Policy briefing 4

Road traffic injuries among vulnerable road users

Background

An estimated 1.2 million road users are killed by road traffic injuries each year throughout the world and many millions more are injured or disabled (Peden et al. 2004). Even though road traffic injuries were the 9th leading cause of death and disability in the world in 1990, **if unchecked** they are predicted to increase and become the 3rd leading cause in 2020. In the World Health Organization (WHO) European Region, road traffic injuries are a major cause of premature mortality, disability and economic loss to society. Each year, 127 000 people are killed due to road traffic injuries in the 53 countries in the European Region (Racioppi 2004, Sethi, et al., 2006a). The non-fatal consequences are also severe with millions of people requiring medical attention, and a large proportion of them become permanently disabled. The loss to national productivity is an economic threat, and results in the loss of about 2% of gross domestic product (GDP). For the European Region, this is translated into hundreds of billions of euros. Apart from costs due to lost production and property damage, health care costs for the treatment and rehabilitation of road traffic injured victims should also be taken into account.

Definitions

The WHO *World report on road traffic injury prevention* defines a road traffic injury as: "fatal or non-fatal injuries incurred as a result of a road traffic crash. A road traffic crash is defined as a collision or incident that may or may not lead to injury, occurring on a public road and involving at least one moving vehicle" (Peden et al., 2004). For the purposes of this policy briefing a vulnerable road user will be defined as road user who is present in a crash involving vehicles which do not have a protective shell (OECD 1998, ETSC 2005). This will primarily include pedestrians, cyclists and motorized two-wheelers that comprise the main categories. It is recognized that there are additional minor categories such as skate boarders and skaters, but these categories will not be included in the context of the present briefing. Other road users may also be injured on the roads, such as pedestrians falling, but these do not constitute road traffic injuries.

Aims

The purpose of this policy briefing is to highlight the burden of road traffic injuries in vulnerable road users and to make policy proposals.

Policy priority

In view of the public health threat of road traffic injuries, a higher policy priority has been afforded to prevention both at the global and European levels. World Health Assembly resolution WHA57.10 on *Road safety and health* and the United Nations General Assembly Resolution on *Improving global road safety* recommend that Member Statess will overcome this threat by implementing the recommendations of the *World report on road traffic injury prevention* (WHO 2004, United Nations 2005). Injury prevention was highlighted as a priority area by the WHO Regional Committee for Europe resolution EUR/RC55/R9 on prevention of injuries in the WHO European Region (WHO Regional Office for Europe 2005). As highlighted in the global and European resolutions, the health sector, by coordinating a multisectoral action in the context of a public health approach, has much to offer in response to road traffic injury prevention. The European Union (EU) Council Recommendation on the prevention of injury and the promotion of safety highlights vulnerable road users as a group for special attention (EC 2007). The EC Third Road Safety Action Plan emphasized a reduction of 50% of road traffic injury mortality in countries by 2010. However a mid-term review published in 2006 emphasized that, although progress has been made, more efforts were needed, and the European Parliament has called for a higher level of political commitment to road safety (EC 2006).

Burden of road traffic injuries

As already mentioned, road traffic injuries (RTIs) kill 127 000 people per year in the 53 countries in the WHO European Region (Sethi, et al., 2006a). On top of that, at least

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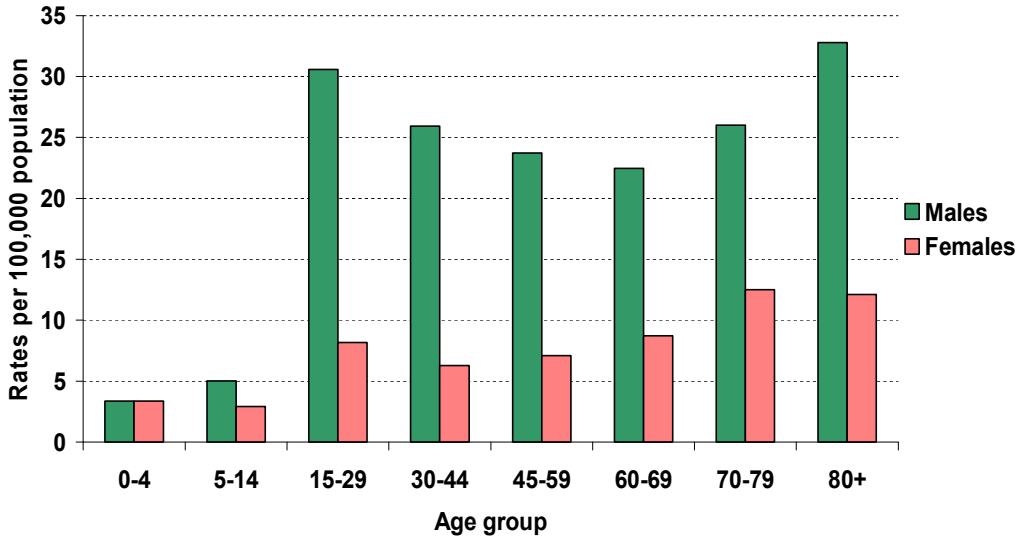
2.4 million people are reported to be injured each year. This figure, however, is underestimated due to the fact that police services under-record non-fatal injuries; thus the true figure is more likely to be around 6 million (Gill et al., 2006, Sethi et al., 2007a). Almost 55% of deaths occur in younger people aged 15–44 and 75% occur in males as opposed to females. Road traffic injuries are the leading cause of death in young people aged 5–29 years.

People over 80 years of age have the highest death rates even though they only make up 3% of all RTI deaths (Fig. 1). Older people have a higher fatality once injured because of their frailty, and as pedestrians are more vulnerable as road users because they may be more severely injured. The second highest rate is in young people aged 15–29, who account for 30% of deaths, thus constituting a huge public health problem. Altogether there were about 3.6 million disability-adjusted life-years or DALYs[1] lost in the European Region in 2002 from road traffic injuries, and 45% of these were in the 15-29 year age group. This emphasizes that the highest burden is in the younger age groups; 77% of the DALYs lost from road traffic injuries are in males.

Fig. 1. Age- and sex-specific mortality rates from RTI per 100 000 population in the WHO European Region, 2002 (Source: GBD 2002 version 3)



Proportion of road traffic injured people who are vulnerable road users

The proportion of people dying from road traffic injuries as vulnerable road users (pedestrians, cyclists and motorized two-wheelers) varies by age (UNECE 2007). When all ages are taken together, then 47% of the RTI victims that die are car occupants, and 48% are vulnerable road users with pedestrians constituting 32% of the deaths, motorized two-wheelers 11% and cyclists 5% of deaths (see Fig. 2). In 2004, within the EU25 (25 countries of the European Union before April 2007), there were 43 000 deaths from RTIs; it is estimated that 38% or 16 000 of these deaths concerned vulnerable road users comprising motorized two wheelers (14%), pedestrians (18%), and cyclists (6%) (Körmer 2007).

[1] One DALY is one year of healthy life lost, either due to premature death or life lived with disability.

Fig. 2. Proportion of road traffic injury deaths by road user for all ages in the WHO European Region, averages for 2002–2004, or most recent years (Source UNECE transport database 2006)

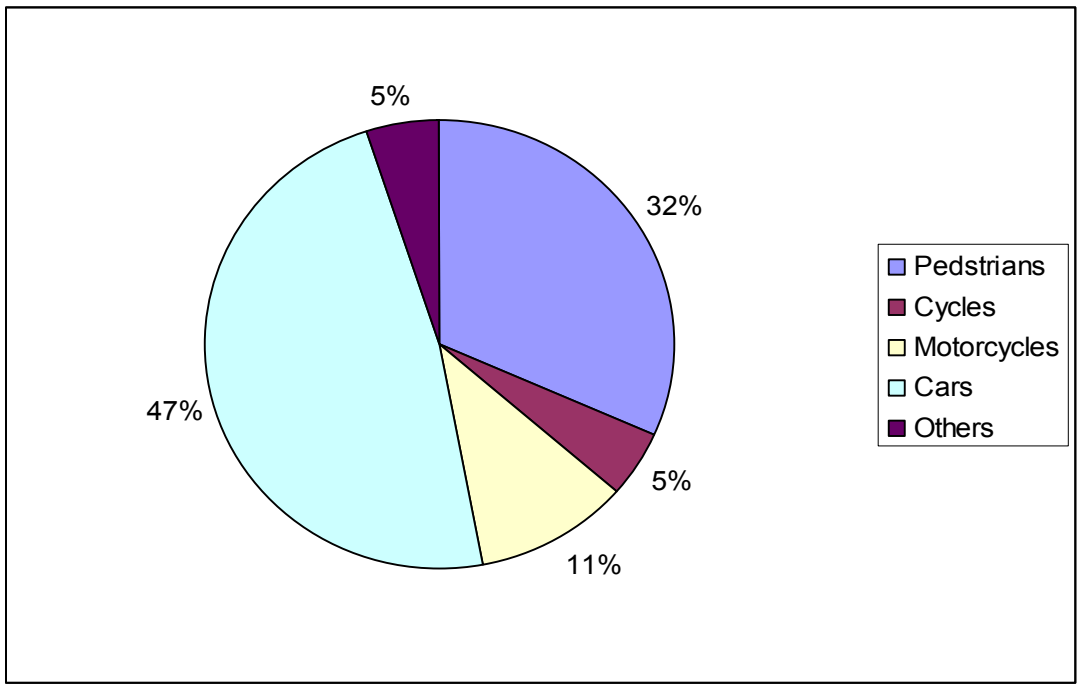


Table 1. Proportion (percentages) of RTI deaths by mode of road user and age group in Europe, averages for 2002–2004, or most recent years. Total vulnerable road user is the sum of pedestrian, cycle and motorcycle deaths (Source UNECE transport database 2006)

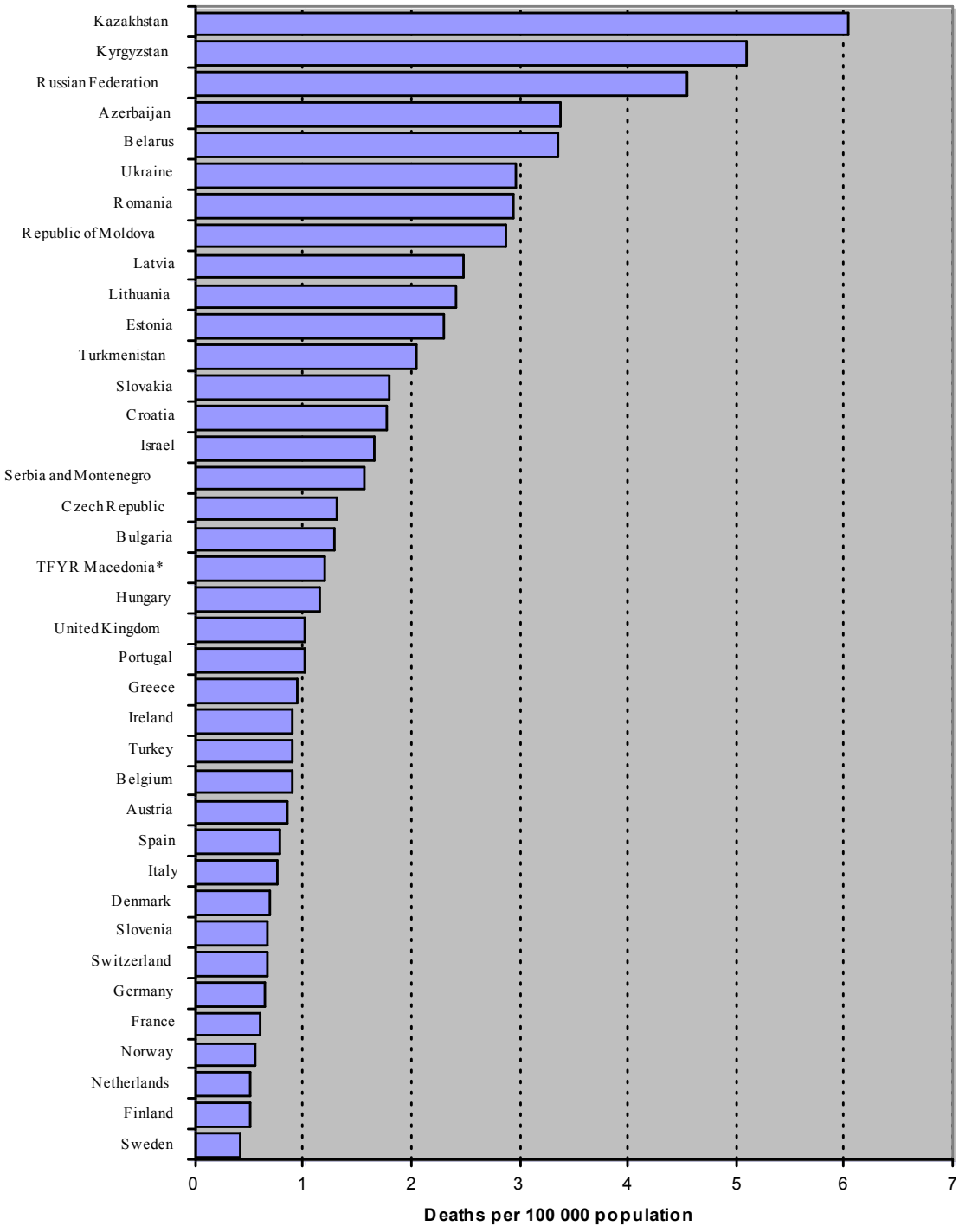
Age band (years)	RTI deaths (%)					
	Pedes-trian	Bicycles	Motor-cycles	Cars	Others	Total VRU
0–14	48	9	6	32	5	63
15–24	17	2	19	59	3	38
25–64	28	4	10	52	6	42
65 and over	49	10	4	33	4	63

The highest proportions of deaths due to RTIs as vulnerable road users have been recorded for children under 15 years and people aged 65 years and over (Table 1). For RTI deaths in children, pedestrians comprise 48% of deaths, cyclists 9% and motorcyclists 6%. In older people the proportions are similar with pedestrians comprising 49% of deaths, cyclists 10% and motorcyclists 4%. In youth (15–24 years) 59% of RTI deaths are as car occupants and only 38% of deaths occur as vulnerable road users (motorcycles 19%, pedestrians 17%, cycles 2%). For people aged 25–64 years, 42% of the RTI deaths are as vulnerable road users (pedestrians 28%, motorcycles 10%, cycles 4%) and 47% as car occupants. Data on non-fatal injuries are less complete, especially for vulnerable road users, as the police services under-report these injuries and in particular the cases involving single vehicles.

Inequalities in young vulnerable road users by country.

There are variations between the European countries in RTI mortality rates by type of road user. Considering young road users (< 25 years), the countries with the highest pedestrian mortality rates are Kazakhstan, Kyrgyzstan and the Russian Federation, whereas the countries with the lowest mortality rates are in Sweden, Finland and the Netherlands (Fig. 3).

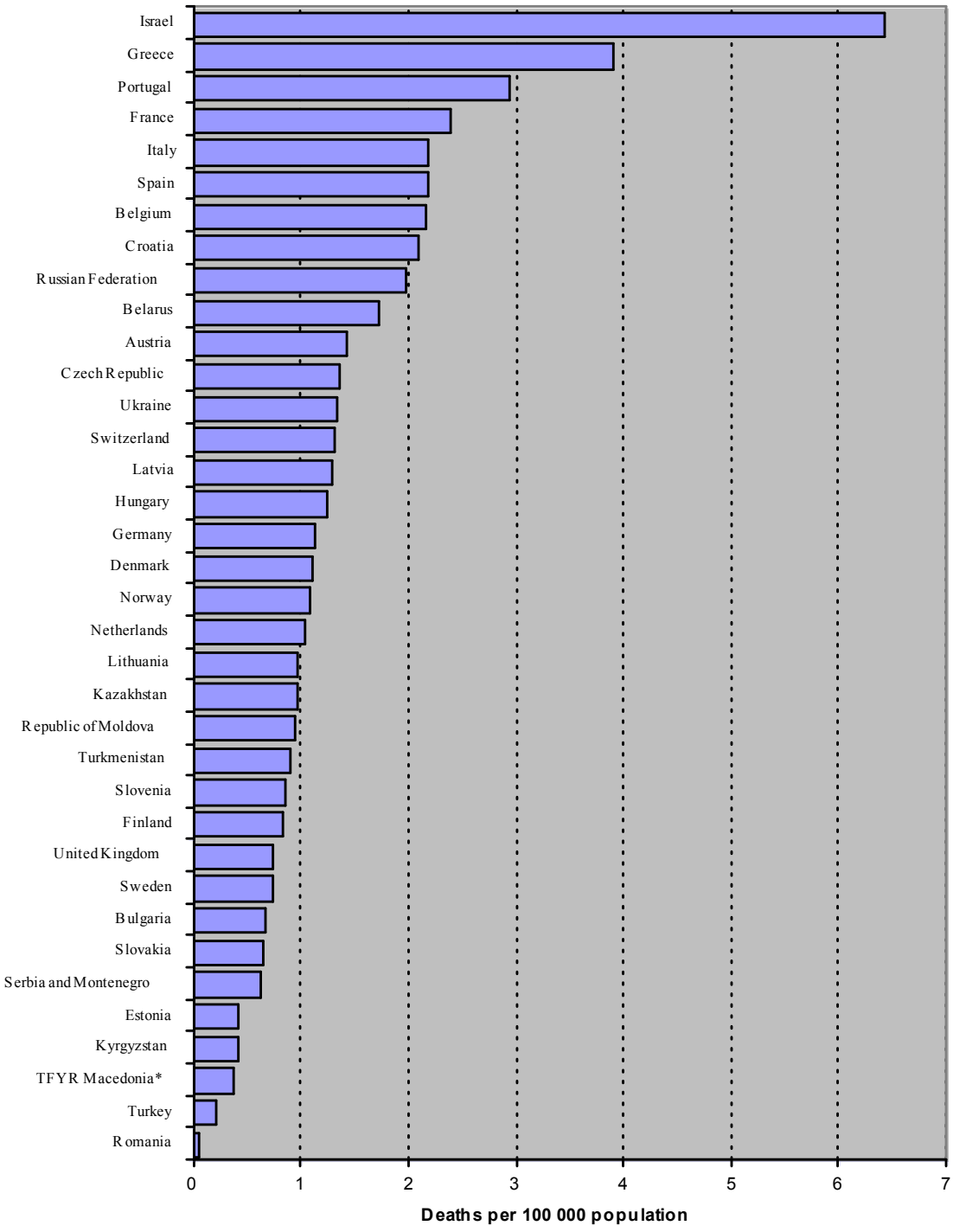
Fig. 3. Standardized mortality rates for pedestrian injuries among people 0–24 years old in European countries, averages for 2002–2004 or most recent three years (Source UNECE transport database).



* The former Yugoslav Republic of Macedonia.

For motorcyclists under the age of 25 years, the countries with the highest mortality rates are Israel, Greece and Portugal, whereas those with the lowest are Romania, Turkey and The former Yugoslav Republic of Macedonia (Fig. 4). Such comparisons can only be made reliably if reporting is complete, and it may be compromised by under reporting in some countries.

Fig. 4. Standardized mortality rates for motorcycle injuries among people 0–24 years old in European countries, averages for 2002–2004 or most recent three years (Source UNECE transport database)



* The former Yugoslav Republic of Macedonia.

Box 1: The Injury Data Base and previously undetected injuries in road users

Pedestrians comprise one of the main categories of vulnerable road users. RTIs among pedestrians that are caused by high-speed collisions with motorized vehicles can result in disability or even death. In addition to these severe injuries resulting from road crashes, pedestrians may also suffer other types of injuries on the roads, and in particular from falls on roads and pavements due to surface defects, slippery surfaces due to ice and mud, etc. Exciting new research using the Injury Data Base project in the EU has shown that a large number of injuries from falls occur in pedestrian road users, which albeit not as serious, represent a large burden to health services and society in view of the high numbers affected. It is estimated that there are about one and a half million pedestrian falls in the EU, which require some medical treatment, constituting a drain on scant health sector resources. To respond to this problem, the public health community needs to share injury information with town planners and transport officials to ensure that pedestrian walkways are free of obstacles, holes, have even surfaces which are slip free and that they are well lit (Körmer et al 2007).

Based on projections from three countries for the year 2004, the Injury Data Base project has estimated that there were 1.3 million non-fatal injuries in cyclists in the EU. In contrast, only 156 000 were known to the transport authorities suggesting that there may have been an undercount of one million cyclist injuries presenting to emergency departments in the EU. This may represent a large cost for the health sector and emphasizes the importance for the health sector to capture useful data for prevention and to share this with other sectors.

Risk factors and groups

The variation in RTI mortality rates by type of transport is partly influenced by type and extent of exposure and partly by risk factors such as road infrastructure, legislative practices and enforcement, not using safety equipment, speed of motorized traffic, the mix of vulnerable road users with motorized traffic, driving under the influence of alcohol, conspicuity, socioeconomic class and access to and affordability of safety equipment (Peden et al., 2004).

When standardized death rates are taken into consideration, the difference between countries with the highest and lowest mortality rates can vary fivefold and are higher by 50% when middle income countries are compared to high income countries (Sethi et al., 2006b). In addition, children in lower social classes are 3–4 times more likely to die from RTIs as vulnerable road users than those in higher classes (Roberts, et al., 1996). Although high-income countries have falling mortality rates regarding RTIs, closer analysis of this trend shows a steep social class division, with the major gains in life and well-being experienced by people from high socioeconomic status (Sethi et al 2007, Edwards et al., 2006). Recent findings from the United Kingdom show that children under 15 years old, coming from the most deprived backgrounds, are 20 times more likely to be fatally injured as pedestrians and cyclists, when compared to the privileged ones (Edwards et al., 2006). Their risk is increased because they are more likely to live in neighbourhoods with unsafe road design, speeding and dense traffic, with fewer safe areas to play or fenced driveways (Roberts 1996, Laflamme et al 2001).

Speeding vehicles are a particularly dangerous risk factor for pedestrians. It is estimated that there is an eightfold increase in the probability of a pedestrian being killed, as the speed of impact with a car increases from 30–50 km/h (Racioppi, et al., 2004). Alcohol is another important risk factor for all road users. In particular, young drivers and riders, aged 18–25 years that are under the influence of alcohol are at the highest risk of crashing (Sethi, et al., 2007a). There is a dose–response relationship and, as blood alcohol concentrations (BAC) increase from 0 g/dl, so does the likelihood of crashing, particularly after a BAC of 0.04g/dl. At a BAC of 0.08g/dl the risk is twice that at 0.05 g/dl.

Evidence shows that up to 25% of fatally injured pedestrians had high BACs when injured and this was also true for the 45% of fatally injured motorcyclists. Poor conspicuity (when people are not easy to notice) has been noted for 55% of pedestrian deaths and 30% of those involving cyclists (Transport Canada 2004). Countries undergoing transition with intense economic activity such as Latvia, Lithuania, Kazakhstan and the Russian Federation, have undergone rapid motorization, without adequate infrastructural development and regulatory controls such as speed, alcohol and driving licensing systems. In the Commonwealth of Independent States, where there are high pedestrian mortality rates, many countries have urban speed limits of 60 kph without adequate infrastructures such as pedestrian walkways, underpasses, raised pedestrian crossings, etc. leaving pedestrians vulnerable to high speed impacts with motorized vehicle (Sethi et al., 2007b).

Older people are vulnerable as pedestrians; fatality after a crash increases from 2% at age of 30 years to 9% in those over 80 years. Multiple factors have been identified to explain this, such as impairment of vision, hearing, physical mobility and cognitive processes in particular when older pedestrians have to cross at junctions with complex traffic flows and at roads with fast traffic (Dunbar et al. 2004).

Motorcycle RTI mortality rates are particularly high in the southern European countries such as France, Greece, Israel, Italy and Portugal. In many of these countries the proportion of young road users using motorcycles is high and many start riding mopeds at an age as low as 14 years. When they are in areas of dense traffic, such as busy urban areas and island resorts, there is a high risk of serious injury or even death (Sethi et al., 2007a). This may be due to a combination of weak enforcement of helmet wearing and drink–driving laws and a lack of familiarity with local road conditions.

Evidence-based interventions

The *World report on road traffic injury prevention* identified the following factors as key areas for preventive intervention (Peden et al., 2004), which concern vulnerable road users:

- controlling speed
- stopping driving when under the influence of alcohol
- enforcing use of safety equipment such motorcycle helmets
- increasing conspicuity
- making infrastructural changes to road design to ensure that vulnerable road users are not exposed to unnecessary risk by mixing them with motorized traffic.

The use of seat-belts and child safety seats is also recommended though apply only to car occupants. Wearing a cycle helmet is known to be protective in reducing the severity of head injury (Thompson 1999).

When all road users are taken into account, the health service and societal costs of RTIs are very high and estimates suggest that costs to society are in the order of 2% of GDP (Racioppi, et al., 2004). There are reports suggesting that an estimated 55 000 lives would have been saved in one year (or 63% of RTI deaths) if the whole European Region had the same mortality rates as the country with the lowest rates in the Region (Sethi et al., 2006a). Even though reliable estimates of the expenditure that is required to achieve this goal cannot be made, there is ample evidence of cost–effective interventions. The financial savings to society from selected road safety interventions are presented in Table 2. Although the precise magnitude of the cost–benefit ratio may be country specific, the measures mentioned in Table 2 have been proven to provide value for money (ETSC 2003, Institute for Road Safety Research SWOV 2001 and United States National Centre for Injury Prevention and Control 2000). For example, Table 2 shows that, for every €1 spent on random breath testing for alcohol control, there is a saving of €36. Affordability of safety equipment is an important issue, as this will not only be influenced by disposable income for different social groups but also by the price of safety equipment relative to income, especially for middle-income countries (Hendrie et al., 2004). Community based programmes consisting of a combination of education and subsidization of safety equipment, such as helmets, to ensure access and affordability are also promising. These can be targeted to at risk groups such as youth in areas of deprivation.

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

Measure on which €1 could be spent:	Savings (€)
Road design	
Simple road markings	1.5
Upgrading marked pedestrian crossings	14
Pedestrian bridges or underpasses	2.5
Guard rails along the roadside	10.4
Removal of roadside obstacles	19.3
Median guard rail	10.3
Signing of hazardous curves	3.5
Area-wide speed and traffic management	9.7
Conspicuousness	
Daytime running lights (normal bulbs)	4.4
Roadside lighting	10.7
Alcohol control	
Random breath testing	36
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).

Specific role of the health sector

The health sector has an important role in providing evidence-based emergency trauma services both at the pre-hospital and hospital phases, as well as rehabilitation services. In addition to this traditional role of the health sector, both the WHO resolutions and the EU Council Recommendation recommend a wider role for the health sector, consisting of surveillance, evidence-based practices, advocacy, research and evaluation and policy formulation. The response to preventing death and disability in vulnerable road users needs to be multisectoral and the participation of the transport, justice, education sectors and nongovernmental organizations is considered essential. The health sector has an important role to play in coordinating a response, whether this is through surveillance and data sharing, building the evidence base of cost-effective interventions, increasing injury prevention capacity, and advocating to put safety for vulnerable road users higher on the policy agenda and contributing to policy formulations (Peden et al., 2004; see also APOLLO Policy briefing 1: *The role of public health in injury prevention* available at http://www.eurosafe.eu.com/csi/eurosafe2006.nsf/wwwVwContent/l4policybriefings.htm).

Other health and environmental benefits of a safer transport policy

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 may discourage 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 non-communicable diseases (Cavill et al., 2006). Reports from the Region have highlighted that only one third of 11–15-year-olds are sufficiently physically active (WHO Regional Office for Europe, 2004a). Countries such as Denmark and the Netherlands have developed policies and infrastructures to encourage cycling and walking for all age groups. Decreasing dependence on car use for short journeys, which could be undertaken by walking or cycling, has other beneficial health effects, such as less respiratory illness and improved mental well-being due to reduced air pollution and noise, and increased physical activity leading to reductions in obesity and heart disease. 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 health and environmental benefits.

Conclusion and way ahead

RTIs are a preventable public health problem and protecting vulnerable road users, many of whom are children, is an important area of social justice (Sethi 2007b). The evidence on preventing road traffic injuries has been summarized in the *World report on road traffic injury prevention* and policy priority has been given to the area at both the international and European level. In order to respond to the needs of vulnerable road users, policy-makers need to develop national road safety plans that emphasize this relatively neglected group. A shift in the research emphasis from car occupants to vulnerable road users is warranted, focusing on exposures, risks and transferable good practice (Ameratunga 2006). There is strong evidence that modification of the road environment and risk exposures reduces crashes (Peden et al 2004). Measures such as area wide traffic calming, and safer road design – such as upgraded pedestrian crossings, pedestrian bridges or underpasses, cycle lanes, guard rails and street lighting – are cost-effective and equitable, making environments inherently safer (Racioppi et al, 2004). Addressing the needs of vulnerable road users is important in responding to the epidemic of road traffic injuries and should be given greater priority by public health practitioners, researchers and policy-makers.

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