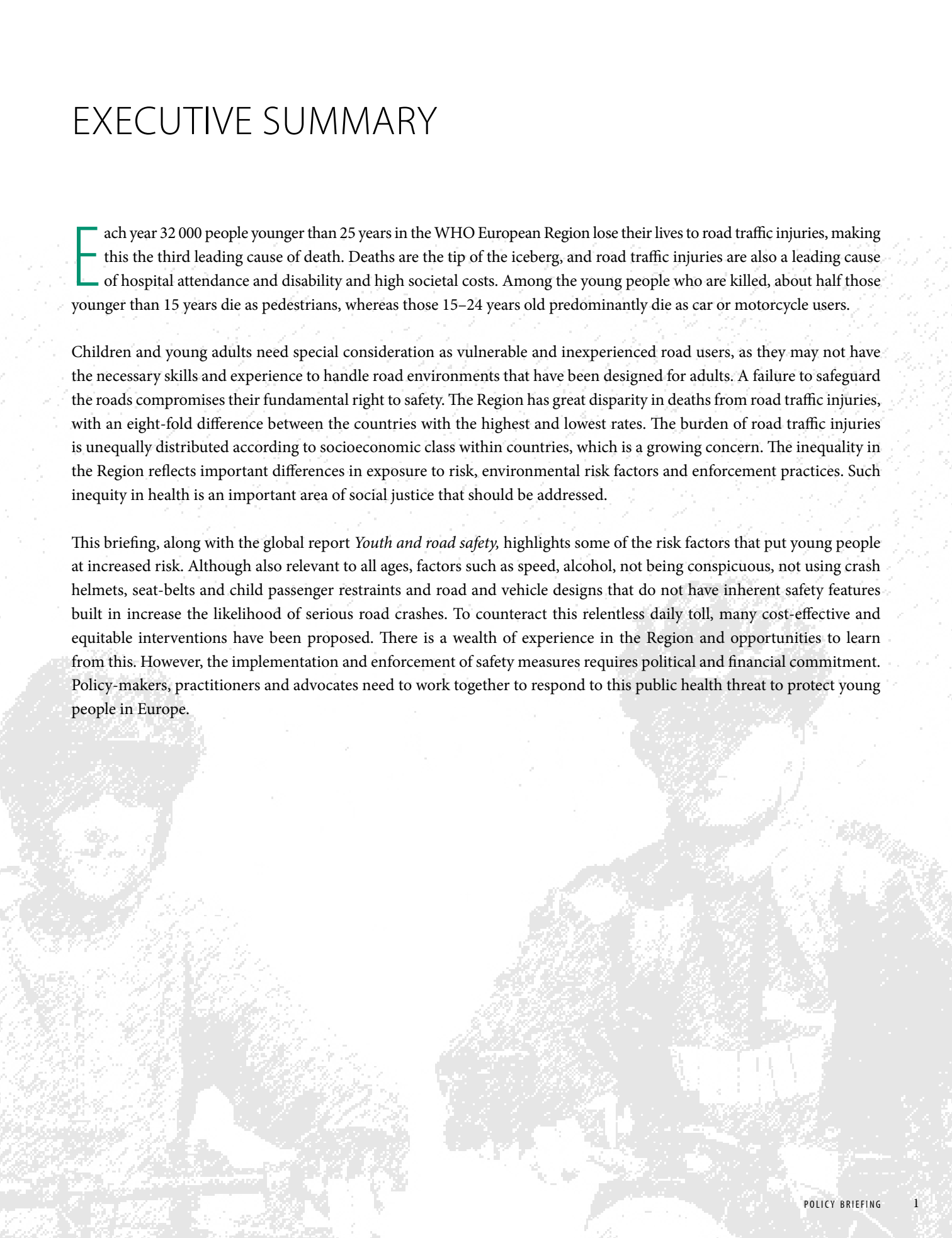
ROBERTO BERTOLLINI
Director, Special Programme for Health and Environment
WHO Regional Office for Europe

EXECUTIVE SUMMARY

Each year 32 000 people younger than 25 years in the WHO European Region lose their lives to road traffic injuries, making this the third leading cause of death. Deaths are the tip of the iceberg, and road traffic injuries are also a leading cause of hospital attendance and disability and high societal costs. Among the young people who are killed, about half those younger than 15 years die as pedestrians, whereas those 15–24 years old predominantly die as car or motorcycle users.

Children and young adults need special consideration as vulnerable and inexperienced road users, as they may not have the necessary skills and experience to handle road environments that have been designed for adults. A failure to safeguard the roads compromises their fundamental right to safety. The Region has great disparity in deaths from road traffic injuries, with an eight-fold difference between the countries with the highest and lowest rates. The burden of road traffic injuries is unequally distributed according to socioeconomic class within countries, which is a growing concern. The inequality in the Region reflects important differences in exposure to risk, environmental risk factors and enforcement practices. Such inequity in health is an important area of social justice that should be addressed.

This briefing, along with the global report *Youth and road safety,* highlights some of the risk factors that put young people at increased risk. Although also relevant to all ages, factors such as speed, alcohol, not being conspicuous, not using crash helmets, seat-belts and child passenger restraints and road and vehicle designs that do not have inherent safety features built in increase the likelihood of serious road crashes. To counteract this relentless daily toll, many cost-effective and equitable interventions have been proposed. There is a wealth of experience in the Region and opportunities to learn from this. However, the implementation and enforcement of safety measures requires political and financial commitment. Policy-makers, practitioners and advocates need to work together to respond to this public health threat to protect young people in Europe.



1 WHY THIS POLICY BRIEFING?

Each year 127 000 people die from road crashes in the WHO European Region (Peden et al., 2004). The nonfatal consequences are also severe: more than 2 million injured people require hospital admission and millions more require medical attention, with a large proportion permanently disabled (UNECE, 2006). Road traffic injuries in the Region result in an annual loss of 3.6 million years of healthy life due to premature death or disability (disability-adjusted life-years). The loss of national productivity is an economic threat, resulting in high societal costs equivalent to about 2% of gross domestic product. For the European Region, this translates into hundred of billions of euros, including health service costs to treat and rehabilitate injured people.

Road crashes can affect anyone, but children and young people pay a heavy toll; road traffic injuries kill an estimated 32 000 people younger than 25 years annually (Box 1). The high number of years of life lost due to premature mortality

BOX 1. THE REASONS FOR FOCUSING ON PEOPLE YOUNGER THAN 25 YEARS

- Road traffic injuries are the leading cause of death among people 5–24 years old.
- Europe has great inequality in death from road traffic injury between and within countries; addressing inequity is an important area for social justice.
- Young people make up many of the pedestrians, cyclists and motorbike riders, who are vulnerable as road users.
- Young and novice drivers are more susceptible to risk factors such as alcohol and speeding.
- Children and young adults need advocates in this important area of health and social policy.
- Providing safer environments for pedestrians and cyclists will have other beneficial effects, including helping to promote physical activity and to counteract obesity and other noncommunicable diseases in Europe.

among young people, coupled with the severe and life-long disability, results in a disproportionately higher burden of injuries (Sethi et al., 2006a).

There have been global calls for action to combat this rising epidemic that threatens the social and economic development of societies (Peden et al., 2004; Toroyan & Peden, 2007).

This publication highlights the problem and potential solutions of road safety faced by young people in Europe. It accompanies the global report, *Youth and road safety* (Toroyan & Peden, 2007). The briefing is a tool to promote awareness in the 53 Member States in the WHO European Region. Its purpose is to highlight the burden of road traffic injuries among road users aged 0–24 years, to discuss the risk factors that are of special concern in this age group, to present examples of preventive programmes from the countries of the Region and to emphasize priorities for policy and research (Box 2).

BOX 2. THE RIGHT TO SAFETY AND A HEALTHY LIFE FOR CHILDREN AND YOUNG ADULTS

Children are not just small adults. Childhood encompasses different stages of emotional, neural and physical development ranging from newly born babies to adolescents. Each stage requires a different response, whether these are for preventive policies or services (Aynsley-Green et al., 2000).

Children cannot speak for themselves or are not given an opportunity to express their views. They therefore need advocates as road users, whether as pedestrians, cyclists, motorbike riders or car occupants. Similarly, young adults need special consideration as road users not yet experienced enough to respond appropriately to situations that put them and others at risk. In promoting road safety for these groups of road users, policy-makers and practitioners need to take these special circumstances into account. Failure to do so compromises the fundamental rights of children (and young adults) to safety and a full, healthy and productive life in accordance with the United Nations Convention on the Rights of the Child (United Nations, 1989).

2 HOW GREAT IS THE PROBLEM OF ROAD TRAFFIC INJURIES AMONG YOUNG PEOPLE IN EUROPE?

Nearly 290 million people 0–24 years old live in the European Region, comprising one third of the population; 32 000 of these lost their lives to road traffic injury in 2002 (WHO, 2002) (Table 1).

Road traffic injuries are the leading cause of death among people 5–24 years old. Deaths are the tip of the iceberg; for every person who dies, an estimated 20 more people require hospital admission for their serious injuries, 70 more people require outpatient treatment and many are permanently disabled (Gill et al., 2006; Roberts, 2005). Whereas these estimates are for all ages, the number of young nonfatal victims of road traffic injuries is likely to run into the millions. The impact on the lives of victims and families is devastating. In addition, there are both health service costs and costs to society, which have been estimated to be €1.7 million to €2.2 million per fatality (ECMT and OECD, 2006). The total costs for the European Region are therefore enormous.

2.1 FROM CHILDHOOD TO YOUNG ADULTHOOD: CHANGING VULNERABILITY

Vulnerability to road crash deaths increases with age, being highest among people 20–24 years old (Fig. 1). Three fourths of the people 0–24 years old killed in road crashes are male, and the increased risk for males relative to females increases with age. The increase with age reflects changes in exposure to risk resulting from differences in travel patterns.

2.1.1 DEATHS VARY BY AGE AND TYPE OF ROAD USER

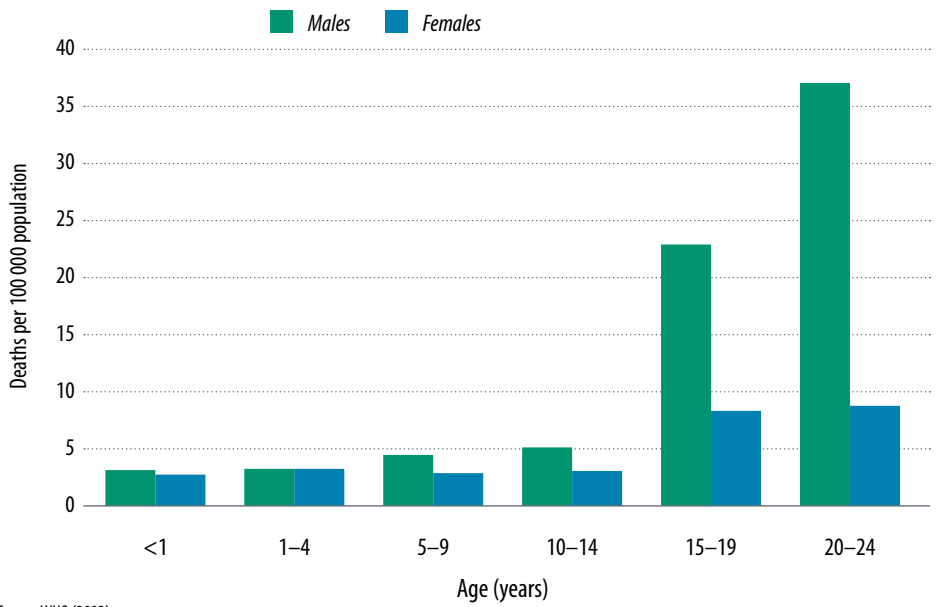
Compared with the general population, more people younger than 25 years who die from road crashes die as car users (54% of road traffic deaths versus 47% for the general population) and as users of motorized two-wheelers (17% of road traffic deaths versus 11% for the general population).

Table 1. Rank of the leading 10 causes of death and numbers of deaths among people aged 0–24 years in the WHO European Region, 2002

Rank	< 1 year	1–4 years	5–9 years	10–14 years	15–19 years	20–24 years	0–24 years
1	Perinatal conditions 65 635	Lower respiratory infections 6 467	Road traffic injuries 2 132	Road traffic injuries 2 560	Road traffic injuries 10 441	Road traffic injuries 15 001	Perinatal conditions 65 692
2	Congenital anomalies 26 085	Childhood-cluster diseases 3 142	Lower respiratory infections 2 111	Lower respiratory infections 1 682	Self-inflicted injuries 7 552	Self-inflicted injuries 12 056	Lower respiratory infections 38 459
3	Lower respiratory infections 25 504	Congenital anomalies 2 575	Drownings 1 382	Drownings 1 481	Violence 2 900	Violence 5 844	Road traffic injuries 31 830
4	Diarrhoeal diseases 10 560	Drownings 1 708	Leukaemia 855	Self-inflicted injuries 1 431	Drownings 2 174	Poisonings 4 283	Congenital anomalies 31 626
5	Meningitis 8 199	Road traffic injuries 1 387	Congenital anomalies 798	Leukaemia 910	Poisonings 1 643	War 3 474	Self-inflicted injuries 21 211
6	Upper respiratory infections 2 022	Diarrhoeal diseases 1 267	Cerebrovascular disease 400	Congenital anomalies 730	Lower respiratory infections 1 472	Drownings 3 037	Diarrhoeal diseases 12 242
7	Childhood-cluster diseases 1 770	Meningitis 1 114	Poisonings 367	Violence 505	Cerebrovascular disease 1 355	Tuberculosis 2 468	Meningitis 10 484
8	Endocrine disorders 795	Fires 764	Fires 327	Cerebrovascular disease 448	Leukaemia 1 314	Cerebrovascular disease 1 633	Violence 10 048
9	Inflammatory heart diseases 563	Poisonings 761	Epilepsy 306	Poisonings 443	War 852	Falls 1 446	Drownings 9 891
10	HIV/AIDS 397	Leukaemia 708	Lymphomas, multiple myeloma 267	Epilepsy 381	Falls 843	Drug use disorders 1 285	Poisonings 7 760

Source: WHO (2002).

Fig. 1. Mortality rates from road crashes among people 0–24 years old per 100 000 population by age and sex



Source: WHO (2002).

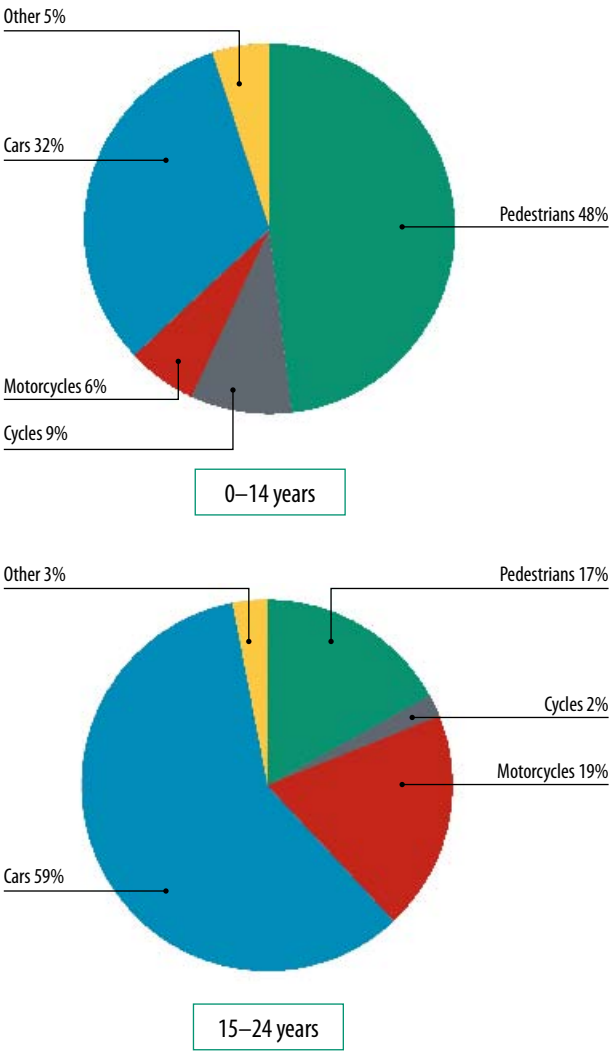
However, closer examination of the mortality data by type of road user reveals important differences in mortality indicating changes in exposure and risk from childhood into adolescence and young adulthood. Among children younger than 15 years, the leading causes of road traffic deaths are as pedestrians (48%), followed by car occupants (32%) and bicycle riders and passengers (8%). At 15–24 years, this changes considerably, and the leading causes become car drivers or occupants (59%), riders and passengers of motorized two-wheelers (19%) and as pedestrians (17%) (Fig. 2). These differences reflect greater exposure to risk as pedestrians and cyclists among children and as car drivers or occupants and riders and passengers of motorized two-wheelers among those 15–24 years old (Box 3). This information is essential for planning and targeting prevention to those most at risk.

2.2 ROAD SAFETY AMONG YOUNG PEOPLE: INEQUALITY IN THE REGION

Road deaths across the European Region are unequally distributed, with an eight-fold difference between the countries with the highest road traffic mortality rate and those with the lowest. Fig. 3 and 4 show that the European countries with the highest transport injury death rates among people 0–24 years old are the Russian Federation, Lithuania, Latvia, Portugal and Greece. The countries with the lowest mortality are Tajikistan, Azerbaijan, Armenia, Georgia and The former Yugoslav Republic of Macedonia. The low death rates in these countries may reflect lower exposure to risk because of lower levels of motorization as well as changes in reporting (Annex 1). More highly motorized countries that have low rates of road deaths include Sweden, United Kingdom and the Netherlands, suggesting better road safety practices. Lessons can be transferred from these countries to elsewhere in the Region.

For all parts of the Region, transport death rates among people 15–24 years old are about four times higher than among people 0–14 years old (Fig. 5). This reflects the dramatic increase in exposure as travel patterns change from childhood to adolescence and adulthood. For both age groups the average rates for the Commonwealth of Independent States (CIS) countries are higher than those in the European Union (EU). Except for the peak in 1989–1991, recent death rates from transport injuries in the two age groups are declining in the EU and the European Region as a whole but have increased in the CIS countries since 1997 (Box 4). There is recent concern in western Europe that the previously declining road death rates are levelling off.

Fig. 2. Road deaths by mode of road transport among people 0–14 and 15–24 years old, 2002–2004 (average number of deaths per year among people 0–15 years old = 4303, 15–24 years old = 20 354)



Source: data from the UNECE transport database.

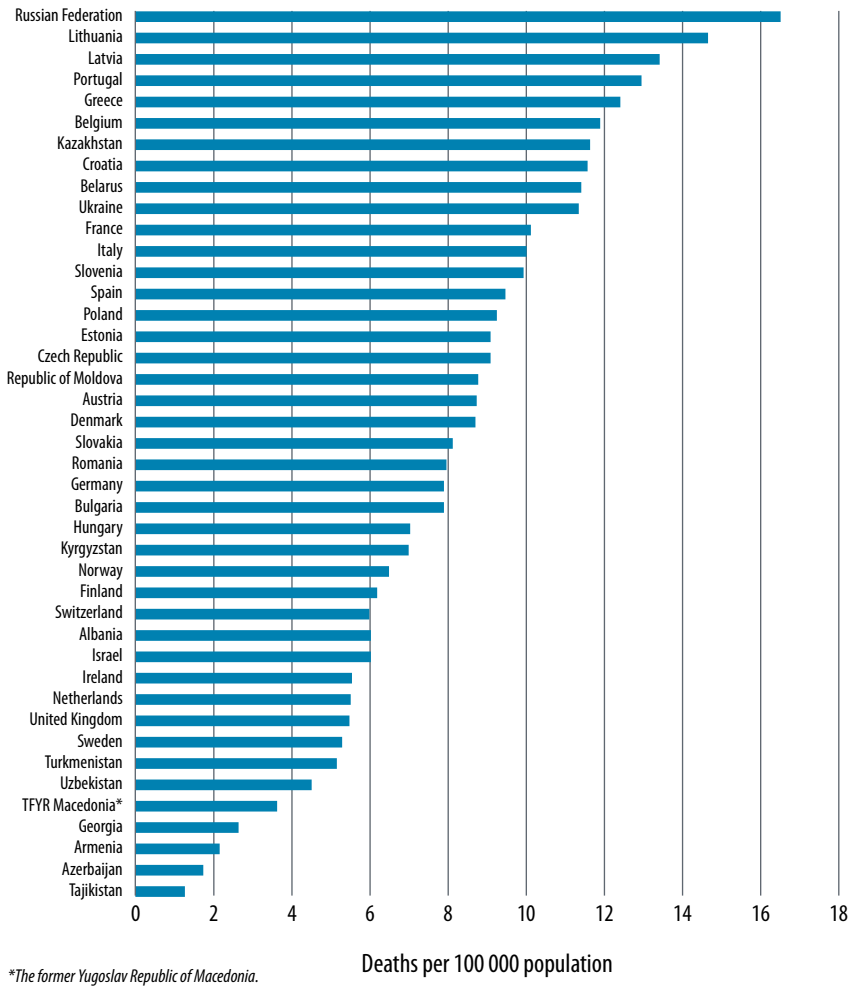
BOX 3. WHAT PUTS CHILDREN AND YOUNG ADULTS AT RISK OF ROAD TRAFFIC INJURY?

Children have limited ability to handle complex road traffic environments designed for adults because of their cognitive and physical development. This lack of capacity to make correct judgements about traffic speeds and distances and to negotiate the road with other users leaves them vulnerable as pedestrians and cyclists. To compound the problem, their short stature makes them less visible, and in the case of a crash, their vital body parts are more likely than those of adults to be damaged by a colliding vehicle (OECD, 2004). Road systems and motor vehicles could therefore be better designed to account for their vulnerability.

Adolescence and young adulthood is a time for exploration, and testing the limits of interaction with the environment may involve taking risks. Further, this is a period of life when peer pressure is important, and sensation-seeking may be gratifying. If this is expressed as risky driving, young people may be in hazardous situations but without adequate experience in handling them. This applies particularly to men, who also drive cars and motorcycles more than women and are more likely to have serious and fatal crashes (Fig. 1). Men are more likely than women to be exposed to risk by driving at higher speeds, under the influence of alcohol and not using seat-belts and helmets (Toroyan & Peden, 2007).

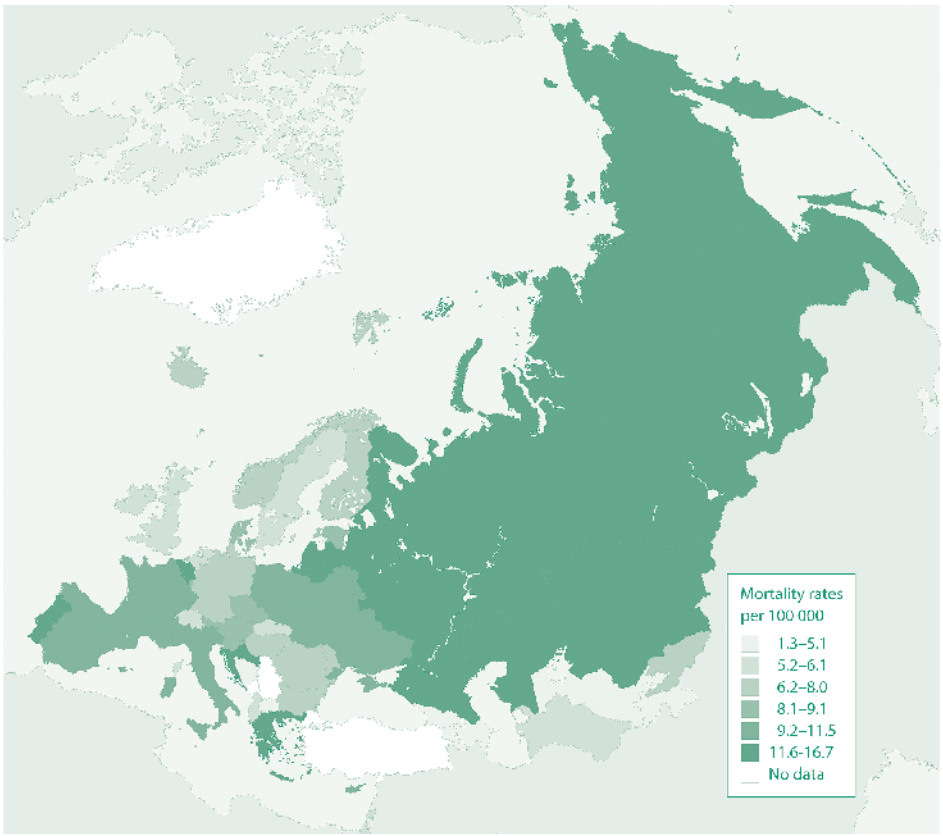
These physical, mental and behavioural characteristics of young people need to be taken into account in trying to understand why they are at risk on the roads and in developing preventive strategies. Further, social norms and lifestyles also contribute to risk in these age groups. For example, in many European countries participation in night-life activities increases in the evenings and weekends.

Fig. 3. Standardized mortality rates for transport injuries among people 0–24 years old in the WHO European Region, averages for 2003–2005 or the most recent three years



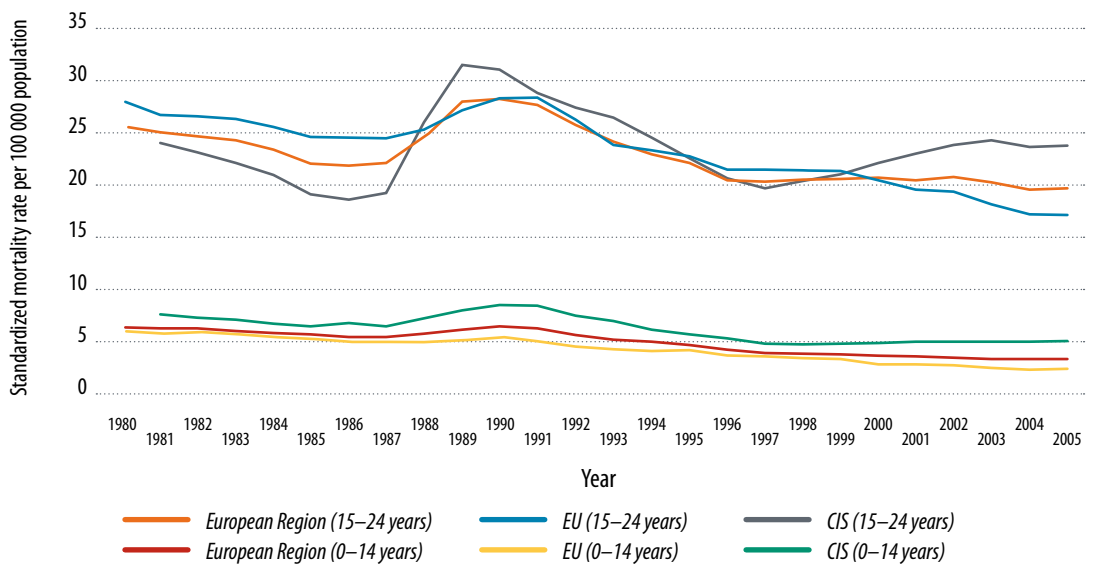
**The former Yugoslav Republic of Macedonia.*
Source: WHO Regional Office for Europe (2007a).

Fig. 4. Age-standardized mortality rates from transport injuries per 100 000 population among people 0–24 years old in the European Region, average for 2003–2005 or the most recent three years



Source: WHO Regional Office for Europe (2007a).

Fig. 5. Trends in age-standardized mortality rates from transport injuries per 100 000 population among people 0–14 and 15–24 years old in the European Region, the EU and the CIS, 1980–2005



Source: WHO Regional Office for Europe (2007a).

BOX 4. ROAD CRASH DEATHS IN COUNTRIES IN TRANSITION

Death rates on the roads are influenced by transport policy, population density, vehicle density, transport modes used and protective factors such as legislation and enforcement, road design and infrastructure, vehicle design, road user behaviour such as use of safety equipment and access to high-quality emergency trauma services. Countries undergoing transition with intense economic activity such as Estonia, Latvia, Lithuania and the Russian Federation have undergone rapid motorization, with changes in travel patterns but without adequate infrastructure development and regulatory controls (such as of speed, alcohol and driving licensing systems), resulting in increased exposure and the consequent high road death rates. In contrast, some countries in the eastern part of the European Region, including several countries of the former USSR, have lower levels of motorization and report fewer crashes and lower death rates. Road traffic death rates in these countries would be expected to increase with rapid motorization in accordance with the experience of other countries in transition; this presents an opportunity to implement safety policies and programmes to prevent such increases in road crashes.

2.3 SOCIOECONOMIC INEQUALITY IN ROAD CRASH DEATHS WITHIN COUNTRIES

Young people of lower socioeconomic status are at much greater risk of road traffic injuries than those of higher socioeconomic status. This is of particular importance because socioeconomic inequality is increasing in many countries in the Region (Christie et al., 2004; Edwards et al., 2006; Sethi et al., 2006b). Nevertheless, the extent of the problem has not been studied everywhere and few European countries have invested in investigating this further (Laflamme & Diderichsen, 2000; Roberts & Power, 1996).

For example, children from the lowest socioeconomic class in the United Kingdom were four times more likely to die from road traffic injuries; among pedestrians this was five times more likely (Roberts & Power, 1996). The difference between the higher and lower socioeconomic classes has increased in the United Kingdom. Edwards et al. (2006) have shown among children 0–15 years old that the likelihood of dying as a car occupant is 5.5 times higher if the parents are unemployed than if the parents have managerial or professional jobs, and this ratio exceeds 20 among pedestrians and cyclists.

Much evidence suggests that these differences in death risk are due to differences in exposure rather than behaviour (Laflamme & Diderichsen, 2000). Children from lower social classes are more likely to live in neighbourhoods with unsafe roads and high-speed traffic (Institute of Policy Research, 2002). If they have less access to cars, then these children are more likely to be vulnerable as pedestrians and bicyclists. This reinforces the need to address road safety in such neighbourhoods (Sonkin et al., 2006). However, there may be other additional factors such as access to and affordability of safety equipment and access to high-quality emergency trauma services. These warrant further investigation.

2.4 FEAR OF UNSAFE ROADS: LACK OF PHYSICAL ACTIVITY AND INCREASING OBESITY

The fear of unsafe roads is a powerful deterrent that may stop parents from allowing their children to walk or cycle (Di Guiseppi et al., 1998). This discourages children from using these forms of transport, which were used more frequently a few decades ago. The resulting lack of physical activity among children is an emerging concern because it contributes to the epidemic proportions of obesity in the Region and associated ill health due to other noncommunicable diseases (Cavill et al., 2006). Recent trends from countries such as the United Kingdom show that travel by walking and bicycling has declined substantially in the last two decades and dependence on car transport has increased (Sonkin et al., 2006). Among children 0–14 years old in the United Kingdom, the average distance travelled by walking fell by 19% and by cycling by 58%, whereas that travelled by car increased by 70% between 1985 and 2003.

This is consistent with reports from the Region stating that only one third of 11- to 15-year-olds are sufficiently physically active (WHO Regional Office for Europe, 2004a). Such countries as Denmark and the Netherlands have developed policies and infrastructure that encourage cycling and walking. Decreasing dependence on car travel for short journeys, which could be undertaken by walking and cycling, also has other beneficial health effects, such as those due to decreased air pollution and noise, leading to less respiratory illness and improved mental well-being. Such policies would also contribute to a more sustainable environment (Racioppi et al., 2004). Ensuring safety on the

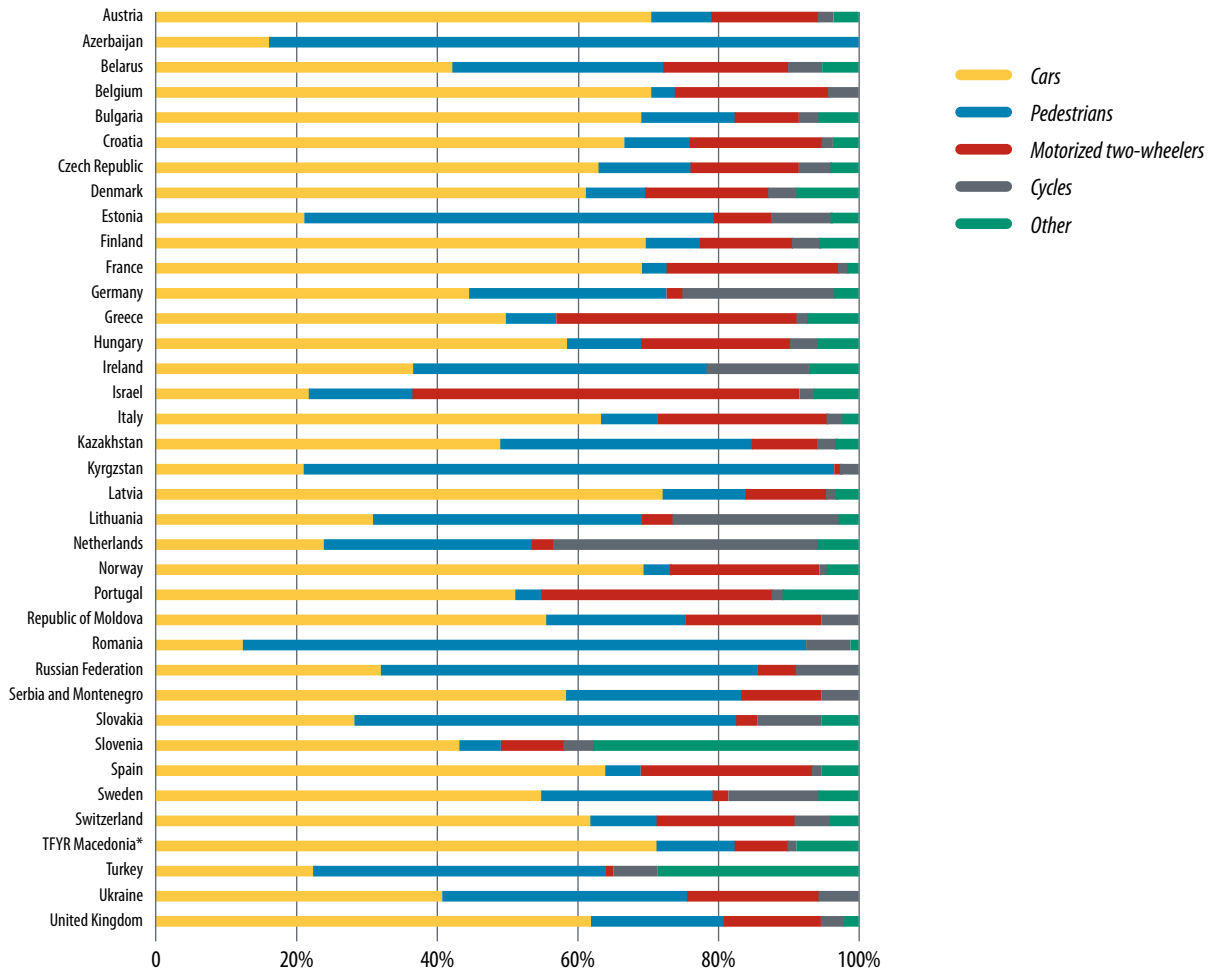
roads for vulnerable road users will therefore contribute to these other beneficial health and environmental effects (Box 5).

2.5 ROAD SAFETY AMONG YOUNG PEOPLE: RISK DIFFERS AMONG MODES OF ROAD TRANSPORT

Not only do death rates for all road crashes differ between countries, but the exposure and therefore risk is distributed differently according to the mode of road transport used.

The proportion of total deaths reported for each mode of road transport varies enormously by country (Fig. 6, Box 6). Although the quality of reporting varies across the Region, these data nevertheless show some important trends. For example, the countries reporting the highest proportions of car occupants among crash deaths are Latvia, The former Yugoslav Republic of Macedonia, Belgium, Austria and Finland. In contrast, the countries with the highest proportions of pedestrian deaths are Azerbaijan, Romania, Kyrgyzstan and Estonia. The countries with the highest proportions of motorcycle deaths are Israel, Greece, Portugal and Italy and, for cycling deaths, the Netherlands, Lithuania and Germany. Policy-makers and advocates may therefore wish to use this information when selecting country priorities.

Fig. 6. Proportion of deaths by mode of road transport among people 0–24 years old in selected European countries, 2002–2004



*The former Yugoslav Republic of Macedonia.
Source: Data from the UNECE transport database.

BOX 5. LINKING PREVENTING ROAD INJURY AND PROMOTING PHYSICAL ACTIVITY AMONG CHILDREN: THE CHILDREN'S ENVIRONMENT AND HEALTH ACTION PLAN FOR EUROPE

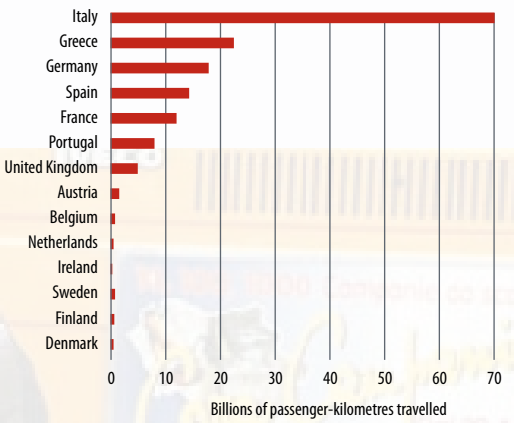
In June 2004, at the WHO Fourth Ministerial Conference on Environment and Health, representatives of European health and environment ministries adopted the Children's Environment and Health Action Plan for Europe (WHO Regional Office for Europe, 2004b). This tackles the most important environmental risk factors for the health of European children and contains commitments to be taken by European Member States of WHO to protect children's health in key priority areas. In particular, it sets as one of the priority goals "to prevent and substantially reduce health consequences from accidents and injuries and pursue a decrease in morbidity from lack of adequate physical activity, by promoting safe, secure and supportive human settlements for all children". Many Member States are working towards this commitment, and this work is in synergy with reducing the burden of injury and death among young road users.

BOX 6. MOTORCYCLES, MOPEDS AND MEDITERRANEAN COUNTRIES

In Mediterranean countries such as France, Greece, Israel, Italy and Portugal, mopeds and motorcycles are used in large numbers as a convenient form of transport, particularly among young people, who may use mopeds from the age of 14 years. When they are used in areas of dense traffic such as in busy urban areas and island holiday resorts, this results in high levels of mortality and serious injury. This may be due to a combination of weak law enforcement of helmet wearing and drink-driving and lack of familiarity with local road conditions.

Data are available on the passenger-kilometres travelled by motorized two-wheelers for 14 countries of the EU for all ages (Fig. 7). These show that the countries in southern Europe and Germany have the most passenger-kilometres travelled using motorized two-wheelers, with the lowest distances travelled in the Nordic countries. Assuming that the patterns of transport among young people are similar, this increase in exposure helps explain the high mortality from this form of transport among young people in countries in southern Europe (Fig. 3 in Annex 2).

Fig. 7. Passenger-kilometres travelled using motorized two-wheelers among people of all ages in 14 EU countries



Source: European Commission (2006).

3 WHAT CAN BE DONE? RISK FACTORS AND STRATEGIES FOR PREVENTION

Several risk factors increase the likelihood of road traffic injury irrespective of age. These include:

- inexperienced or novice drivers;
- excessive speed;
- not using helmets;
- driving under the influence of alcohol;
- failure to use seat-belts and child passenger restraints in cars;
- unsafe road design;
- insufficient vehicle crash protection;
- lack of conspicuousness.

Many of these risks are elevated among young people as pedestrians, cyclists, motorcycle riders and car users. Understanding how patterns of exposure and vulnerability change over the course of life is important in setting priorities among risk factors to be targeted in policies and programmes. Preventive interventions and programmes that strive to control these for the general population will also work for younger people. These have been summarized in both the *World report on road traffic injury prevention* (Peden et al., 2004) and *Preventing road traffic injury: a public health perspective for Europe* (Racioppi et al., 2004). Nevertheless, several preventive programmes have been shown to be very effective in reducing the risks of road traffic injury facing young people, and the global report *Youth and road safety* (Toroyan & Peden, 2007) presents these. This section presents the risk factors and examples of programmes that have been implemented to protect young people in the European Region.

3.1 REDUCING RISKS AMONG YOUNG DRIVERS

Young drivers appear to be at greater risk of crashes that involve speed, alcohol use, night driving and carrying young passengers (Box 2) (ECMT and OECD, 2006). One approach that attempts to control a variety of risk factors is the graduated driver licensing system.

3.1.1 STRATEGIES

The traditional licensing system has depended on novice drivers gaining experience by driving on their own (Mayhew et al., 2002). Several European countries are now taking action to change this. The countries that have introduced some form of graduated driver licensing system include Austria, Denmark, Finland, France, Germany, Luxembourg, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom. The purpose of this is to gradually expose young people to risk as they attain the competencies to manage that risk. A variable range of restrictions may be imposed in the intermediate stage: reducing the permissible blood alcohol concentration among drivers to zero, restricting teenage passengers in the car, restricting night driving with any passengers or imposing night curfews. An evaluation of studies from North America, Australia and New Zealand showed a reduction in crashes of about 31% for teenage drivers older than 15 years (Hartling et al., 2004). More widespread use has been advocated in the EU, in particular reducing the permissible blood alcohol concentration to zero and restricting carrying young passengers at night (ECMT and OECD, 2006). Box 7 presents an example of more thorough training and driving mentorship for novice drivers.

Progress in improving road safety in some EU countries has been inadequate (Fig. 5). In response to this concern, more concerted action has been recommended. Although these measures are across the board, implementation will also target young people (Box 8).

3.2 SPEEDING AND THE RISK OF SEVERE INJURY AND DEATH

Speed is a major risk factor for road traffic crashes, increasing the likelihood of death or severe injury for all road users. Speed is a risk factor for drivers of all ages but is much more likely to be a factor in fatal crashes involving young drivers (ECMT and OECD, 2006). Vulnerable road users are at particularly high risk of injury from speeding vehicles. For example, pedestrians have a 90% chance of surviving car crashes at speeds below 30 kph but less than 50% at speeds of 45 kph (Peden et al., 2004). Nearly half the deaths on the roads among children younger than 15 years are as pedestrians.

BOX 7. PRACTICAL DRIVING EXPERIENCE IN AUSTRIA: L17 EDUCATION

Until 1999 in Austria, driver education was based almost exclusively on driving schools focused on passing a driving test at 18 years of age. About 300 km of practical driving was achieved. A law passed in 1999 allows people to take the driving test for a motor vehicle licence at 17 years and start practical and theoretical driver training at 16 years. A new form of training called L17 education has been introduced that involves extensive education at a driving school and structured practical training, which includes driving at least 3000 km, with a mentor – such as a parent.

An evaluation of the training programme showed the following.

- **Drivers who chose L17 education had fewer crashes than traditionally educated drivers.**
- **Fewer L17-educated drivers exceeded the speed limit or were caught speeding than traditionally trained drivers.**
- **L17-educated drivers were half as likely as traditionally trained drivers to have their licence revoked, receive disciplinary measures or be enrolled compulsorily in driver improvement schemes.**

L17 education has been introduced that involves extensive education at a driving school and structured practical training. Altogether, the evaluation shows that drivers who attended L17 education complied more with the law and had 15% fewer crashes in the first 10 000 km driven (Kaltenegger, 2004). Today about 25% of all beginners, mostly adolescents, use the L17 educational training. The success of this approach has been mainly attributed to more extensive driving under supervision and strict penalties for driving offences.

BOX 8. EUROPEAN UNION SUPPORT FOR VULNERABLE ROAD USERS

The EU has a Road Safety Action Programme with a target of halving the number of road deaths by 2010. However, in response to a report produced for the European Commission's mid-term review in 2006, the European Parliament (2007) has called for "a higher level of political commitment to road safety" in all Member States and EU institutions. It urged Member States to enforce existing legislation, as this would greatly improve road safety if road users fully observed traffic laws.

The European Parliament made several other recommendations that apply to all ages. One of these is much more specific to young people.

- **An EU-wide zero blood alcohol concentration limit should be introduced for new drivers as well as for bus drivers and professional commercial drivers involved in transporting hazardous goods.**

The European Commission's Public Health Programme has supported a public health approach to preventing road traffic injuries in vulnerable road users as part of its APOLLO project (Strategies and Best Practices for the Reduction of Injuries). This is being partnered by EuroSafe, the European Association for Injury Prevention and Safety Promotion, which is a network of European associations working to reduce the burden of injuries.

3.2.1 STRATEGIES

Setting and enforcing speed limits, regulating traffic and making the overall speed more consistent have been shown to work (Toroyan & Peden, 2007). Road function, traffic composition, types of road user and road design should be considered in determining speed limits.

In this respect, controlling speed and the volume of traffic in urban areas and separating motor vehicle traffic from vulnerable road users are critical factors in preventing crashes impacting pedestrians and cyclists (Box 9). This can be achieved by setting and enforcing speed limits of less than 30 kph in areas with heavy pedestrian traffic, reducing traffic volume, using physical traffic-calming measures such as speed bumps and building bicycle lanes and pedestrian walkways. Concern has been expressed in many countries in the Region about reducing mortality and disability in this vulnerable group of road users (Ameratunga et al., 2006a; Roberts et al., 2002). Local knowledge and action are needed to calm traffic and reduce traffic volume around schools and residential areas, especially in low-income neighbourhoods.

3.3 INCREASING THE USE OF HELMETS

Strong evidence indicates that wearing helmets reduces the risk of serious head injury and deaths from motorcycle and bicycle crashes. Wearing a motorcycle helmet reduces the risk and severity of head injuries by about 72% and the likelihood of death by up to 39%. The evidence for cycle helmets shows a reduction of 63% to 88% in head, brain and severe brain injury (Liu et al., 2004; Thompson et al., 1999; WHO, 2006). However, popular beliefs among adolescents in many countries question the efficacy of helmets, with peer pressure reinforcing their unacceptability (Toroyan & Peden, 2007).

3.3.1 STRATEGIES

Many countries legally mandate wearing a helmet when riding motorcycles, but the proportion wearing helmets only increases if the law is enforced (Box 10). Wearing of helmets can be increased further if laws are supplemented by educational campaigns. Helmet distribution programmes to subsidize the cost for children in lower-income households have been shown to increase uptake and reach those that are difficult to reach.

Evidence shows that cycle helmets are effective in reducing head injury (Karkhaneh et al., 2006). Estimates show that every €1 spent on cycle helmets will save society €29

BOX 9. SAFETY IN NUMBERS FOR PEDESTRIANS AND CYCLISTS

Intriguing recent evidence indicates that there is safety in numbers for pedestrians and cyclists (Jacobsen, 2003). Thus, motorist behaviour is an important factor influencing whether motor vehicles hit pedestrians and cyclists. Motorists are more likely to adjust their behaviour and be more cautious if there are more cyclists and pedestrians on the roads. Efforts to enhance pedestrian and bicyclist safety such as traffic engineering and legal policies clearly modify motorist behaviour, and this needs to be studied further. Policies that encourage walking and cycling have therefore been effective in improving the safety of these road users, also by influencing driver behaviour.

BOX 10. ITALY'S MANDATORY HELMET LAW AND TRAUMATIC BRAIN INJURY

In Italy the laws on wearing helmets were changed in 2000 to include all moped and motorcycle riders, irrespective of age. There were publicity campaigns and active police enforcement. Evaluation showed:

- **an increase in helmet wearing to up to 95% in some regions;**
- **the highest uptake was achieved in the regions that used a combination of educational campaigns and enforcement; and**
- **a 66% decrease in traumatic head injury admissions due to motorized two-wheelers and a 31% decrease in admissions to neurosurgical units.**

This study therefore shows that political will and the combination of campaigns and police enforcement can achieve major public health gains through the wearing of helmets (WHO, 2006).

(United States National Centre for Injury Prevention and Control, 2000). Cycle helmet use has been promoted using a range of measures in different contexts (Box 11). These include both non-legislative and legislative approaches. Among non-legislative approaches, community-based approaches including the provision of helmets free of charge with an educational component are somewhat more effective than school-based education and subsidized helmets for schoolchildren (Royal et al., 2005). Legislation, especially in conjunction with information campaigns, has been shown to be effective in increasing helmet wearing (Karkhaneh et al., 2006). However, in some countries concern has been expressed that legally requiring wearing helmets may discourage cycling, thereby reducing the net public health benefit of this preventive measure.

BOX 11. A THREE-YEAR COMMUNITY CAMPAIGN PROMOTING BICYCLE HELMETS IN KROMERIZ, CZECH REPUBLIC

It is a legal requirement for children under 15 years to wear bicycle helmets in the Czech Republic. However, helmet wearing was noted to be low and this raised concerns because bicycle-related head injuries are an important cause of hospitalization and disabilities in young cyclists. In the town of Kroměříž, Safe Communities decided to champion cycle helmet wearing and cycle path development beginning in 2002 by working with civic authorities, schools and police. This included educational campaigns in schools, spot checks by police and positive reinforcement with rewards for helmet and cycle path users. Evaluation has shown that this resulted in a 100% increase in helmet wearing and a 75% decrease in head injury admission rates. This intervention has now been rolled out to 11 other municipalities (Sedlák et al., 2006).

3.4 MEASURES TO REDUCE DRIVING UNDER THE INFLUENCE OF ALCOHOL AND OTHER DRUGS

Alcohol is an important risk factor for road crashes. Many young drivers involved in crashes are under the influence of alcohol. At any blood alcohol concentration, drivers 16–20 years old are three times more likely to crash than drivers older than 30 years. Irrespective of age, risks increase exponentially relative to no alcohol when the blood alcohol concentration exceeds 0.04 g/dl (Peden et al., 2004). This has led experts to recommend that the blood alcohol concentration limit for young novice drivers be set at zero (ECMT and OECD, 2006).

Young drivers are much more likely to be distracted by passengers, with a hugely increased risk of crashing than older drivers. Drunk drivers are more likely to speed and put their own lives and those of other road users at risk. Recreational drugs, more commonly consumed by young men than the rest of the population, greatly increase the risk of crashing, and this increased risk almost doubles if mixed with alcohol use (ECMT and OECD, 2006).

The peak periods when road deaths occur in most countries of the EU (where these data are available) among people 15–24 years old are Saturday from 16:00 to 24:00 and Sunday from 00:00 to 8:00 (Broughton et al., 2005). The peak period also varies seasonally in the months of July and August. These patterns are linked to alcohol intake and travelling for recreation and leisure.

3.4.1 STRATEGIES

Most EU countries impose a maximum blood alcohol concentration of 0.05 g/dl or lower, with a few exceptions: Ireland, Malta and the United Kingdom stipulate 0.08 g/dl. Most countries in the CIS have a limit of zero (WHO Regional Office for Europe, 2007b). However, enforcing the law and good governance are critical factors, and practice varies, with some countries reporting poor enforcement and penalties insufficiently severe to act as a deterrent (ECMT, 2006). Given the disproportionate effects of alcohol on the safety of young drivers, the European Parliament (2007) and WHO (2000) recommend a lower limit of zero for drivers younger than 21 years (Boxes 8 and 12). High-visibility random breath testing as part of enforcement is highly cost-effective in discouraging drink–driving.

Estimates for the EU suggest that every €1 spent saves society €36 (ETSC, 2003). High-profile public awareness campaigns enhance the success of such measures. In many countries, police do not have the jurisdiction to undertake testing without due cause. Controlling sales of alcohol to young people and fiscal policy also influence drink–driving by young people (WHO Regional Office for Europe, 2000; Sethi et al., 2006a).

3.5 USING SEAT-BELTS AND CHILD RESTRAINTS

Failure to use seat-belts and child restraints is a major hazard and is more likely after alcohol use. Seat-belts and child restraints are essential for improving the safety of car occupants, reducing injury by 45–55% and 60–95% respectively (Toroyan & Peden, 2007).

3.5.1 STRATEGIES

Cost–effectiveness studies show that every €1 spent on child restraints saves society €32 (United States National Centre for Injury Prevention and Control, 2000). Legislation and enforcement accompanied by campaigns can maximize the use of seat-belts. Legislation, parental knowledge, availability, cost and accessibility can influence the use of child restraints. Community-based approaches consisting of educational initiatives and rental schemes or subsidization have been shown to be effective in including families with lower income (Boxes 13 and 14). Proper use of restraints may be inconsistent even in countries with high usage, and appropriate instruction in usage according to the child's height or age is required.

BOX 12. THE EUROPEAN ALCOHOL ACTION PLAN 2000–2005

The European Alcohol Action Plan 2000–2005 made the following recommendations to reduce road traffic injuries related to drink–driving:

- **ensuring high levels of enforcement of current drink–driving legislation;**
- **promoting high-visibility random breath testing;**
- **considering adopting blood alcohol concentration limits of 0.05 g/dl or lower and of zero for novice and professional drivers;**
- **encouraging the provision of alternative transport for drivers who have consumed alcohol; and**
- **implementing mandatory driver education and treatment programmes for habitual offenders (WHO Regional Office for Europe, 2000).**

BOX 13. PROGRAMMES FOR RENTING CAR SAFETY SEATS IN AUSTRIA AND GREECE

An innovative approach in Styria, Austria involved a private company that rented child restraints to mothers delivering at maternity hospitals for a modest fee. It was launched in 1992 by Safe Kids Austria to improve the use of child restraints by parents. This required some intensive input by maternity staff. Mothers signed a rental scheme document agreeing to pay the rental fees for the next 12 months. Before leaving hospital, a car seat was given and the first ride the baby had was a safe one. The company makes obligatory technical checks and cleans seats to prepare for rental again. Some local governments assumed the initial financing, and using restraints for children younger than 14 years became mandatory in 1994. Parents now pay €3.60 per month to rent the child restraint (Mackay et al., 2006; Safe Kids Austria, 2007).

In Greece, a scheme for renting car restraints was initiated when a manufacturer agreed to donate child restraints to a maternity hospital. The restraints were then rented to parents for six months for a modest fee. Evaluation showed that 90% of parents used the restraints correctly and that many parents went on to buy the second-stage seats (Kedikoglou et al., 2005).

BOX 14. AFFORDABILITY OF SAFETY EQUIPMENT IN LOW- AND MIDDLE-INCOME COUNTRIES

The affordability of safety equipment is particularly pertinent in low- to middle-income countries, where the retail price of car seats and cycle helmets may be as high as in high-income countries. Expressed in terms of hours of work for factory workers using local wage rates, the relative price in a middle-income country such as Albania is 11 times higher for car child restraints and 20 times higher for cycle helmets compared with a high-income country such as the United Kingdom. Market forces influence the differences in price between countries. Costs need to be kept down through subsidies and more competitive pricing by retailers (Hendrie et al., 2004).

BOX 15. AREA-WIDE TRAFFIC-CALMING

According to the UNECE transport database, about two thirds of road crashes resulting in injury occur in urban areas. Urban and transport planners can use area-wide traffic-calming to control speed. This consists of a combination of closing roads, changing junctions, building speed humps, improving pedestrian crossing facilities and building mini-roundabouts. These measures are effective in reducing speed and therefore the severity of crash injuries among vulnerable road users in areas with a high mix of motorized and nonmotorized road users (Bunn et al., 2003). The overall results show that area-wide traffic-calming led to a 37% reduction in deaths, an 11% reduction in road traffic injuries and a 5% reduction in all crashes.

3.6 IMPROVING THE ROAD ENVIRONMENT

The road environment and how it is designed are fundamental to ensuring the safety of all road users.

3.6.1 STRATEGIES

Safer road design will protect a variety of road users, including those most vulnerable. Area-wide traffic-calming measures (Box 15) have been shown to reduce the number of road traffic injuries by 11% (Bunn et al., 2003). Changes in road design are cost-effective. Estimates based on figures from Norway show that a variety of road improvements are of proven cost-benefit: €1 spent on simple road markings saves society €1.5, €1 spent on upgrading marked pedestrian crossings saves €14, pedestrian bridges or underpasses save €2.5 for every €1 spent and guard rails along the roadside save €10 for every €1 spent (ETSC, 2003).

Changing road design requires commitment from urban planners, road designers and transport authorities. However, the initial investment required soon reaps benefits, as shown by the evidence of cost–effectiveness for the development of upgraded marked pedestrian crossings, road lighting, guard rails along the roadside, pedestrian bridges and underpasses and cycle lanes. These measures require an assessment of traffic and pedestrian flows to identify appropriate sites and are particularly relevant in residential areas, near schools and community centres (Box 16).

BOX 16. THE ROLE OF EDUCATION IN PEDESTRIAN SAFETY

Educational interventions, whether direct or indirect, through teachers and parents, are effective in improving road safety knowledge, attitudes and, to a more variable extent, behaviour. Such health education programmes are more likely to be more effective if the messages are repeated at regular intervals. Whereas it is desirable to equip children with the necessary skills to "behave correctly" as pedestrians, such educational initiatives should also be accompanied by other changes in the traffic and road environments to make these inherently safer. In this context, education of children and other road users can bring additional value to a comprehensive prevention effort, which includes interventions to reduce exposure such as traffic-calming measures and pedestrian walkways. If used in isolation, however, education, information and publicity do not deliver sustained reductions in road traffic injuries (Duperrex et al., 2002; Peden et al., 2004).

3.7 SAFER VEHICLE DESIGN FOR PROTECTING PEOPLE IN CRASHES

The human body is frail and easily damaged on impact with hard surfaces such as the front ends of cars and vehicles. Whereas controlling speed is the most important factor in preventing serious injury to pedestrians and cyclists, the damage done can also be markedly reduced by having safer vehicle bumpers and bonnets. Improving bumper and bonnet design can reduce damage to the lower and upper legs and heads of children and adults in collisions.

3.7.1 STRATEGIES

An example of this approach is the tests developed by the European Enhanced Vehicle-safety Committee to enhance the degree of protection afforded to pedestrians and cyclists in the event of a crash with a car. These tests are referred to by Directive 2003/102/EC relating to the protection of pedestrians and other vulnerable road users before and in the event of a collision with a motor vehicle (ETSC, 2001; European Parliament and Council, 2003). Initiatives such as the European New Car Assessment Programme (EuroNCAP, 2007) provide consumers with a realistic and independent assessment of the safety performance of some of the most popular cars sold in Europe, with information on the safety features of cars, designed to protect both occupants (including children) and pedestrians and cyclists. Car manufacturers aim to achieve safety test scores for new car models and then advertise the safety star rating of these vehicles to meet increasing customer demand for safer cars. This practice has increased the numbers of models available with higher safety ratings, although the main successes have been in the area of crashworthiness, conferring occupant rather than pedestrian safety (ETSC, 2001). Other modifications include wheel protectors for lorries to prevent side under-run and well-placed rear-view mirrors to detect cyclists on the inside lane (Institute for Road Safety Research SWOV, 2006).

3.8 IMPROVING CONSPICUOUSNESS AND VISIBILITY

Poor conspicuousness, or the inability to easily distinguish and notice road users, is one factor responsible for the susceptibility of vulnerable road users to being hit by vehicles. This is true for pedestrians, bicyclists and motorcyclists, especially at night. For example, in such countries as Estonia and Finland, more than half the crashes involving vulnerable road users happen during dark hours.

3.8.1 STRATEGIES

Specific measures for pedestrians involve wearing reflective strips or light clothing and walking facing oncoming traffic and on streets with good lighting. These measures have been shown to improve detection by drivers and are of promising if not proven efficacy (Kwan & Mapstone, 2002). For cyclists this includes wearing reflective clothing, using bicycle lamps, and front, rear and wheel reflectors. For motorcycle riders this includes using daytime running lights and wearing reflective clothing and white or light-coloured helmets.

Improving street lighting will benefit all vulnerable road users and needs to be implemented by urban and road planners, particularly in areas with dense traffic and population. Every €1 spent on road lighting saves society an estimated €11 (ETSC, 2003). Mandatory use of daytime running lights in motor vehicles eases detection by other road users, with a 15% reduction in pedestrians and a 10% reduction in cyclists hit by cars after this was introduced in countries (Elvik & Vaa, 2004).

3.9 IMPROVING THE QUALITY OF TRAUMA CARE

High-quality hospital care contributes to the trends of decreasing road traffic injury mortality in children and adults (Roberts et al., 1996). Improving prehospital and hospital trauma care and rehabilitation services for children and young adults is essential to decreasing deaths and disability and reintegrating people who have been disabled into society (Mock et al., 2004; Sasser et al., 2005). These services need to have the capacity and organization not only to promptly collect and treat road crash victims but also have the medical equipment and training necessary for treating young people, including children (Box 17).

BOX 17. TURNING GRIEF INTO ACTION – GIVING A VOICE TO THE VICTIMS

The European Federation of Road Traffic Victims (FEVR) is an umbrella organization of more than 20 European nongovernmental organizations. It champions the interests of bereaved people, as well as injured road crash victims, and calls for a more appropriate legal response to road death and injury. In particular, FEVR advocates the inclusion of post-crash care and rehabilitation in prevention plans. On the occasion of the first United Nations Road Safety Week in 2007, FEVR campaigned for the use of black-box devices for monitoring speed in cars, for graduated driver licences and for strict liability laws to be introduced. Together with RoadPeace, the United Kingdom's charity for road crash victims, FEVR has developed a guide for organizing events on the World Day of Remembrance for Road Traffic Victims. This was initiated by RoadPeace in 1993 and is now celebrated globally on the third Sunday in November each year "(Chaudry B, personal communication).

4 A FRAMEWORK FOR FURTHER ACTION

This section provides a framework for further action, in accordance with WHO Regional Committee for Europe resolution RC55/R9 on preventing injuries in Europe (WHO Regional Office for Europe, 2005).

4.1 STRENGTHENING NATIONAL PLANS AND AGENCIES FOR ROAD SAFETY

National road safety plans with targets for reducing road traffic injuries and deaths are an essential way forward to ensure the safety of young people in Europe. A well-resourced lead national or regional road safety agency is key to developing and implementing road safety plans (O'Neill & Mohan, 2002; Peden et al., 2004; Roberts et al., 2002). Legislation and proper enforcement are critical elements of national road safety plans. This requires the commitment of human, financial and political capital (Box 18) (Haegi, 2002). This briefing has highlighted evidence-based interventions that could be used in safety plans (Table 2).

Table 2. Financial savings to society from selected road safety interventions

Measure on which €1 could be spent	Savings (€)
ROAD DESIGN	
Removal of roadside obstacles	19.3
Upgrading marked pedestrian crossings	14
Guard rails along the roadside	10.4
Median guard rail	10.3
Area-wide speed and traffic management	9.7
Signing of hazardous curves	3.5
Pedestrian bridges or underpasses	2.5
Simple road markings	1.5
CONSPICUOUSNESS	
Roadside lighting	10.7
Daytime running lights (normal bulbs)	4.4
ALCOHOL CONTROL	
Random breath testing	36
CAR RESTRAINTS	
Child restraints	32
Audible seat-belt reminders	6
HELMETS	
Cycle helmets	29
Motorcycle helmets	16

Sources: ETSC (2003), Institute for Road Safety Research SWOV (2001) and United States National Centre for Injury Prevention and Control (2000).

Although the precise magnitude of the cost–benefit ratio may be country specific, and influenced by the methods used, the measures mentioned in Table 2 have proven to provide value for money (ETSC, 2003).

BOX 18. NOVEL POLICY APPROACHES TO ROAD SAFETY IN EUROPE

Some countries have developed and implemented new thinking about transport and road safety emphasizing the importance of safety and using a systems approach to make the road environment inherently safer. This allows for the fact that human beings may make mistakes, leading to road crashes. Thus, a focus has been on specific risk factors such as speeding, drink–driving, infrastructure and focusing on vulnerable road users. Special targets to reduce the number of road traffic injuries among young people have been set as part of the policy. Sweden has adopted Vision Zero, which is based on the principles of ethics, responsibility, safety and mechanisms for change, and aims to eliminate road traffic injuries by reshaping the road system to be inherently safer. In the Netherlands, a similar approach has been undertaken that has a vision of sustainable safety (Racioppi et al., 2004). The emphasis in the United Kingdom has been to target risk groups using safety professionals focusing on improving safety practices, to achieve a target of a 50% reduction in deaths and injuries in children by 2010 compared with the average for 1994–1998 (Department for Transport, 2000).

4.2 IMPROVING SURVEILLANCE

Surveillance needs to be improved to better understand the burden of road traffic injuries by age, sex, social class, type of road user and risk factors in order to develop and monitor preventive strategies and to ensure that benefits are equitably distributed. Data on health outcomes are also needed to measure the nonfatal outcomes of injuries and to monitor the quality of emergency trauma care (Ameratunga et al., 2006b). The use of hospital admission and attendance data to monitor road traffic injuries will help to fill the gaps caused by the underreporting of nonfatal outcomes using police data, especially for pedestrians and cyclists (Gill et al., 2006).

4.3 STRENGTHENING NATIONAL CAPACITY – THE ROLE OF PROFESSIONALS

Investment is needed in prehospital and hospital trauma care services, with better research and training of doctors and other health professionals. Health practitioners, road safety professionals and other practitioners need to join forces with victims' organizations to advocate for better prevention and services. Parts of the Region also need to invest in building capacity for road safety.

4.4 PROMOTING EVIDENCE-BASED PRACTICE BY FACILITATING THE EXCHANGE OF KNOWLEDGE

Evidence-based practice indicates the benefits of controlling excessive speed and drink–driving, promoting the use of safety equipment and appropriately designing roads. The exchange of such information and adaptation to different contexts needs to be facilitated as part of building capacity in the Region.

4.5 RECOGNIZING GAPS IN KNOWLEDGE AND PROMOTING RESEARCH ON PROTECTING VULNERABLE PEOPLE

Research needs to be strengthened on how best to protect the most vulnerable road users: pedestrians, cyclists and motorcycle riders (Ameratunga et al., 2006b). Research is needed on how best to mount responses to local traffic conditions, especially in the low- and middle-income countries of the Region. This will require increased levels of funding for research and development.

4.6 PROMOTING MULTISECTORAL APPROACHES TO POLICY-MAKING

Whereas much of this briefing has focused on changes in behaviour such as the use of safety equipment by young people and by parents of children, lowering the death toll will take much more than altering road user behaviour. Governments, whether national or local, have a role in influencing the types of transport used, legislation, regulation and enforcement, road design and infrastructure development. Transport and fiscal policies influence the type of transport young people use and thereby their exposure and risk. National alcohol policy influences risk factors such as alcohol use, and taxation to raise prices is one effective way of reducing consumption (WHO Regional Office for Europe, 2000). Sustainable transport policy will also provide other environmental and health benefits (Racioppi et al., 2004).

5 CONCLUSION

Road traffic injuries are a leading cause of death and disability among young people in Europe, and forgetting that these injuries are largely avoidable is easy. Children and young adults need special consideration as vulnerable and inexperienced road users. Failure to safeguard the roads compromises their fundamental right to safety. Substantial disparities in road traffic deaths exist in the Region both between countries and within countries, with important differences in exposure to risk. Such inequity in health is an important area of social justice that needs to be addressed. Many cost-effective and equitable interventions could reduce this relentless daily toll, and this briefing has provided some of the evidence on which such action can be based. Action is now needed to make society more equitable and the environment more sustainable. Policy-makers, practitioners and advocates from all sectors need to work together to respond to the call for action to protect young people in Europe.

Key points for action

- Improving enforcement of existing laws
- Controlling excessive speed
- Graduating driver licensing
- Reducing alcohol levels for novice drivers
- Increasing helmet use for motorcycle users of all ages
- Implementing seat-belt and child restraint use and subsidy programmes
- Implementing area-wide speed controls and car-free areas
- Creating safe areas to play
- Implementing bicycle paths and lanes and pedestrian areas
- Implementing transport and land-use policies that promote walking and cycling
- Improved surveillance using health service data
- Addressing socioeconomic inequality
- Emphasizing much more strongly research to protect vulnerable road users

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ANNEX 1. METHODS USED

BACKGROUND FOR STATISTICAL INFORMATION

This report relies on four main sources of information:

- the WHO Global Burden of Disease version 5 database (WHO, 2002);
- the WHO Statistical Information System (WHO, 2006);
- the WHO European health for all database (WHO Regional Office for Europe, 2007); and
- the United Nations Economic Commission for Europe (UNECE, 2006 and data from the UNECE transport database).

Data for the European Region are collected annually.

HOW ROAD TRAFFIC INJURIES CAN BE MEASURED?

Deaths and states of health resulting from road traffic injuries are categorically attributed to one underlying cause using the rules and conventions of the International Classification of Diseases (ICD). Most countries use the ICD-9, ICD-9 Basic Tabular List or ICD-10 (WHO 1978, 1992–1994). Table 1 shows the ICD external cause codes used for transport and road traffic injuries. These codes were the basis of the classification of the WHO mortality data.

Table 1. External cause of injury and their corresponding ICD codes

Type of external cause of injury	ICD-9 code	ICD-9 Basic Tabular List code	ICD-10 code
Transport injuries	E800–E848	B47	V01–V99
Road traffic injuries	E810–E819, E826–E829, E929	B471–B472	V01–V89, V99, Y850

GLOBAL BURDEN OF DISEASE PROJECT VERSION 5

Estimates for road traffic injury mortality were prepared using data from the Global Burden of Disease database, 2002 version 5 (WHO, 2002). The Global Burden of Disease data were used to derive regional ranking and to calculate rates and rate ratios. The 10 leading causes of death are reported by age group for both sexes for the WHO European Region (Table 1) and by country income (Tables 2 and 3 in Annex 2).

WHO EUROPEAN HEALTH FOR ALL DATABASE

The WHO European health for all database (WHO Regional Office for Europe, 2007) contains data on mortality rates per 100 000 population for the age groups 0–1, 1–4, 5–14, 15–24 years and older. This briefing used the version of the health for all database dated January 2007, in which the most recent data are for 2005. Whenever possible, data for 2003–2005 were used: Austria, Belarus, Croatia, Czech Republic, Estonia, Finland, Hungary, Ireland, Kazakhstan, Kyrgyzstan, Latvia, Lithuania, Republic of Moldova, Russian Federation, Slovakia, Slovenia, Ukraine and Uzbekistan. The exceptions to this are: Belgium (1997), Turkmenistan (1998), Denmark, Georgia, Italy and Tajikistan (1999–2001), Sweden (2000–2002), Armenia, Azerbaijan, France, Israel and The former Yugoslav Republic of Macedonia (2001–2003), Albania, Bosnia and Herzegovina, Bulgaria, Germany, Greece, Montenegro, Poland, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Spain, Switzerland and United Kingdom (2002–2004).

WHO STATISTICAL INFORMATION SYSTEM (WHOSIS)

The WHO Mortality Database statistics for each country and WHO region was used for this report to obtain the mortality data officially reported by WHO Member States (WHO, 2006). These are available from the WHO Statistical Information System, which includes data presented according to ICD-9 and ICD-10; data available are from 1979 onwards. For the purposes of this briefing, data were downloaded for the years 2003–2005 (or the most recent three years available); the exceptions are those shown above.

UNITED NATIONS ECONOMIC COMMISSION FOR EUROPE (UNECE)

UNECE collects data on road traffic crashes resulting in death or injury annually and compiles them based on replies submitted by Member States and from official national and international sources (UNECE, 2006). Unlike WHO data sets, which are based on vital registration, these data are based on police reports and surveys of modes of transport used. As of 2006, 52 of the 55 UNECE Member States were Member States in the WHO European Region (UNECE includes Canada, Liechtenstein and the United States as Member States). The data for Liechtenstein are consolidated here with those for Switzerland.

COUNTRIES WITH A POPULATION OF LESS THAN 1 MILLION

As a general rule, countries with a population of less than 1 million have been excluded from the charts: Andorra, Cyprus, Iceland, Luxembourg, Malta, Monaco, Montenegro and San Marino. This was to limit the potentially large margins of error that may have arisen because of the small numbers of events.

LIMITATIONS OF CURRENT ROUTINE INFORMATION SYSTEMS

These data have several limitations. First, vital registration data are missing in a few European countries (WHO, 2007). Mortality data are not adequate for Andorra, Monaco and Turkey. Second, since systems and practices for recording and handling health data vary between countries, the availability and accuracy of the data reported to WHO may vary. This applies especially to some countries affected by transition and/or conflict, such as several countries of the former USSR, particularly in central Asia and the Caucasus, and some countries in south-eastern Europe. Third, the Global Burden of Disease estimates are based on extrapolation of information compiled to estimate the burden of disease (Murray & Lopez, 1996).

The number of deaths reported to the vital registration system would therefore be lower than those the Global Burden of Disease project estimated for the European Region.

One limitation of UNECE data on road traffic injuries is that they are based on police reports. These may be incomplete or affected by underreporting, especially for crashes of limited severity or those involving single vehicles (such as a bicycle). Further, types of road users may be misclassified. Casualties are reported by the place of occurrence rather than the country of residence of the victim. International comparisons between countries and should thus be carried out and interpreted with caution.

CLASSIFICATION OF COUNTRIES BY INCOME

The European Region has been disaggregated further into high-income countries and low- and middle-income countries based on the World Bank definition using country income in 2001 (World Bank, 2002). Countries are divided by income level according to gross national income per capita in 2001 as defined by the World Bank (low to middle income up to US$ 9205; high income US$ 9206 or more) as described previously (Sethi et al., 2006).

Table 2. Definition of country groups in the European Region

European Region	**Albania, Andorra, Armenia, Austria, Azerbaijan, Belgium, Belarus, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Georgia, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Kazakhstan, Kyrgyzstan, Latvia, Lithuania, Luxembourg, Malta, Monaco, Montenegro, Netherlands, Norway, Poland, Portugal, Republic of Moldova, Romania, Russian Federation, San Marino, Slovenia, Serbia, Slovakia, Spain, Sweden, Switzerland, Tajikistan, The former Yugoslav Republic of Macedonia, Turkey, Turkmenistan, Ukraine, United Kingdom, Uzbekistan**
European Union (after 1 January 2007)	**Austria, Belgium, Bulgaria, Czech Republic, Cyprus, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom**
Commonwealth of Independent States	**Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Republic of Moldova, Russian Federation, Tajikistan, Turkmenistan, Ukraine, Uzbekistan**
Central Asian republics	**Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan**

Source: WHO Regional Office for Europe (2007).

DEFINITION OF COUNTRY GROUPS

The WHO European health for all database groups countries as in Table 2. The EU in this publication refers to the 27 Member States after 1 January 2007.

CALCULATION OF STANDARDIZED MORTALITY RATE RATIOS

Standardized mortality rate ratios were calculated to determine the excess risk of dying from a road traffic injury among young people living in low- or middle-income countries compared with high-income countries. To do this, death data were downloaded from the Global Burden of Disease 2002 version 5 database and age-standardized mortality rates were calculated for road traffic injury using the European population for standardization (WHO Regional Office for Europe, 2007). Confidence intervals were calculated but have not been included because they are narrow. Table 1 in Annex 2 presents the standardized rates and the rate ratios for males, females and both sexes.

CALCULATION OF AGE-STANDARDIZED MORTALITY RATES FOR TRANSPORT INJURIES

Data were downloaded for the period 2003–2005 (or the three most recent years) from the European health for all database and age-standardized rates calculated using the European standard population for standardization. A three-year period was chosen to increase reliability, and the annual averages were calculated. The data presented (Fig. 3–5 in the text) are for transport injury mortality for completeness, as some countries do not report data as road traffic injury deaths. Road traffic deaths comprise 95% of transport deaths.

CALCULATION OF NUMBER OF TRANSPORT DEATHS AS A PROPORTION OF ALL DEATHS

The total observed numbers of deaths were obtained from the European mortality database of the European health for all database (WHO Regional Office for Europe, 2007). Data were downloaded for the period 2003–2005 (or the three most recent years). A three-year period was chosen to increase reliability. Proportions were calculated of transport deaths as a ratio of deaths from all causes (Fig. 1, Annex 2). The data presented are for transport deaths for completeness, as some countries do not report data as road traffic injury deaths. Road traffic deaths comprise 95% of transport deaths.

CALCULATION OF AGE-STANDARDIZED MORTALITY RATES BY TYPE OF ROAD USER

Data were obtained for the period 2002–2004 (or the three most recent years) from the 2006 UNECE transport database and annual averages were calculated for each country for each type of road user. A three-year period was chosen to increase reliability. The data presented are for road traffic injury mortality by type of road user (Fig. 2–4, Annex 2).

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ANNEX 2. ADDITIONAL RESULTS

COMPARISON OF DEATH RATES AND RANKING IN LOW- TO MIDDLE-INCOME COUNTRIES VERSUS HIGH-INCOME COUNTRIES

Age-standardized death rates among males are consistently higher than in females. Rates among males and females are marginally higher in low- to middle-income countries than in high-income countries (Table 1). These rate ratios for this age group are not as high as the rate ratios for other injuries as previously described, reflecting greater exposure to the risk of road traffic crashes in high-income countries (Sethi et al., 2006).

Table 1. Age-standardized mortality rates among people 0–24 years old in the European Region by country income and sex

	Low- and medium-income countries	High-income countries	European Region	Rate ratio of low- and medium-income countries to high-income countries
Male	14.71	14.05	14.40	1.05
Female	5.87	4.47	5.30	1.31
Both sexes	10.35	9.36	9.92	1.11
Rate ratio male:female	2.51	3.14	2.72	

Source: WHO (2002).

Tables 2 and 3 present the ranking of the leading causes of death by country income.

Table 2. Leading causes of death among people 0–24 years old in high-income European countries

Ranking	< 1 year	1–4 years	5–9 years	10–14 years	15–19 years	20–24 years	0–24 years
1	Perinatal conditions (9 704)	Congenital anomalies (644)	Road traffic injuries (394)	Road traffic injuries (735)	Road traffic injuries (4 379)	Road traffic injuries (7 364)	Road traffic injuries (13 247)
2	Congenital anomalies (5 384)	Road traffic injuries (298)	Congenital anomalies (232)	Leukaemia (241)	Self-inflicted injuries (1 193)	Leukaemia (2 607)	Perinatal conditions (9 755)
3	Endocrine disorders (299)	Endocrine disorders (268)	Leukaemia (212)	Congenital anomalies (205)	Leukaemia (350)	Alcohol use disorders (677)	Congenital anomalies (6 985)
4	Lower respiratory infections (248)	Drownings (220)	Endocrine disorders (121)	Endocrine disorders (132)	Congenital anomalies (280)	Self-inflicted injuries (610)	Leukaemia (3 617)
5	Meningitis (201)	Meningitis (211)	Drownings (71)	Self-inflicted injuries (120)	Endocrine disorders (200)	Fires (441)	Self-inflicted injuries (1 923)
6	Inflammatory heart diseases (103)	Leukaemia (189)	Violence (59)	Drownings (64)	Drug use disorders (195)	Drug use disorders (433)	Endocrine disorders (1 139)
7	Diarrhoeal diseases (84)	Lower respiratory infections (120)	Fires (54)	Epilepsy (62)	Violence (185)	Inflammatory heart diseases (362)	Lower respiratory infections (828)
8	Road traffic injuries (77)	Fires (90)	Epilepsy (50)	Cerebrovascular disease (60)	Poisonings (181)	Lower respiratory infections (249)	Alcohol use disorders (695)
9	Violence (73)	Falls (71)	Alzheimer and other dementias (44)	Lower respiratory infections (57)	Falls (156)	Congenital anomalies (238)	Inflammatory heart diseases (695)
10	Cerebrovascular disease (64)	Violence (71)	Meningitis (43)	Falls (53)	Lymphomas, multiple myeloma (125)	Poisonings (231)	Fires (659)

Source: WHO (2002).

Table 3. Leading causes of death among people 0–24 years old in low- to middle-income European countries

Ranking	< 1 year	1–4 years	5–9 years	10–14 years	15–19 years	20–24 years	0–24 years
1	Perinatal conditions (55 931)	Lower respiratory infections (6 346)	Lower respiratory infections (2 070)	Road traffic injuries (1 825)	Self-inflicted injuries (6 359)	Self-inflicted injuries (9 890)	Perinatal conditions (55 937)
2	Lower respiratory infections (25 256)	Childhood-cluster diseases (3 139)	Road traffic injuries (1 738)	Lower respiratory infections (1 625)	Road traffic injuries (6 062)	Road traffic injuries (9 286)	Lower respiratory infections (37 737)
3	Congenital anomalies (20 701)	Congenital anomalies (1 930)	Drownings (1 310)	Drownings (1 417)	Violence (2 715)	Violence (5 482)	Congenital anomalies (24 618)
4	Diarrhoeal diseases (10 476)	Drownings (1 488)	Childhood-cluster diseases (839)	Self-inflicted injuries (1310)	Drownings (2 055)	Poisonings (3 842)	Road traffic injuries (20 233)
5	Meningitis (7 998)	Diarrhoeal diseases (1 249)	Leukaemia (643)	Leukaemia (670)	Poisonings (1 461)	War (3 397)	Self-inflicted injuries (17 732)
6	Upper respiratory infections (2 006)	Road traffic injuries (1 090)	Congenital anomalies (566)	Congenital anomalies (525)	Lower respiratory infections (1 360)	Drownings (2 858)	Diarrhoeal diseases (12 133)
7	Childhood-cluster diseases (1 758)	Meningitis (903)	Cerebrovascular disease (366)	Violence (459)	Cerebrovascular disease (1 239)	Tuberculosis (2 447)	Meningitis (9 831)
8	Endocrine disorders (496)	Poisonings (734)	Poisonings (357)	Poisonings (423)	Leukaemia (964)	Cerebrovascular disease (1 416)	Violence (9 253)
9	Inflammatory heart diseases (460)	Fires (674)	Fires (274)	Cerebrovascular disease (388)	War (834)	Falls (1 197)	Drownings (9 222)
10	HIV/AIDS (386)	Cerebrovascular disease (560)	Epilepsy (257)	HIV/AIDS (347)	Falls (688)	HIV/AIDS (1 142)	Poisonings (7 073)

Source: WHO (2002).

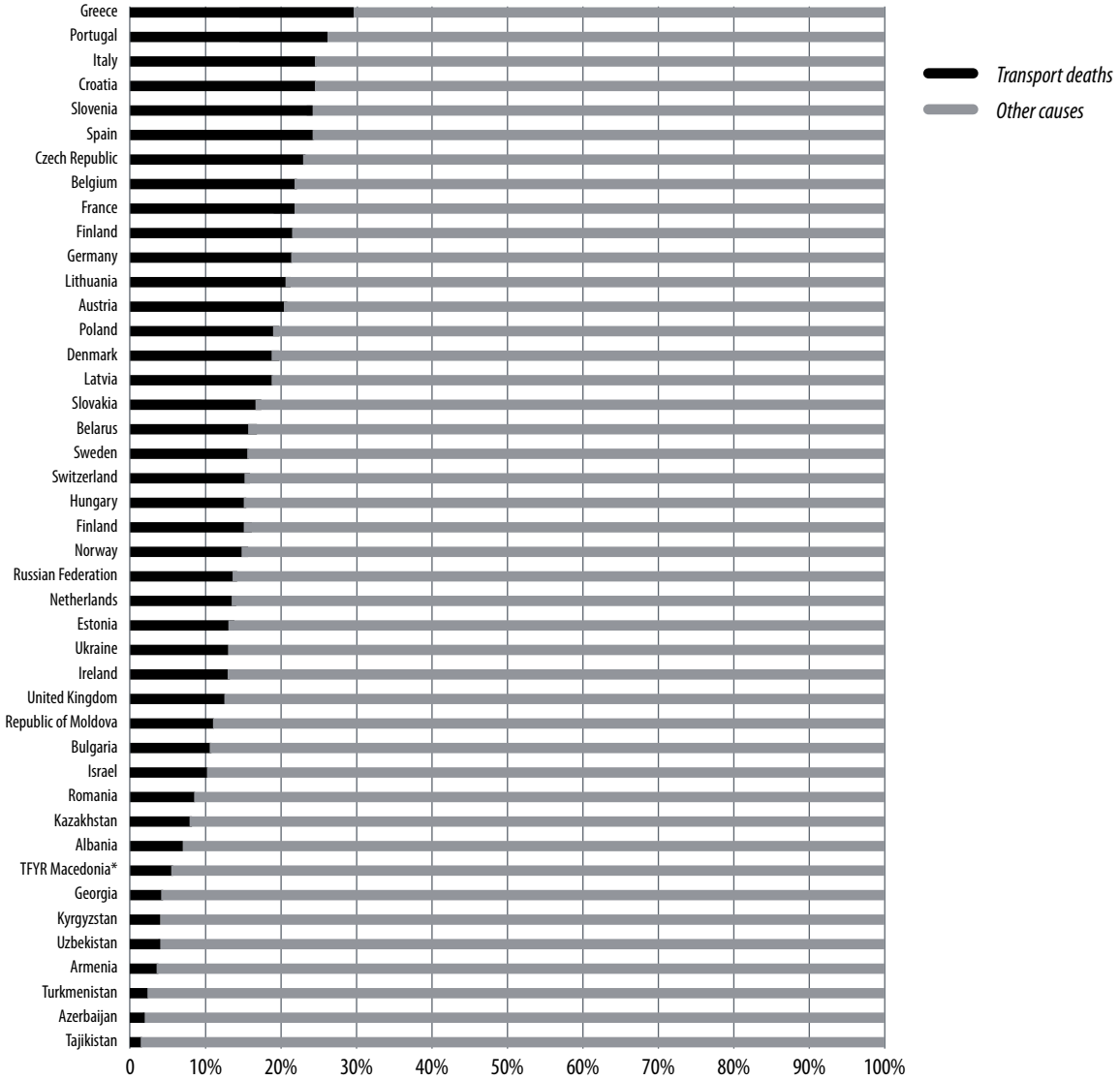
PROPORTION OF DEATHS AMONG YOUNG PEOPLE IN EUROPE CAUSED BY TRANSPORT INJURIES

Fig. 1 shows the number of deaths caused by transport injuries as a proportion of the total number of deaths from all causes among young people. The median value for the Region is 13%, with the highest in Greece (29%) and the lowest in Tajikistan (2%). The countries where road traffic injury deaths among young people cause more than 20% of all deaths in this age group are Greece, Portugal, Italy, Croatia, Slovenia, Spain, Czech Republic, Belgium, France, Germany, Lithuania and Austria. Road crash deaths appear to be a disproportionately frequent cause of death among young people in southern Europe.

AGE-STANDARDIZED DEATH RATES BY MODE OF TRANSPORT

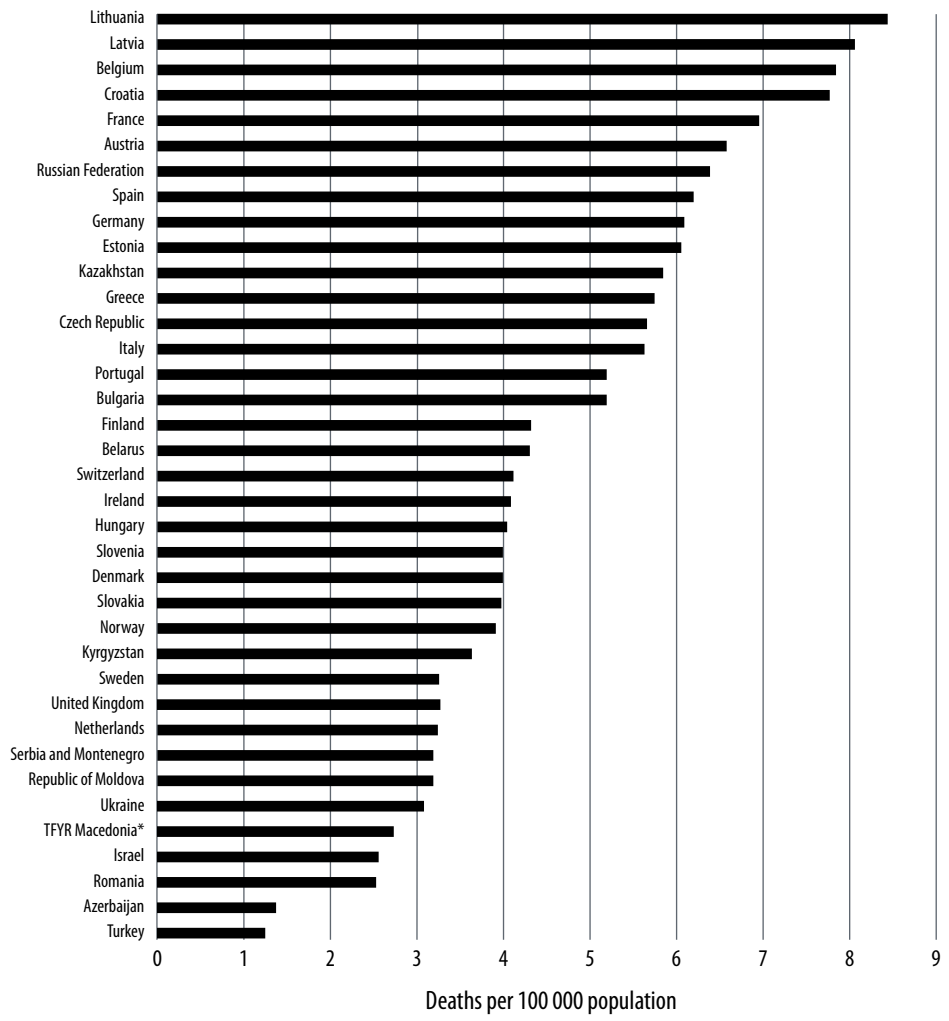
Age standardized death rates per 100 000 population were calculated for the different modes of road transport used. These are presented as country league tables (Fig. 2–4) for each type of road user, although variation in data quality needs to be taken into account. Death rates for car occupant crashes are highest in Lithuania, Latvia, Belgium, Croatia and France. For motorcycles deaths, the highest rates are in Israel, Greece, Portugal, France and Italy. Pedestrian mortality is highest in Kazakhstan, Kyrgyzstan, the Russian Federation, Azerbaijan and Belarus. These data give an idea of the risk in different countries for different types of young road users.

Fig. 1. Estimated proportion of deaths caused by transport injuries among people 0–24 years old in European countries (2002–2004 or last available)



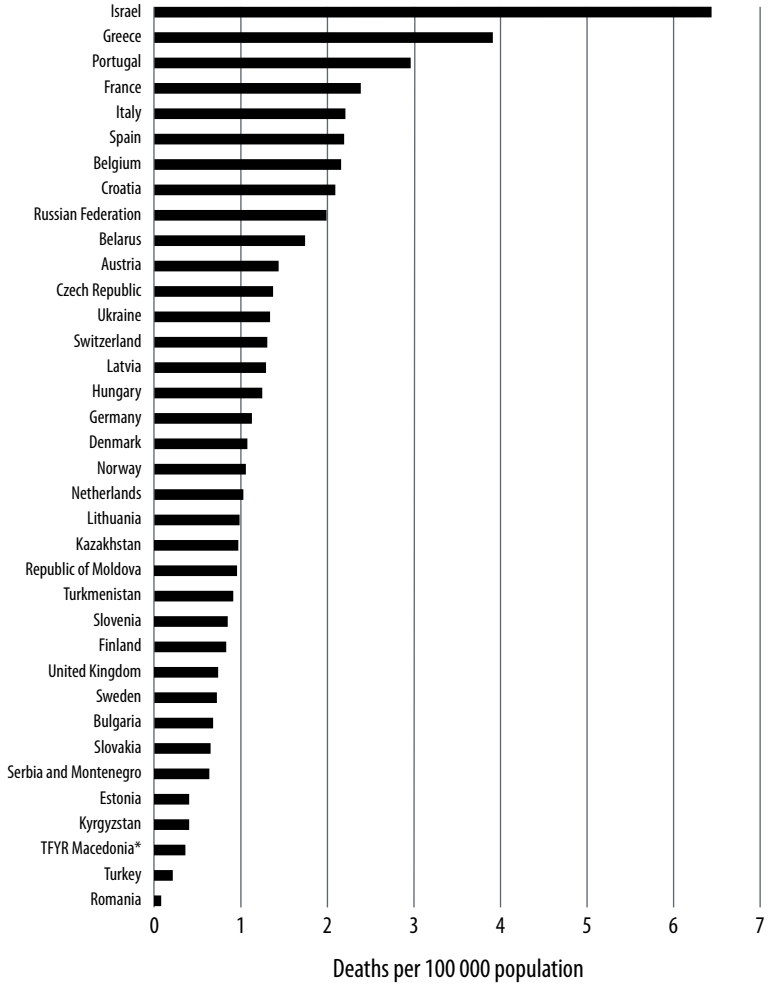
**The former Yugoslav Republic of Macedonia.*
Source: WHO (2006).

Fig. 2. Standardized mortality rates for car injuries among people 0–24 years old in European countries, averages for 2002–2004 or most recent three years



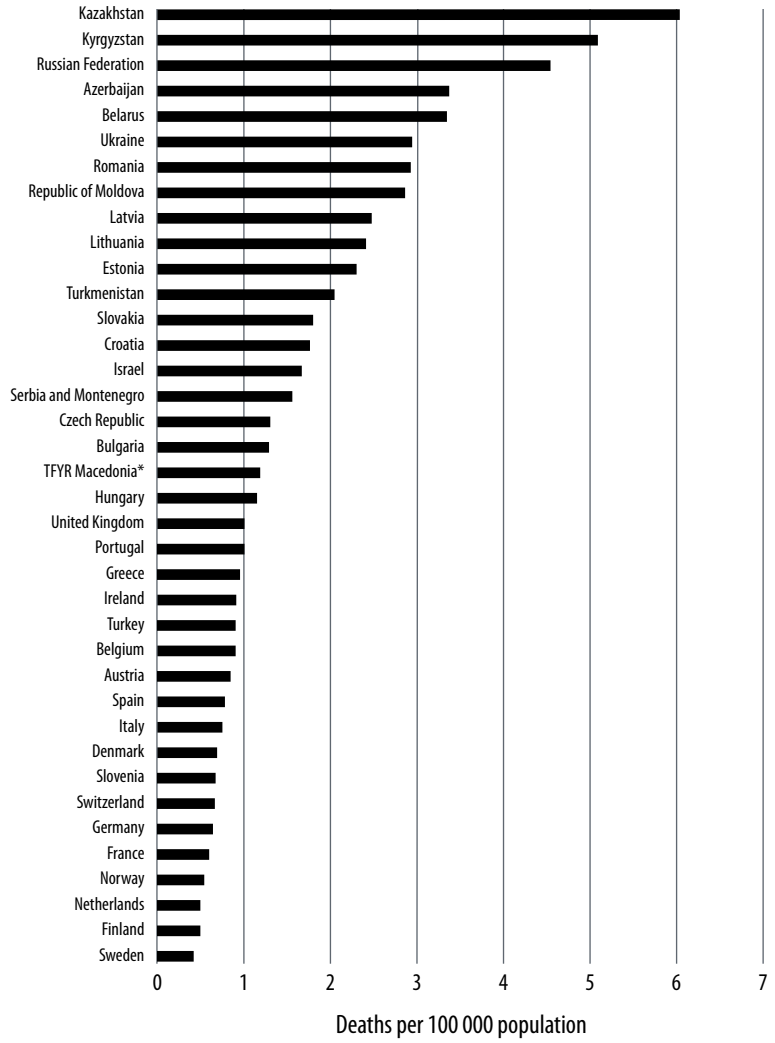
**The former Yugoslav Republic of Macedonia.*
Source: data from the UNECE transport database.

Fig. 3. Standardized mortality rates for motorcycle injuries among people 0–24 years old in European countries, averages for 2002–2004 or most recent three years



**The former Yugoslav Republic of Macedonia.*
Source: data from the UNECE transport database.

Fig. 4. Standardized mortality rates for pedestrian injuries among people 0–24 years old in European countries, averages for 2002–2004 or most recent three years



**The former Yugoslav Republic of Macedonia.*
Source: data from the UNECE transport database.

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