



YOUTH

AND

ROAD SAFETY



ROAD SAFETY
IS NO ACCIDENT



World Health
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road safety

Foreword



**Dr Margaret Chan, Director-General,
World Health Organization**

Road traffic crashes are a routine occurrence on roads throughout the world. Thousands of people lose their lives on the roads every day. Many millions more are left with disabilities or emotional scars that they will carry for the rest of their lives. Children and young adults are among the most vulnerable. Every hour of every day, forty youngsters die as a result of road traffic crashes. This means that every day another one thousand families have to cope with the unexpected loss of a loved one. Losing a child is never easy. Knowing that a child was lost to a preventable incident may add to the pain and suffering, and can leave families and communities with emotional wounds that take decades to heal.

This is a tragedy we can change. Publication of the WHO and World Bank *World report on road traffic injury prevention* in 2004 and the dedication of World Health Day to road safety have resulted in unprecedented attention to road safety around the world. These events issued a clear call for action, and governments, international organizations, civil society, road safety practitioners, and the private sector have all responded with energy and enthusiasm. As a concrete expression of this energy and enthusiasm, we have seen a number

of United Nations General Assembly resolutions as well as a World Health Assembly resolution urging countries to take further action to curb this escalating epidemic.

This document has been produced by WHO and launched on the occasion of the First United Nations Global Road Safety week, dedicated to “Youth and Road Safety”. The document does not seek to single out young adults and children as risk-takers deserving special attention. Instead, it seeks to highlight the many interventions which can and should be taken to make our children safer on the roads. We know that there is no blue-print for road safety, no simple solution or easy vaccine-like intervention. But we do have some tried and tested interventions which can keep our youth safer as they go about their daily activities. We hope that this document will inspire governments, road builders, vehicle manufacturers and other stakeholders around the globe to think about our young road users when they build roads, design vehicles and implement road safety programmes. We also hope that it will inspire many more young adults to encourage their peers and friends to make responsible decisions when taking to the roads and become activists for road safety.

The future of a country is its young people. We cannot afford to lose our children to road traffic crashes. When planning road safety initiatives, policy-makers and leaders need to recognize children’s vulnerabilities as well as their inexperience, developmental needs and exuberance for life. Road traffic crashes are not “accidents”. We need to challenge the notion that road traffic crashes are unavoidable and make room for a pro-active, preventive approach to reducing death on our roads. Doing so is our best route to better road safety.

Executive summary

Road traffic crashes kill 1.2 million people each year and injure millions more, particularly in low-income and middle-income countries.

Every day just over 1000 young people under the age of 25 years are killed in road traffic crashes around the world. Road traffic injuries are the leading cause of death globally among 15–19-year-olds, while for those in the 10–14-years and 20–24-years age brackets they are the second leading cause of death.

Most young people killed in road crashes are vulnerable road users – pedestrians, cyclists, motorcyclists and passengers of public transport – with those from the African and Eastern Mediterranean regions most at risk.

In many parts of the world children and young adults and other vulnerable road users have been given inadequate consideration in urban planning decisions. As a result, they are often forced to share transport space with motorized vehicles, increasing their chances of being involved in a road traffic crash. A combination of physical and developmental immaturity among children, and inexperience and youth-related lifestyles further increase the risk of young road users – particularly males – to road traffic collisions.

A number of factors increase the likelihood of road traffic injuries occurring, not only among young people, but also in the general population. These include speed, lack of helmet use, lack of seat-belt and child restraint use, drinking and driving, and lack of conspicuity. Interventions to address these specific risk factors have been promoted through the *World report on road traffic injury prevention*. Strategies to protect children in traffic can include modifications to the environment and to vehicles and changes in behaviour.

This document outlines some of the strategies that can be targeted specifically at reducing road traffic crashes among youth. These include addressing the major risk factors, through legislation and enforcement, and by educating the public about the use of protective equipment.

Road traffic injuries are a public health epidemic that costs countries millions of dollars. However, there is evidence of what can be done effectively to cut the volume of deaths and injuries linked to road traffic crashes. Bringing about a reduction in the road traffic toll among youth requires both political will and financial investments in prevention efforts targeting young people.

the future



youth and

photo © P. Virot/WHO

1 Introduction

Each year nearly 1.2 million people die and millions more are injured or disabled as a result of road traffic crashes. The vast majority (over 90%) of all road traffic deaths and injuries occur in low-income and middle-income countries (1).

In high-income countries, most of those killed or injured in road traffic crashes are drivers and passengers of four-wheeled vehicles. In low-income and middle-income countries, however, “vulnerable road users” – pedestrians, cyclists and motorcyclists and users of public transportation – constitute a higher proportion of road users, and consequently make up a larger proportion of those injured or killed on the roads.

This report focuses on young road users, defined as those under 25 years of age. The document highlights the main risk factors for road traffic injuries, noting how many of these risks are elevated in youth. It stresses that successful prevention programmes can be put in place to protect young people, and presents examples of interventions from different geographic and cultural contexts that have been shown to be effective.

This document aims to raise awareness and to promote action around factors which can make the greatest impact in reducing road traffic injuries among young people. It draws heavily on the *World report on road traffic injury prevention*, jointly published by the World Health Organization and the World Bank on the occasion of World Health Day in 2004 (1).

Global data used in this document are taken from the World Health Organization’s *Global Burden of Disease Project for 2002*, Version 5. Additional data have been provided by partner organizations around the world and are included as case studies.

This document can be downloaded from the: www.who.int/violence_injury_prevention/publications.

road safety

2 Young road users: a profile

2.1 Which young road users are most affected by road traffic injuries?

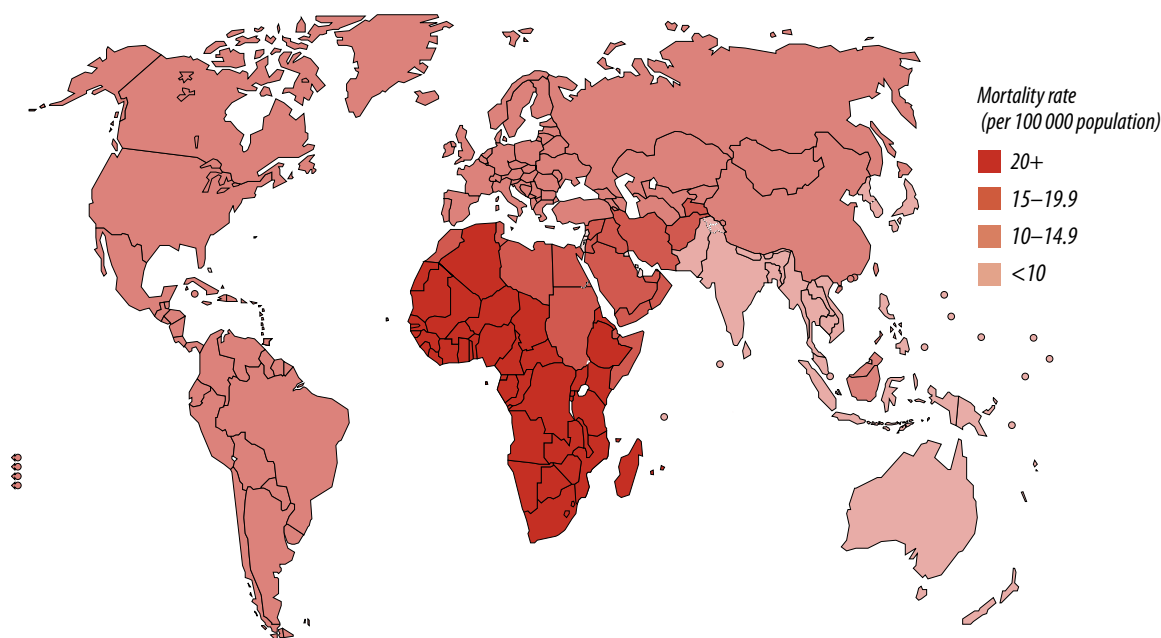
Type of country

Children and young people under the age of 25 years account for over 30% of those killed and injured in road traffic crashes. Of the 383 046 road traffic deaths that were recorded in this age group in 2002 around the world, at least half were road users from the World Health Organization's African and South-

East Asia Regions (2). However, the highest rates of road traffic fatalities in the 0–25 year age range occur among road users in the African and the Eastern Mediterranean regions (see Figure 1).

Road traffic injuries among those under 25 years rank as the eighth leading cause of death around the world (see Table 1). However, when analysed by five-year age groups the significance of road traffic injuries rises dramatically. Among 15–19 year-olds,

Figure 1: Geographical variation in road traffic mortality rates (per 100 000 population) among those under 25 years, the world, 2002.



AFRO		AMRO		EMRO		EURO		SEARO	WPRO		World	
LMIC	HIC	LMIC	HIC	LMIC	HIC	LMIC	HIC	LIC	HIC	LMIC	HIC	LMIC
24.2	12.4	10.1	14.3	17.6	10.0	11.1	9.8	7.8	10.5	10.5	13.4	

LIC low-income; LMIC low- middle-income; HIC high-income

AFRO = African region; AMRO = Region of the Americas; EMRO = Eastern Mediterranean region; EURO = European region; SEARO = South-East Asia region; WPRO = Western Pacific region.

Countries within each geographical region have been further subdivided into income level, according to the divisions developed by the World Bank.
Source: reference 2.

Table 1: Rank cause of death among young people under 25 around the world, 2002

Rank	< 1 year	1 to 4 years	5 to 9 years	10 to 14 years	15 to 19 years	20 to 24 years	All < 25 years
1	Perinatal conditions	Lower respiratory infections	Lower respiratory infections	Lower respiratory infections	Road traffic injuries	HIV/AIDS	Perinatal conditions
2	Diarrhoeal diseases	Childhood cluster diseases	HIV/AIDS	Road traffic injuries	Self-inflicted injuries	Road traffic injuries	Lower respiratory infections
3	Lower respiratory infections	Diarrhoeal diseases	Road traffic injuries	Drowning	Maternal conditions	Self-inflicted injuries	Diarrhoeal diseases
4	Malaria	Malaria	Childhood cluster diseases	HIV/AIDS	Lower respiratory infections	Maternal conditions	Childhood cluster diseases
5	Childhood cluster diseases	HIV/AIDS	Drowning	Tuberculosis	Interpersonal violence	Interpersonal violence	Malaria
6	Congenital anomalies	Perinatal conditions	Meningitis	Protein-energy malnutrition	Drowning	Tuberculosis	HIV/AIDS
7	HIV/AIDS	Protein-energy malnutrition	Fire burns	Fire burns	Tuberculosis	Lower respiratory infections	Congenital anomalies
8	Protein-energy malnutrition	Congenital anomalies	Tuberculosis	Self-inflicted injuries	Fire burns	Fire burns	Road traffic injuries
9	Syphilis	Drowning	Protein-energy malnutrition	Leukaemia	HIV/AIDS	War	Drowning
10	Meningitis	Road traffic injuries	Falls	Interpersonal violence	Leukaemia	Drowning	Tuberculosis

Source: reference 2.

road traffic injuries are the leading cause of death, while among the 10–14 years and 20–24 years age groups they are the second leading cause of death. Children under five years of age, and in particular infants under 1 year, being especially vulnerable to other diseases and conditions, have the lowest ranking for road traffic deaths.

In many countries it is extremely difficult to obtain reliable data on the numbers of road traffic deaths and injuries that occur. Underreporting of deaths and injuries resulting from road traffic crashes is known to be widespread, and may be more common among children, particularly when they incur moderate injuries.

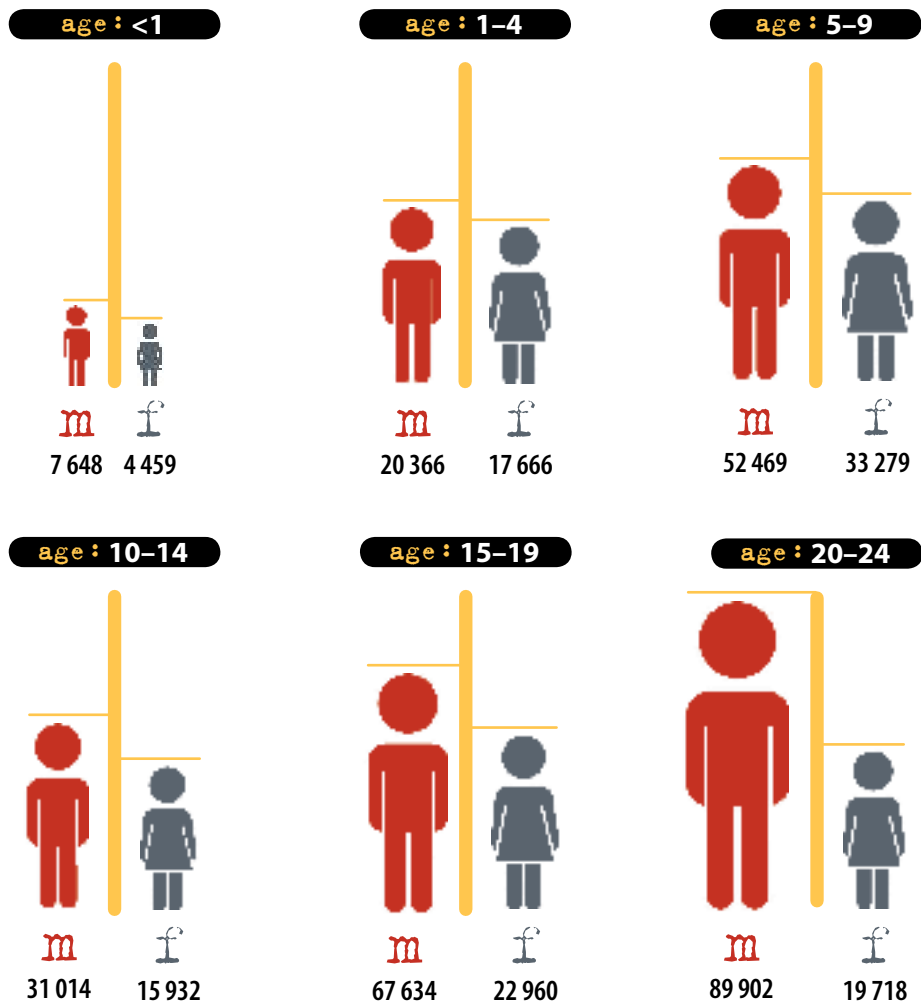
Gender

From a young age, males are more likely to be involved in road traffic crashes than young females (see Figure 2). Among drivers, young males under the age of 25 years are almost three times as likely to be killed as their female counterparts. This may reflect the fact that males are more likely to be on the roads, often because of sociocultural reasons, as well as a greater propensity to take risks, compared to females.

Socioeconomic level

The socioeconomic condition of a family affects the likelihood of a child or young adult being killed or injured in a road traffic crash, with those from economically poor backgrounds at greatest risk. This relationship is true not just between higher-income and lower-income countries, but within countries as well. For instance, data from both Sweden and the United Kingdom show that the risk of children and young adults for road traffic injuries is higher

Figure 2: Road traffic fatalities among youth under the age of 25 years, by age group (in years) and sex, 2002



Source: reference 2.

if they are from families of a lower social class. In Kenya, the choice of transport used is often related to a family's income – with those from low-income families more likely to be vulnerable road users at increased risk of injuries (3-5) .

2.2 How do young people use the road?

The degree of risk from traffic injuries incurred by young road users is associated with the region of the world they live in.

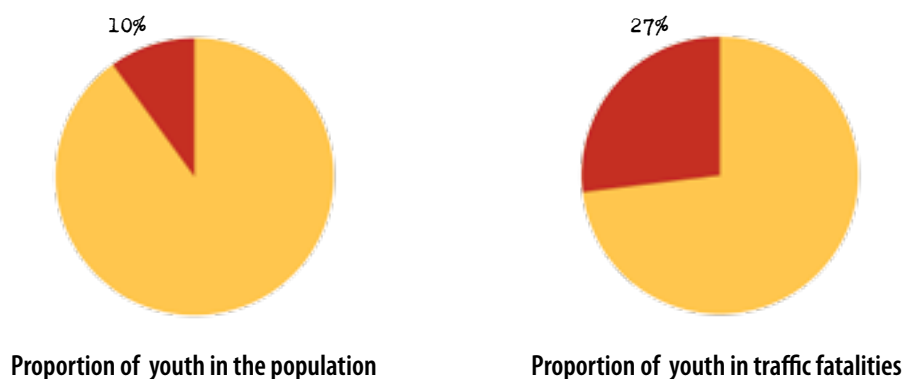
In the higher-income countries of the Organisation for Economic Co-operation and Development (OECD), almost half of those under the age of 25 years killed in road traffic crashes are between the ages of 20 and 24 years, reflecting the relatively high proportion of young drivers in these countries. For example, in 30 OECD countries, young drivers are overrepresented in road traffic death statistics by a factor of between 1.2 and 3.9 – when compared with the proportion of this age group in the general population (6) (see Figure 3).

Most youths killed by road traffic injuries, however, live in low-income and middle-income countries. They are most likely to be the vulnerable road users – pedestrians, cyclists, motorcyclists and

passengers of private and public transport (see Figure 4). This is partly because in many low-income and middle-income countries, transport and urban planning have given insufficient consideration to the non-motorized road users, and as a result, vulnerable road users are forced to share the transport space with cars, buses and trucks, and sometimes animals. In addition, the lack of physical protection among users of not wheeler vehicles and pedestrians makes them particularly vulnerable to being injured (or more severely injured) if they are involved in a road traffic collision.

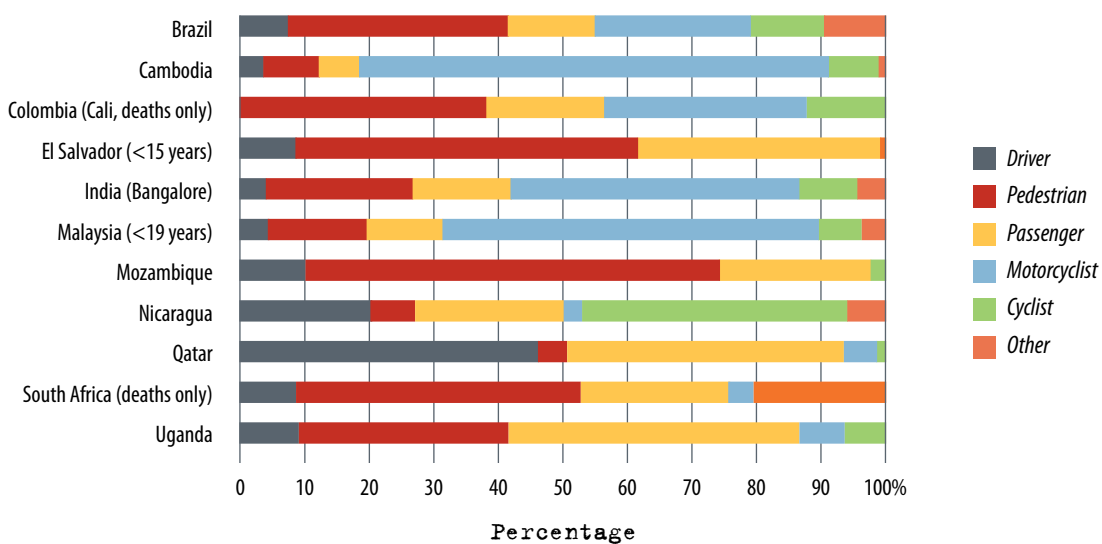
The ages of the young people who are killed in road traffic crashes in the different regions of the world reflect the preponderant types of road users. For example, in the WHO African Region, of the 105 000 children under 25 years who are killed each year as a result of road traffic injuries, 46% are between the ages of 5 and 9 years, reflecting the high proportion of road users who are pedestrians in the region. In contrast, in the WHO South-East Asia Region, of the 80 400 people under 25 years of age who die each year from road traffic collisions, the majority are aged between 15 and 24 years, which may be a reflection of the high use of two-wheeled vehicles among this age group in this region.

Figure 3: Proportion of young people in traffic fatalities versus population, OECD countries, 2004



Source: reference 6.

Figure 4: Injuries and fatalities among road users in selected low-income and middle-income countries (<25 years)



Source: Colleagues in Brazil, Cambodia, Colombia, El Salvador, India, Malaysia, Mozambique, Nicaragua, Qatar, South Africa, and Uganda.



Vulnerable road users often share transport space with motorized vehicles.

photo © D. Mohan

2.3 What type of injuries do they typically sustain?

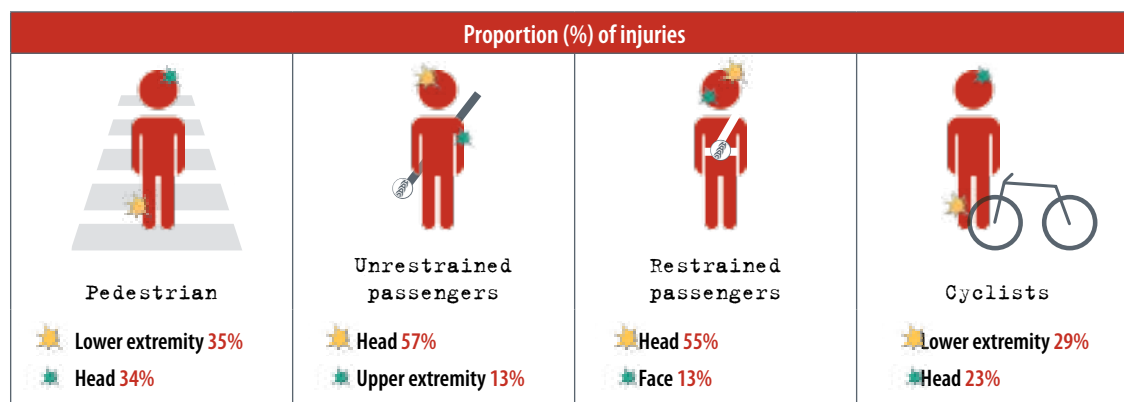
The nature and severity of injuries that children and youth sustain in road traffic collisions are influenced by their age and on what type of road user they are. Traumatic brain injuries are the leading cause of traffic-related deaths and injuries in both high-income countries as well as low-income and middle-income countries (1) (see Figure 5). For example, in the United Arab Emirates a hospital study of children under 15 years old found that head and neck injuries were responsible for 57% of injury fatalities (7). In addition to head injuries, limb injuries – particularly fractures, abrasions and contusions – are common among youth injured in traffic crashes (see Figure 5).

2.4 What are the costs of their injuries?

Road traffic injuries can place considerable physical and psychosocial strain on those injured and their families.

Many children and young people who have been involved in road traffic collisions are left with long-term injuries or disabilities. The extent of disability can range from minor or short-term incapacity which may affect day-to-day living or activities, to severe or permanent disabilities. For instance, children with a brain injury may, depending on their environment, experience restrictions in their participation at school or within their community.

Figure 5: Most common injuries sustained by children (<13 years) following a road traffic crash



Source: The Child Accident Prevention Foundation of Southern Africa (CAPFSA), Red Cross Children's Hospital, Cape Town, South Africa, 2003.



Every year, hundreds of thousands of families have to cope with the emotional, practical and financial consequences of bereavement or caring for family members who are disabled for life.

photo © M Peden/WHO

The emotional and practical impact on the victim's families and caregivers is considerable. In addition, road traffic crashes may place severe financial strain on a family, who often have to absorb the direct medical costs, as well as indirect costs – created by a victim's inability to continue earning, or through the reallocation of work required by their carers that may result in lost income.

At a national level, road traffic collisions place enormous costs on the economies affected. These costs include:

- the direct impacts on health care services and the costs of providing rehabilitation;
- the indirect costs, such as the value of lost household services and lost earnings of victims and survivors, caregivers and families (1).

The annual costs of road crashes in low-income and middle-income countries are estimated to be between US\$ 65 billion and US\$ 100 billion – more than the total annual amount received in development aid (8). Road traffic crashes and their consequences cost governments about 2% of their Gross National Product.

In many low-income and middle-income countries, a large proportion of road traffic casualties are from the younger, wage-earning groups. In Africa, for instance, with 50% of the population below the age of 16 years, road crashes among economically active young people place an enormous economic burden on countries, while the costs of importing medicines and providing appropriate care for road traffic victims further strain resources.

Even in high-income countries, road traffic crashes among young people impose a huge economic burden on societies. In the United States of America, crashes involving 15–20-year-old drivers cost the country about US\$41 billion in 2002 (6).

2.5 Why are young road users at high risk?

For people of any age, there are many risk factors that increase their likelihood of sustaining road traffic injuries (1). A number of these risks are elevated among young road users, including among pedestrians, and drivers and passengers of both cars and motorcycles. The factors influencing the risk fall into a number of categories:

- those influencing *exposure to risk* – such as a mixture of high-speed motorized traffic with vulnerable road users, or the lack of integration of a road's function with decisions about speed limits;
- those influencing *crash involvement* – such as high speed, use of alcohol before road use, being a young male, and defects in road design;

- those influencing *crash severity* – such as the use of excessive speed, and whether or not seat-belts or helmets are used;
- those influencing the *post crash outcomes* after a crash – such as the time taken by rescuers to reach a crash, and the availability of pre-hospital and hospital care.

Understanding the risks faced by young road users is important in order to plan appropriate programmes to reduce road traffic deaths and injuries among this age group. Most of the interventions that reduce the risk of road traffic injuries among the general population will also reduce the occurrence among youth. In addition, experience from high-income countries shows that sustained efforts to implement appropriate interventions targeted specifically at children and young adults can lead to great success in reducing the numbers of deaths and injuries among this population group.

The rest of this section summarizes the risk factors for road traffic injuries in young people, according to the main environmental factors, developmental factors and gender. Also described in the next section are a few of the most successful interventions for children and young people, though this list is by no means exhaustive.

The road environment

In many countries, the planning of road transport systems and urban development has not accommodated the needs of all road users. Frequently motorized transport has been catered for when developing transport infrastructure, while non-motorized transport and other uses of transport and land space – such as children's recreational spaces – have received considerably less attention. In some cases, roads have been developed with little consideration for the needs of the communities they pass through – such as where high-speed roads have been built passing close to schools or residential areas.



Non-motorized and motorized traffic share space on the roads of Bogotá, Colombia.

photo © D. Rodríguez

Box 1: Limitations of the child in traffic

As children are not small versions of adults, simply reproducing safe adult strategies will not protect children sufficiently. Various developmental factors make the task of protection more complicated. These include the following.

■ Limitations of size

- The child has difficulty seeing in traffic – he or she needs to be tall enough to view the surrounding traffic.
- The child may easily not be seen by other traffic users.



photo © M. Peden/WHO

- A child is top-heavy – that is, the size of the child's head relative to the rest of the body is greater than the ratio in adults. A child therefore has a higher centre of gravity than an adult, leading to a greater disposition to head injuries.

■ Limitations of vision

- Children have a less developed perception of depth and thus have difficulty judging the distance between themselves and other objects, particularly when both are in motion.

■ Limitations of hearing

- Small children have difficulty discerning the size and speeds of vehicles from the sound of the engine as they approach.
- Children have difficulty discerning what direction a sound is coming from and hence what direction a car is coming from.

■ Limitations of attention

- Young children are active, energetic and often impulsive. Their concentration span is shorter and they can struggle to attend to more than one problem at a time.
- Children can be easily distracted by other stimuli which may lead them to suddenly run into the road.

■ Limitations of judgement

- Speed and distance are difficult for a child to judge but are essential for safely crossing a road.
- The concept of left and right as positions relative to the body develop slowly and are only well established after the age of about seven.

In most high-income countries the needs of motorized traffic have been given priority over those of non-motorized road users. Sometimes, steps are taken to separate different types of transport. For example, there may be one lane on a motorway for slower or non-motorized road users, or a separate bicycle lane along roads. However, in low-income and middle-income countries, resource constraints and lack of planning mean that slow and non-motorized road users are often forced to share the road space with motorized traffic, leading to an increased risk for these more vulnerable road users.

Developmental factors

Child developmental factors — Young children do not understand or react to complex traffic situations in the same way as adults. Their developmental immaturity means that in the traffic environment young children lack certain abilities that adults possess and this increases their risk to road traffic crashes (see Box 1). In addition, the need of young children to exert physical energy, explore and play – combined with a lack of safe areas to do so – may predispose them to a greater likelihood of being hit by a vehicle.

Youth-related risk taking — While young children may inadvertently take risks because they lack appropriate skills to do otherwise, older children and adolescents may indeed have the skills but may actively seek out risk. Risk-taking behaviour may allow adolescents to feel a sense of control over their lives or sometimes to oppose authority. Research shows that there are high levels of 'sensation seeking' behaviour among young adults and a need to maintain a heightened level of physiological arousal. Young people consequently seek new situations and experiences to maintain this level, irrespective of the risks inherent in the experience. Such sensation-seeking frequently focuses on risky behaviours, including while driving a vehicle or crossing a road. Sensation-seeking has been shown to rise between the ages of

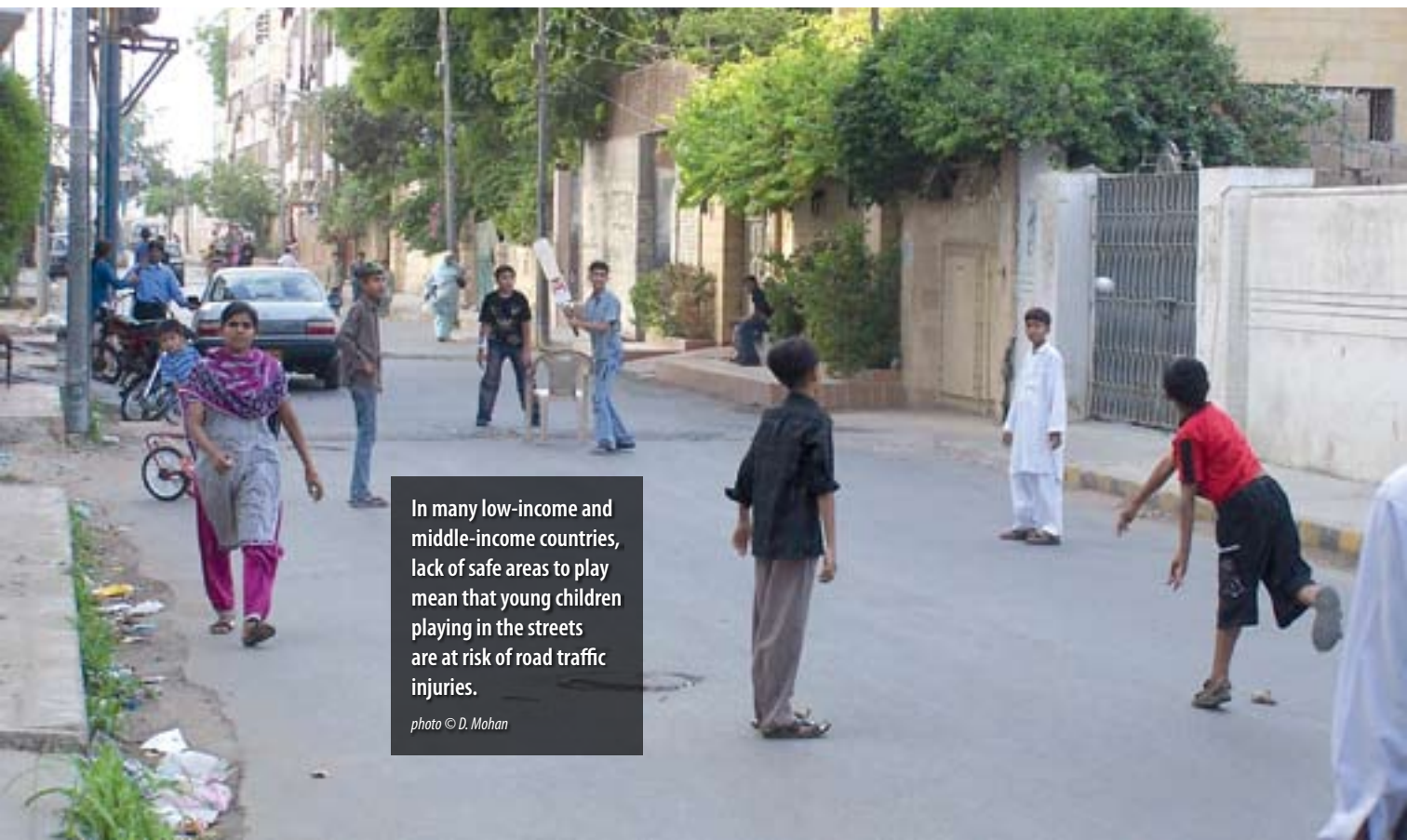
9 and 14 years, peaking in late adolescence or the early 20s, and then declining steadily with age (9, 10). Across all ages and particularly among the young, sensation-seeking is more common among males than females.

Peer influence — As young children become adolescents, peer influence becomes increasingly important, compared to the earlier strong influence of parents. For many young people, their peers are the most important people in their lives and are often also their primary source of behavioural norms. Teenagers can be led by what is considered “cool”, not necessarily what is safe. Peer pressure can mean that young people are more likely to behave in a risky manner on the road, both as novice drivers or riders, and as pedestrians.

Other social pressures — In considering the developmental factors that predispose youth towards increased risk for road traffic collisions, the environmental pressures that may exacerbate inherent risks should be taken into account.

Factors, such as risk-taking and peer pressure, that direct young people towards high-risk behaviours are often used in marketing techniques targeted to appeal to youth (see Boxes 4 & 9). Large corporations and industries can influence both individual behaviour and social norms in a manner that may increase risk on the roads. For this reason, one needs to consider not only individual behaviours, but also the environmental factors – including media messages, community norms, and public and institutional policies – that may support high-risk behaviours.

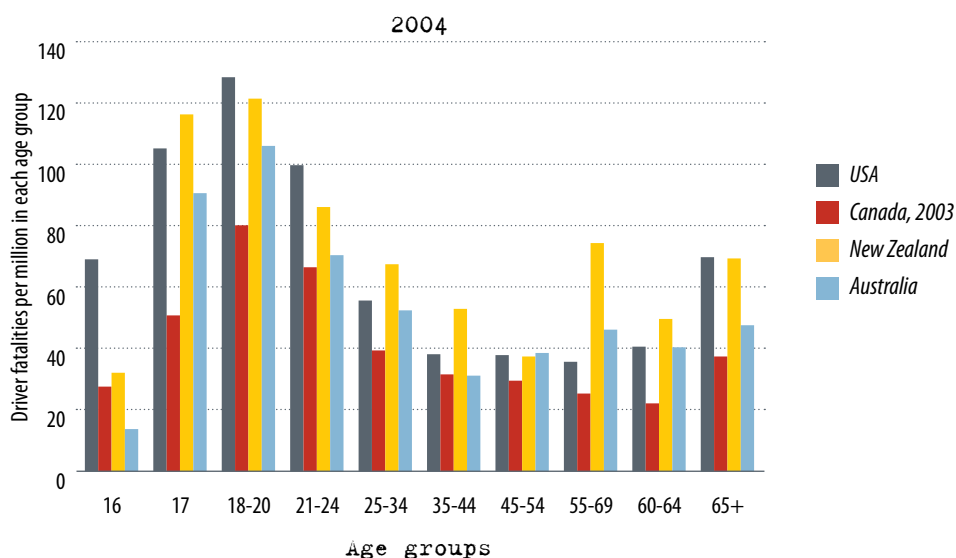
Inexperience — The various risks often interact with inexperience among young drivers, in turn increasing the chances of a crash occurring. As with adolescent pedestrians or cyclists, the increased risk of a crash among young drivers can be mainly due to their inexperience on the roads. They may, for example, be less able to accurately perceive hazards, control the vehicle and make appropriate decisions on the road.



In many low-income and middle-income countries, lack of safe areas to play mean that young children playing in the streets are at risk of road traffic injuries.

photo © D. Mohan

Figure 6: Driver fatalities per million population for different age groups in selected OECD countries*



**Note: this data is from countries where solo driving occurs before 18 years of age.
Source: IRTAD, in reference 6.*

Gender

Developmental risks are also affected by gender. Young boys are more likely than young girls to play on busy roads and to run or ride bicycles onto roads without first stopping to check for traffic.

Young men who drive are also more likely to be involved in a crash than young women. Men are more likely than women to own and drive motor vehicles, and to engage in risky driving behaviour and overestimate their driving abilities.

For example, a study in New Zealand found that males were more likely both to speed and drive after drinking, while research from Spain has found young males to be less likely to use seat-belts or helmets than their female counterparts (11, 12). In addition, young men drive more than young women: this increased exposure in turn exacerbates their crash rates.

testimonial



Turning grief into action: a father's testimonial

Deana is my daughter. She was 17 years old when her life was cut short. Deana was with four friends going to a birthday party. They had just got out of a taxi and were trying to cross the Nile Corniche in Maadi. The traffic is heavy, chaotic. There are no traffic lights, no crosswalks, just a constant stream of speeding, weaving cars, trucks and buses. You have to dart across several lanes of traffic to get to the other side. Deana was hit and killed by a speeding bus as she tried to cross the road. The bus driver didn't even slow down.

I was in Damascus at the time, travelling for my work. My brother-in-law called me to tell me the terrible news that my baby girl had been hit. You can imagine my guilt. I should have been in Cairo. I could have driven her to the party.

Deana loved so many things, she loved life. She had an infectious smile. She always had time for other people more than for herself. She wanted to be a paediatric dentist – she loved kids. She had a special love of angels. She always had pictures or figurines of angels in her room. For us, she has become the "Angel of the Nile".

Everyone was deeply affected by Deana's death, her family her friends, the entire community. I think of ripples of pain, an ever-widening circle of those who were affected. My wife, son and I had to leave Cairo after Deana's death. It was too painful, too many memories. We came back to Cairo just a few months ago.

Most of the time I can't comprehend Deana's death. Part of me is still in denial. I think of what could have been, should have been. She should be twenty

years old now, in college. I should be going to "Dads' day" at some university. I know that I have to let go of those ideas. I am angry, in part at myself. I don't know what I could have done to save her, everyone tells me that, but I still feel responsible for what happened.

I guess that early on I made a decision. I could roll up into a ball in a fetal position and never wake up. It would be very easy to do this and give up. But I felt I had to try to make sense out of the senseless, the unbelievable. I decided to do something tangible, something that would save other people's lives.

A nongovernmental organization, the Safe Road Society, started because our daughter lost her life. It is dedicated to making the roads in Egypt safer for its citizens. Our first project is the building of a pedestrian tunnel under the Maadi Corniche El Nile. Governmental permits have been obtained and request for construction bids sent. Our next step is to ensure sufficient funds are raised through voluntary donations to complete this life saving project. This busy road of death runs alongside the serenity of the Nile River. Many concerned and dedicated Egyptians and foreigners have joined together with the goal to make the tunnel a reality. Also, a scholarship was started in Deana's name at her school and every year a graduating senior who smiles and brings light to another student's day is awarded a helping hand.

By building a pedestrian tunnel we hope to save lives and, in my dreams, to see my Deana, my Angel of the Nile, looking down upon us and smiling in approval.

David Blanchard, Deana's father

my angel of the Nile

3 Preventing road traffic injuries among children and young people

3.1 Strategies for protecting young road users

In addition to a number of generic road safety prevention strategies – such as implementing laws, making vehicles safer and improving the conditions of roads – there are various interventions aimed at addressing some of the factors that increase the likelihood of children and youth being involved in a road traffic crash.

Modifying the road environment

A sustainable transport system is one that provides mobility and accessibility to all residents in a safe and environmentally friendly manner (13). In the case of the road system, this is clearly a complex task, as the needs of various groups of road users may conflict. The safety of all road users should be consciously included in the decision-making of urban and road planners. This in turn may require that new infrastructure be built, or that there is segregated road space between non-motorized and motorized traffic, so that each group has enough space on the transport network.

Even in high-income countries, there should be a reassessment of the priority that has been given to cars. More resources should go specifically towards improving pedestrian and cyclist safety (14). Indeed, modifying the road environment to accommodate pedestrian needs would have health benefits other

than injury prevention, stemming from increased physical activity and reduced pollution.

Infrastructural interventions include such things as safe crossings – zebra crossings or raised crossings – near school areas, and the availability of foot and bicycle paths. Such interventions can also be used to prevent children from crossing motorized traffic, for instance through the provision of well-lit footbridges or tunnels.

Restricting or calming traffic on roads that children use as play areas is another intervention of the road environment (see page 19).

Box 2: The need for a systems approach

Any road traffic system is very complex and potentially hazardous to human health. Elements of the system include the motor vehicles, roads and road users, and their physical, social and economic environments. To make the road system less hazardous requires a “systems approach” – understanding the system as a whole and identifying where there is potential for intervention. In particular, it requires recognizing that human beings make mistakes and that the human body is especially vulnerable to injury. A safe road traffic system is one that accommodates and compensates for human error and vulnerability.

A systems approach to road safety considers risk factors related to the road and its environment, the road user and the vehicle.



Children learn by example. Parents are important role models and can influence their children's behaviour in traffic at an early age.

photo © M. Peden/WHO

More consideration should be given to the needs of children. If walking and bicycling were made safer, more children would not need to travel to school by bus or in their parents' vehicles. Children's play spaces should be contained in a safe manner – for instance, with fencing – and with safe access, such as from footpaths or bridges. Alternatively, play spaces should be set far enough away from areas where there is high-speed traffic, so that things that may encourage children to suddenly run out – chasing a ball, for instance – do not put them at risk of moving traffic.

Parental guidance and support

Parents play an important role in the behaviour of young children. First, they make important decisions about the level of exposure of their children to risk. For example, they influence how often or how long children may be in traffic or on the road, and whether or not their children use child restraints or helmets. Second, they serve as important role models: children learn by imitation and careful observation of adults actions, and will begin developing road safety skills well before they reach school age (15).



Reducing exposure of young adults to traffic

There are a number of ways in which the exposure of young people to traffic risks can be reduced. Modifying the environment in the ways already referred to is one method. For example, paying greater attention to pedestrians and cyclists to enable more children to cycle or walk to school safely could reduce the exposure of these children to road traffic.

Beginner drivers lack the skills and experience necessary to successfully handle the risks they may encounter on the roads. An understanding of the factors that increase the risk of young drivers has

changed traditional systems of licensing. Graduated driver licensing systems, for instance, aim to keep people out of high-risk driving situations while they learn and gain experience. These schemes thus address developmental risk factors as well as the inexperience of young drivers (see Box 3). Other strategies to reduce exposure may work by reducing the need to travel.

Other strategies

Various other strategies can be used to reduce the likelihood of an injury or fatality occurring in the event of a road traffic collision. These are discussed in more detail in the following sections.

Box 3: Graduated driver licensing programmes

Beginner drivers of all ages lack driving skills and experience in recognizing potential dangers, putting them at an increased risk of a crash. For newly licensed teenage drivers, their immaturity and limited driving experience result in disproportionately high rates of crashes. Graduated licensing systems are initiatives that allow for a controlled and supervised phasing-in of many driver privileges over a period of time for new young drivers. The purpose is to protect beginners while they are learning, allowing and encouraging them to obtain driving experience on the road under conditions of low risk.



photo ©Utah Safety Council

Graduated driver licensing is widely used in Australia, Canada, New Zealand and the United States. Although details vary between countries, most graduated driver licensing systems rely on a basic three-stage model:

- **stage 1: an extended learner period** – intended to increase the amount of low-risk supervised driving experience before receiving a full licence;
- **stage 2: a provisional or intermediate licence** – with temporary restrictions, such as on unsupervised driving, late-night driving and driving with young passengers;
- **stage 3: a full licence.**

In many countries, moving from one stage to another requires a certain number of supervised driving hours, and it may be stipulated that a proportion of these be conducted at night.

The areas that graduated driver licensing can address include:

- **Alcohol restrictions:** Drivers at stage 1 and 2 of graduated driver licensing in Victoria, Australia for example – and most other states in Australia – must have blood alcohol concentrations of zero.
- **Passenger restrictions:** In Connecticut, United States, drivers at stage 1 are not allowed passengers, while drivers at stage 2 may have passengers only if a parent or supervisor is present for the first three months, after which only immediate family are permitted as passengers.
- **Seat-belt use:** A few states in the United States have specific provisions in their legislation requiring seat-belt use – for example, requiring all occupants in a vehicle driven by a driver in the graduated system to be restrained.
- **Speed:** Drivers at the learning stage in Ontario, Canada, are prohibited from driving on any highways with speed limits over 80 km/h.
- **Night-driving restrictions:** Drivers at stage 1 in Ontario, Canada, are prohibited from driving between midnight and 05.00.

Evaluations of graduated driver licensing have reported significant reductions in crashes and fatalities, with estimates of effectiveness varying from 4% to up to 60%. This range reflects differences in graduated driver licensing systems as well as in the age of drivers, and also differences in the methodologies used to examine effectiveness (16,17).



Research shows that a 5% increase in average speed leads to approximately a 10% increase in all injury crashes and a 20% increase in fatal crashes. In many countries, speed is the main risk factor for road crashes – often contributing to as many as a third of all fatal crashes.

photo © T. Torayon/WHO

3.2 Specific interventions that have proved effective

Speed

High speed increases the chance of death or severe injury among all road users – drivers, pedestrians, passengers, young and old alike. Excess or inappropriate speed is a major risk factor for road traffic crashes. The higher the speed, the shorter time a driver has to stop and avoid a crash. In addition, a higher speed is more likely to result in severe consequences if a crash does occur. 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 30 km/h or below, but less than a 50% chance of surviving impacts at 45 km/h (1).

Youth and speed — Speeding is much more likely to be a factor in a fatal crash when the driver is under 25 years old (6). For example, young Australian drivers aged 17–25 years have double the risk of being involved in a fatal crash, despite a 42% reduction on the fatality rate over the last 20

Box 4 : Vehicles that speed: a commentary on some contributions to be made by automobile manufacturers

A holistic approach to speed and its role in road traffic crashes requires that the road environment, individual behaviour, and also the vehicle itself and its contribution to this risk factor be taken into account. Automobile manufacturers around the world design and produce cars that are capable of travelling – and crashing – at speeds well in excess of the legal maximum speeds.

However, technology is being developed that would allow vehicles to adapt their speed to the recommended speed limits on the road on which they are travelling. Known as “Intelligent Speed Adaptation”, ISA is a system that shows great promise in terms of its potential impact on the numbers of road traffic injuries: with this system, the vehicle “knows” the permitted or recommended maximum speed, through the use of a digital road map onto which speed limits have been coded, combined with a satellite positioning system. Trials of this system in Sweden show promising results in terms of its potential in reducing road traffic crashes.

Nonetheless, at a global level, insufficient serious consideration has been given to proposals that would require built-in maximum speed ceilings for new cars. When such proposals have been made, they have frequently met with claims that excess speed capability is needed for “emergency driving situations” – and that it is drivers, not cars, that kill people on the roads. Meanwhile, the allure of speed continues to be regularly emphasized in advertisements on television and in the print media for new cars.

Source: adapted from reference 18.

years. Speeding is the single most common traffic violation committed by young Australian drivers in the initial years of driving (19).

Several measures have been shown to reduce speed among drivers, including the following.

📍 **Setting and enforcing speed limits**

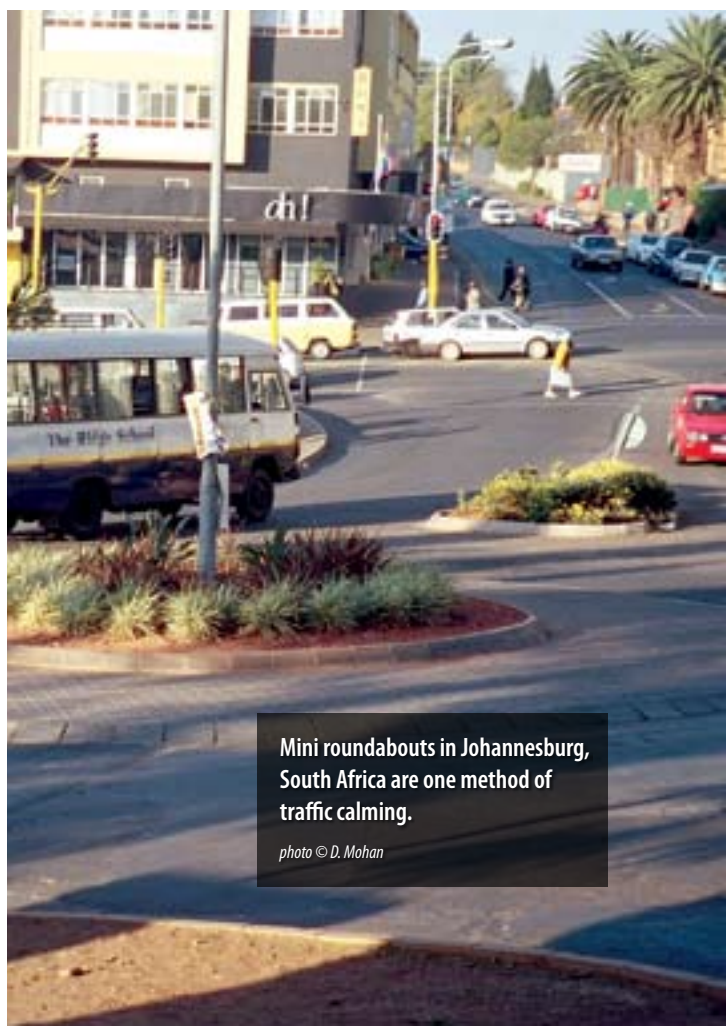
Setting and enforcing upper limits on speed, to regulate traffic and make the overall speed more consistent, have been shown to be effective. In determining speed limits, consideration needs to be given to road function, traffic composition, types of road user and road design. For example, roads with high pedestrian, child and bicyclist activity should have limits no higher than 30 km/h. Speed limits should be enforced in such a way that drivers believe there is a high chance of their being caught if they speed.

📍 **Traffic calming measures**

Traffic calming measures that reduce speed can be used to address the safety of young road users. Traffic calming measures include strategies that slow down traffic through infrastructural engineering measures (eg. speed humps, mini-roundabouts, designated pedestrian crossings, or pedestrian islands); by introducing visual changes (road surface treatment, changes to road lighting); through the redistribution of traffic (blocking roads, creating one-way streets); and by introducing changing to road environments. Area-wide traffic calming in towns and cities is a promising way of reducing the number of road traffic injuries, and deaths, but there is need for these strategies to be evaluated in low-income and middle-income countries (20).

📍 **Restricting drink-driving**

Other measures taken to reduce the risk of traffic crashes will often also have a positive effect in restraining speed among young novice drivers. Strict measures on drink-driving, for example, are likely to reduce the severity and number of speed-related crashes, which are often associated with alcohol consumption. Speed crashes frequently occur at night and the presence of young passengers may encourage a driver to speed. For this reason, restrictions on alcohol consumption by youth behind the wheel, on driving at night, and on passengers carried while driving can complement measures directly aimed at speeding (6).



Mini roundabouts in Johannesburg, South Africa are one method of traffic calming.

photo © D. Mohan

helmets

Helmets

Wearing a helmet is the single most effective way of reducing head injuries and fatalities resulting from motorcycle and bicycle crashes. Not wearing a helmet:

- increases the risk of sustaining a head injury;
- increases the severity of head injuries;
- increases the time spent in hospital;
- increases the likelihood of dying from a head injury;
- increases the likelihood of long-term disability.

Youth and helmet use — In many low-income and middle-income countries, particularly in Asia, a motorcycle is the family vehicle. Motorcycles are much cheaper to purchase and maintain and they provide better mileage per litre of fuel. Children are frequently transported to school on the backs of their parents' motorcycles, while for young adolescents, a motorcycle affords them mobility. However, for various reasons, helmet use among these young road users is often low. The lack of appropriately sized motorcycle helmets for children means that, although the parents may be wearing helmets, their passenger children often are not. It is also known that young motorcycle users are

generally less likely to wear a helmet than those who are older.

Some of the reasons why children and young people may not wear helmets include:

- the tendency for youth to behave in a “risky” manner (see page 10);
- peer pressure (see page 11);
- the lack of appropriately sized helmets for young children;
- concern that a helmet will be stolen;
- concern that a helmet will mess up a hairstyle;
- the inability to fit a helmet over elaborate hairstyles or headgear – a factor sometimes reported among women in African countries or Sikh's in India.

Young road users are more likely to take risks, including riding on a motorcycle without a helmet. A study in a Brazilian city, for instance, found that those younger than 18 years were less likely than others to wear a helmet, particularly if they had been consuming alcohol (22).



Most motorcycle deaths are a result of head injuries. Wearing a motorcycle helmet correctly can cut the risk of death by almost 40%, and the risk of severe injury by 72% (21).

photo ©WHO

Box 5 : **Helmet use among Spanish adolescent motorcycle riders and passengers**

For motorcycle riders and passengers to wear helmets is not general practice in Spain. A study among adolescents found that the beliefs held by their parents and friends about helmet use were strongly related to the use of helmets by participants in the study.

Males were most likely to wear a helmet if they believed their fathers wore helmets while on a motorcycle. For females, the decision was affected by their mother's helmet usage, by their concern that using a helmet would spoil their hairstyle, and also by their belief about the necessity of wearing a helmet on urban roads. There was also a common belief that helmets would be effective in preventing injury even if they were unbuckled.

Source: adapted from reference 23.

Helmets aim to cut the risk of serious head and brain injuries by reducing the impact of a force to the head. Wearing a motorcycle helmet has been shown to decrease the risk and severity of injuries by about 72%, and decreases the likelihood of death by up to 39%, with the probability depending on the speed of the motorcycle involved (21). It also reduces the costs of health care associated with crashes.

Strategies to increase helmet use include the following:

📍 **Mandatory helmet laws**

Laws making helmet use compulsory are an important means of increasing the wearing of helmets, especially in low-income and middle-income countries where helmet-wearing rates are low and where a large number of people use motorized two-wheelers. There have been many studies to evaluate the impact of motorcycle helmet laws on helmet-wearing rates, head injury or death. When mandatory helmet laws are enforced, helmet-wearing rates

have been found to increase to 90% or higher. At the same time, if these laws are repealed, wearing rates fall back to generally less than 60% (24–27).

📍 **Helmet distribution among school children**

As the costs of a helmet can be a disincentive to their use, particularly among young people who have less disposable income, some programmes provide helmets at reduced cost, or at no cost, to young users (see Box 6).

📍 **Introducing a helmet standard**

One of the objectives of a helmet programme is usually to raise the quality of the helmets being used. This is best achieved by ensuring that all helmets meet a recognized safety standard – one that has been demonstrated as being effective in reducing head injuries. The standard must be suitable for the traffic and other conditions of the country. In some countries, such as in Thailand, specific standards for child helmets have been developed.

Box 6: Helmets for children: making helmets affordable

In most high-income countries the family vehicle is the car, and young children are rarely seen on the backs of motorcycles. However, this is not the case in other parts of the world. The reality in many south-east Asian countries, for example, is that children are routinely transported as passengers on motorized two-wheelers. It is therefore of added importance that these children be protected by wearing appropriate helmets. However, in some low-income countries, the cost of these helmets is prohibitive and thus wearing rates are low, particularly among child passengers. Studies have shown that in some countries, factory workers have to work 11 times as long to earn the money to buy a motorcycle helmet as their counterparts in high-income countries. For families where children also ride on the motorcycles, this makes safe motorcycle riding particularly expensive.

One way to overcome the problem is to reduce the cost of helmets to the consumer. For example, the Vietnamese nongovernmental organization, Asia Injury Prevention Foundation, runs a helmet programme that distributes tropical motorcycle helmets free to school-age children, so that they can ride with protection as passengers on their parents' motorcycles. To date, over 165 000 helmets have been distributed through the programme to children across the country (28).



The price of helmets may be a deterrent for families with children. Providing free helmets for children is one way of ensuring that all members of the family ride with a helmet on.

photo © Asia Injury Prevention Foundation 2004

Box 7: Film star campaigns for helmet use among young Cambodians

In 2004, Handicap International Belgium launched a series of helmet-use awareness campaigns in Cambodia, featuring the film star Jackie Chan. The campaign was aimed at young people, who represent 50% of road traffic casualties in the capital, Phnom Penh, and used television spots and posters showing how Chan used a motorcycle helmet. Helmet-wearing surveys conducted before and after the campaign allowed organizers to evaluate its success. Prior to the campaign, the average helmet-wearing rate, assessed at 20 locations in the city over a four-day period, was 8%. At the end of the campaign, a year and a half later, this level had risen to 14.7%.



Jackie Chan, Goodwill Ambassador for UNICEF, promotes helmet use in Cambodia.

photo © Handicap International Belgium and UNICEF 2004

● Helmet public awareness campaigns

Such campaigns aim to increase public awareness about the benefits of using a helmet, or to encourage people to purchase and use helmets, or to explain that a helmet law is coming into effect or being enforced (Box 7). Campaigns may be targeted specifically at educating young people, and may use peer pressure to change norms regarding the acceptability of helmet use. However, such campaigns are best used not in isolation but to back up helmet-wearing laws and their enforcement.

Bicycle helmets and cycling — Bicycles are an important means of transportation in many parts of the world. They are accessible, economical and non-polluting. With a growing recognition of the problem of obesity and lack of physical activity in many countries, bicycling also offers an enjoyable means of recreation and vigorous physical activity. The promotion of bicycle use is therefore to be encouraged widely particularly among children. Bicycling, though, does have associated risks. Approximately two-thirds of serious injuries to cyclists requiring hospitalization and three-quarters of cyclists' deaths are due to head injuries. These injuries can occur from falls following a loss of control, from hitting a hole in the road, or from colliding with another bicycle, motor vehicle or stationary objects. Head injuries among cyclists are a major source of disability everywhere, and create an enormous challenge on the victims' families and on society.

Research shows that wearing a bicycle helmet decreases the risk of a head injury by 69%. Helmets appear to be similarly effective for all age groups, including young children and older adults (29).

youth and

However, whether or not to introduce legislation on bicycle helmet use is a topic that has split the public health community, as well as those involved in implementing road safety programmes. Briefly, the pro-bicycle helmet group base their argument overwhelmingly on one major point: that there is scientific evidence that, in the event of a fall or crash, helmets substantially reduce the chance of sustaining a head injury or in the event of a head injury, they reduce the severity. The anti-helmet group base their argument on a wider range of issues, including that compulsory helmet wearing leads to a decline in bicycling, that risk compensation theory negates health gains, that the scientific studies are defective, and that the overall road environment needs to be improved or traffic separated from bicycles.

While the debate continues, the issue of promoting helmet use among children, whose basic motor skills are still developing, is less controversial. For example, in the Netherlands the road environment has been modified to make it very safe for cycling. Although there is therefore no law mandating bicycle helmet use among adults, Dutch crash data indicate that children in the 4–8 years age range are particularly likely to be involved in bicycle crashes and suffer head injuries, and thus helmet use among children is promoted (30).

While some countries, such as Australia and the United States, legislate and enforce mandatory bicycle helmet laws for all cyclists (either at national, provincial or state levels), others enact provincial or state level laws that stipulate an age below which children must wear helmets. Data from before and after such laws are passed show an increase in helmet use – information that policymakers feel suggest that reductions in head injuries can be achieved through this strategy (15).

Box 8 : Putting helmets on young cyclists' heads: communities in the Czech Republic

Injuries cause 40% of the mortality in children under the age of 14 years in the Czech Republic, with traffic injuries comprising 29% of these deaths. The Network of Health Cities in the Czech Republic has made road safety a priority issue for this group of vulnerable road users. In 2002, bicycle helmet-wearing in the Czech Republic was low, in spite of being compulsory by law for children under 15 years to wear bicycle helmets. This raised concerns because bicycle-related head injuries are an important cause of hospitalization and disabilities among young cyclists. Beginning in 2002 in the town of Křoměříž, the organization Safe Community has worked to address this issue, collaborating with civic authorities, schools and police to promote its initiative, *On Bikes Only With Helmets*. This consists of educational campaigns in schools, and spot-checks by police to ensure children are using helmets and bicycle paths – with rewards in the form of gifts for those that do. Bicycle helmet-wearing rates have almost doubled, while injury surveillance has shown an almost four-fold reduction in head-injury admission rates, compared to areas without the programme. This intervention has been expanded, and now operates in 11 municipalities in the Czech Republic (31).

Source: reference 32.



Legislative methods are combined with public awareness-raising and incentives to increase bicycle helmet use among young Czech cyclists.
photo © M Sedlák

alcohol

Alcohol

Alcohol consumption before using the roads – whether as a driver or a pedestrian – increases the likelihood of a crash occurring, as well as the likelihood that death or serious injury will result. The risk of a road traffic crash begins to increase significantly at a blood alcohol concentration (BAC) level of 0.04 g/dl and rises steeply after that for each small increase in BAC.

Youth and alcohol — In many countries, a high proportion of car and motorcycle drivers involved in crashes are under the influence of alcohol. Many of these are young road users under the age of 25 years. Age is a factor that has a bearing on the risk of young people who have consumed alcohol incurring road traffic injuries.

A number of interventions that have been tried, particularly in high-income countries, have led to declining numbers of traffic deaths related to alcohol use among young road users.

These strategies have included the following:

Introducing laws on blood alcohol concentration

Setting and enforcing a legal blood alcohol concentration limit is key to reducing alcohol impairment among road users. Passing a drink-driving law and enforcing it can reduce the number of road deaths by 20%. Mandatory BAC limits provide an objective and simple means by which alcohol impairment can be



Inexperienced young adults driving with a BAC level of 0.05 g/dl have a 2.5 times higher risk of a crash compared with more older, experienced drivers (33).

Teenage drivers have more than five times the risk of a fatal crash compared with drivers aged 30 years or more, at all levels of blood alcohol content.

Young adults in the 20–29 years age group are estimated to have three times the risk compared with drivers aged 30 years and above, at every level of blood alcohol content.

Teenage drivers with a BAC of 0.03 g/dl, and **who are carrying two or more passengers**, were found in studies to be 34 times more at risk of a crash compared with drivers aged 30 years or more, with no alcohol, driving with one passenger (34).

Alcohol also plays a role in increasing **the risk of a pedestrian being involved in a crash**. In many countries, a high proportion of injured pedestrians who have consumed alcohol fall in the 16–19-year age group (35).

photo © M. Peden/WHO



detected. Upper BAC limits of 0.05g/dl are now common in many high-income countries. Setting BAC limits has been shown to lead to fewer alcohol-related crashes.

📍 Enforcing blood alcohol limits

Consistent enforcement of BAC limits is essential for them to be effective. There are a number of ways enforcement can be implemented.

- *Random breath testing:* This is a highly effective means of reducing alcohol-related traffic injuries. In Australia, strategies that stop drivers at random, testing all who are stopped, have led to reductions in alcohol-related deaths in a number of states – an estimated fall of 36% in New South Wales, 42% in Tasmania and 40% in Victoria (36).
- *Sobriety checks:* In these checks drivers are stopped at particular checkpoints or road blocks and only those suspected of alcohol impairment are then tested. This approach has been shown to be effective at reducing alcohol-related crashes by about 20% (37).

📍 Restricting young or inexperienced drivers

Various methods have been adopted to restrict drinking and driving among younger drivers.

- *Lower BAC limits for younger drivers:* The risk of a crash for inexperienced young adult drivers has been shown to start to increase substantially at lower BAC levels than for older drivers. For this reason, many

Box 9 : Campaigning against drink-driving among young people in the United States

According to Mothers Against Drunk Driving (MADD), a nongovernmental organization in the United States, young people in the United States are targeted with a stream of marketing messages depicting alcohol consumption as sexy and glamorous. They report that in 2001, the alcohol industry spent US\$ 23.2 million dollars to put out 2379 “responsibility” messages, while spending US\$ 812.2 million on 208 909 product advertisements. There were 179 product advertisements for every one that referred to the legal drinking age. In addition, a typical responsibility message contains the alcohol company’s name, leading some public health experts to conclude that these messages are simply another means to promote brand recognition and loyalty.

MADD campaigns against alcohol advertising that appeals to or targets young people or that encourages drinking and driving, noting the following:

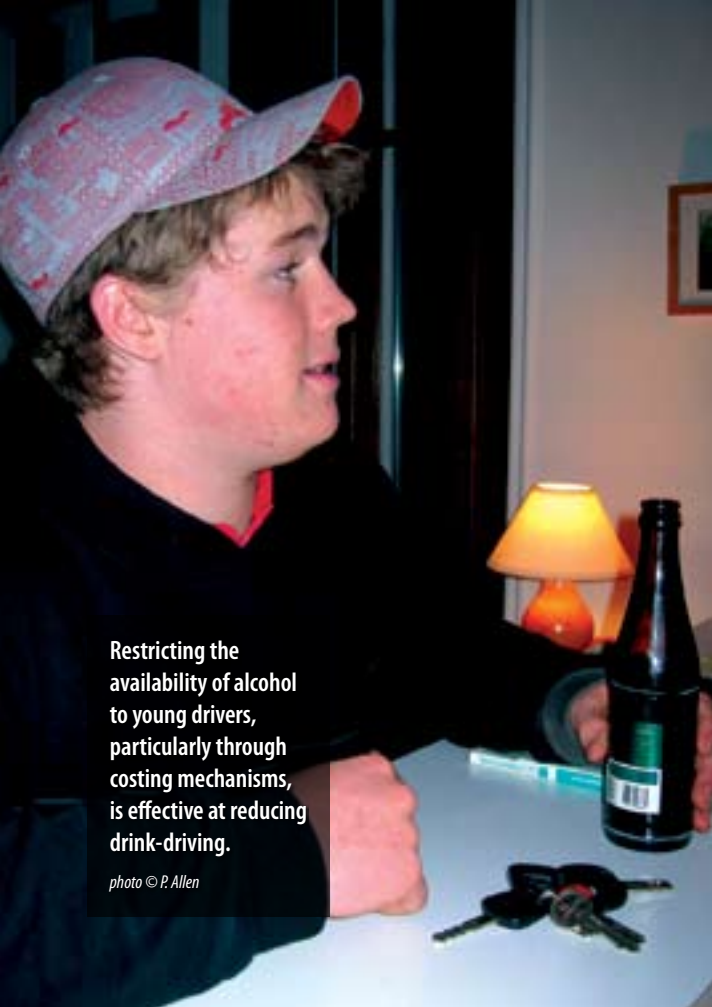
- Studies show that alcohol advertising may predispose young people to drinking. The availability of alcohol within a community can influence drinking rates and related problems related to alcohol consumption.
- Young people aged between 12 and 20 years were, in 2002, 128 times more likely to see advertised on television an alcohol product than a responsibility message from an alcohol company. They were also 188 times more likely to see an alcohol product advertised than a message against drinking and driving.

MADD has called for the US government to monitor youth exposure to alcohol advertising on a continuing basis in an attempt to prevent the overexposure of young people to alcohol advertising.

Source: www.madd.org

European countries and all states in the United States have set a lower blood alcohol limit (usually between zero and 0.02 g/dl) for young drivers under the age of 21 years. These lower limits can lead to reductions in crashes of between 4% and 24% among young or novice drivers (38).

- *Licensing restrictions:* An example of licensing restrictions for young drivers is graduated driver licensing (see Box 3).



Restricting the availability of alcohol to young drivers, particularly through costing mechanisms, is effective at reducing drink-driving.

photo © P. Allen

Raising the legal drinking age

Minimum drinking-age laws specify an age below which purchase or public consumption of alcoholic beverages is illegal. The laws may also include penalties for possession or consumption of alcohol by those who are underage. Evidence from the USA, where over the last few years all states have raised the legal drinking age to 21 years, suggests that minimum legal drinking age laws have reduced drinking, driving after drinking, and alcohol-related crashes and injuries among youth (38–40). However, law enforcement is very limited in many communities.

Introducing disincentives for drink-driving

Disincentive schemes make unsafe behaviour less attractive. In some schemes, drivers are given penalty points if found to be driving while impaired, or even risk losing their driving licence completely.

Restricting the availability of alcohol to young drivers

Restrictions on the hours or days in which alcoholic beverages are sold, as well as on locations where alcohol can be sold, have been tried in an effort to reduce drink-driving. These strategies, along with reducing demand through appropriate taxation and pricing mechanisms, are among the most cost effective ways of reducing drink-driving among young people. Enforcement efforts have also targeted illegal sales and service of alcohol to young people under the legal drinking age.

Implementing designated driver programmes

Some countries have experimented with the concept of “designated drivers”. This refers to people who choose not to drink so that they may safely drive their friends and colleagues home at the end of an evening out. Several of these initiatives have been deliberately targeted at young people, volunteers and bar owners. There is, however, little evidence to suggest that designated driver programmes are effective in reducing drink-driving among young adults. Most research on the subject indicates that these programmes are not enough to change behaviour by themselves, and that strict enforcement is also necessary. Furthermore, policy-makers are anxious to ensure that these campaigns are targeted at young adults *over* the minimum drinking age, and thus do not inadvertently promote underage drinking.

Box 10: Land Transport New Zealand launches hard-hitting campaign against drink-driving

In spite of significant gains in the past 20 years, drink-driving in New Zealand remains a leading cause of death and injury on New Zealand's roads. Each year nearly 2000 people are killed or injured in drink-driving crashes. For almost ten years, Land Transport New Zealand has run a hard-hitting road safety campaign using vivid and realistic road safety images. Since 2004, it has also tried, through its advertising campaigns, to increase the demand from society for a change in behaviour from dangerous drivers.

The organization's approach targets those associated with the drink-driver, rather than the would-be offenders directly. Friends, family and work colleagues – the people that can influence a drink-driver – are encouraged to take on the problem themselves and attempt change the person's behaviour. The government supports this road safety campaign, with annual funding of approximately NZ\$ 9.5 million (US\$ 6.5 million) for advertising.

The advertising campaign approach highlights the link between drink-driving and road crashes. By presenting drink-driving as socially unacceptable and by stimulating social pressure against the practice, Land Transport New Zealand aims to bring about a widespread change in attitudes and behaviour. The campaign is continually evaluated to assess its effect on people's attitudes to road safety and their behaviour on the roads – and ultimately, its effectiveness in helping to cut the number of deaths and injuries.



Source: Land Transport New Zealand, www.landtransport.govt.nz
photo © Land Transport New Zealand

📢 Mass media campaigns

Enforcement of alcohol impairment laws is more effective when accompanied by publicity aimed at making people more alert to the risk of detection, arrest and its consequences; making drinking and driving less publicly acceptable (see Box 10); and raising the acceptability of enforcement activities.

seat-belts

Seat-belts

When a vehicle is involved in a crash it comes to an abrupt halt. If not restrained, the bodies of the occupants will either be catapulted forward into the structure of the vehicle – most likely into the steering wheel if they are driving, or into the back of the front seats if they are back-seat passengers – or be ejected from the vehicle completely. Seat-belts are designed to help keep people away from the vehicle structure or from serving as projectiles, and to distribute the forces of a crash over the strongest parts of the human body, thereby causing the minimum amount of damage to the body's soft tissues.

Failure to use a seat-belt is a major risk factor for road traffic deaths and injuries among vehicle occupants. Passengers who were not wearing their seat-belts at the time of a collision account for the majority of road traffic fatalities among this group. In addition, passengers who do not wear seat-belts and have a frontal crash are most likely to suffer a head injury.

Ejection from the vehicle is one of the most harmful events that can happen to a person in a crash. Analysis of statistics from the United States from 2004 found that among crashes involving a death, 21% of occupants who were killed had been completely ejected from the vehicle. Seat-belts are effective in preventing total ejections: in fatal crashes, only 3% of the occupants using restraints were totally ejected, compared with 37% of unrestrained occupants (42).

Rates of seat-belt use vary greatly between countries, governed to a large extent by the type of laws that require seat-belts to be fitted in vehicles and cars, and the laws requiring them to be worn. Rates are also dependent on the degree to which these laws are enforced. In many low-income countries there is no requirement for belts to be fitted or used, and rates of use are therefore correspondingly low. The problem of enforcing seat-belt laws is exacerbated in the many parts of the world where there exists a large but unregulated taxi industry.

However, even in some high-income countries that do mandate seat-belt use, rates remain low, particularly for passengers seated in the rear of the vehicle.

Youth and seat-belts — Compared with older drivers, young drivers and front-seat passengers are less likely than older drivers and passengers to use seat-belts while in a moving vehicle (43). In 2002, in the United States, more than 60% of the 5625 young adults aged 16 to 20 years who were killed when riding in passenger vehicles were not wearing seat-belts. In particular, young male drivers have been found to use seat-belts less than other groups, thus increasing their risk of injury. This problem is made worse by the fact that young drivers are less likely to use seat-belts in situations where there is a higher risk of a crash, such as late at night or when they have been drinking (44, 45).



Wearing a seat-belt reduces the risk of being ejected from a vehicle and suffering serious or fatal injury by between 40%-65% (41).

photo © NCIPC, Centers for Disease Control

Young occupants are also at increased risk of being killed by ejection from a vehicle. The North American studies mentioned above found that a higher proportion of occupant fatalities among 16–20 year-olds – compared with the general population – were ejections, illustrating the need to promote seat-belt use in this age group (45).

Increasing seat-belt use is clearly essential for improving the safety of car occupants. Strategies to bring this about include the following.

📍 Seat-belt legislation and enforcement

Introducing and enforcing a mandatory seat-belt law is needed if rates of seat-belt are to be increased and maintained. This usually requires laws ensuring that all passenger vehicles are fitted with appropriate seat-belts, as well as laws requiring that they are worn. In the United States, for example, one of the strongest predictors of seat-belt use among young drivers is a state's seat-belt law. Between 2000 and 2004, rates of seat-belt use were

higher and fatality rates lower in all states which enforced a seat-belt law, and in every age group, compared to those that did not (46).

📍 Ensuring that vehicles are fitted with appropriate seat-belts

Although rules that require all cars to be fitted with seat-belts are now in place in most countries, there is evidence that half or more of all vehicles in low-income countries may lack properly functioning seat-belts (47).

📍 Seat-belt public awareness campaigns

Laws mandating seat-belt use should be backed up by public education campaigns. Such campaigns may focus on young people, and can be used both to increase awareness and to help make wearing seat-belts a social norm.

📍 Community-based projects

Community projects can employ parents and peers to encourage young people to wear seat-belts.

why?

Driver reasons for non-use of seat-belts by gender and age					
Reason	Gender		Age		
	Female	Male	16–20 years	21–64 years	65+ years
	(N=725)	(N=960)	(N=175)	(N=1351)	(N=147)
I'm only driving a short distance	54%	56%	56%	55%	56%
I forgot to put it on	52%	56%	65%	53%	53%
I'm in a rush	38%	40%	44%	40%	33%
The seat-belt is uncomfortable	36%	29%	39%	31%	31%
I'm driving in light traffic	19%	24%	26%	22%	20%
The probability of being in a crash is too low	16%	21%	17%	19%	18%
I don't want my clothes wrinkled	12%	9%	12%	9%	12%
People I am with are not wearing seat-belts	7%	9%	11%	8%	9%
I don't like being told what to do	15%	20%	22%	18%	14%
Other reasons	6%	8%	4%	8%	6%

Source: reference 45.

child restraints

Child restraints

Children who are unrestrained in the back of a car are at increased risk of injury and death in the event of a collision. While seat-belts are designed to restrain adults, they are not designed for children. Children are proportioned differently from adults. Their tissues have different strengths and weaknesses and their needs change as they grow. For example, a smaller portion of a child's abdomen is covered by the pelvis and rib cage, while a child's ribs are more likely than an adult's to bend rather than break, resulting in energy from a collision being transferred to the heart and lungs (48).

Appropriate child-restraint systems are designed with the child's developmental stage in mind. Like seat-belts, they work to secure the child to the vehicle in a way that distributes the force of a collision over broad areas of the body, thus reducing the chances of a severe injury occurring.

Restraint systems for child passengers include:

- rear-facing restraints for infants;
- forward-facing child restraints;
- booster cushions or booster seats.

The restraints intended for infants and for young children are designed with their different proportions and physical differences in mind. Similarly, for older children, a booster seat is used to "boost" the child up, enabling a better fit of the lap portion of the belt and ensuring that the belt stays in the correct position instead of moving up onto the soft abdominal area.

Child restraint systems are very effective at preventing fatalities. If correctly installed and used, child restraints can reduce deaths among infants by approximately 70% and deaths of small children, aged 1-4, by 54% in the event of a crash (49). In children aged four to seven years, booster seats are estimated to reduce the chances of sustaining clinically significant injuries during a crash by 59%, as compared to using ordinary vehicle seat-belts (50). However, despite the evidence of their effectiveness, many children are not restrained in age-appropriate child or booster seats.

In high-income countries, the use of child restraints is common – with a usage rate of about 90% in Australia – while in many low-income and middle-income countries they are still rarely employed in car travel. Choosing and installing the appropriate child-restraint system is important. Even in countries where the use of child restraints is high – such as in Sweden, the United Kingdom and the United States – the restraints are frequently inappropriately used. In these cases, the child may be restrained using an inappropriate system, or else straps, harnesses and restraint devices are loose or not adequately secured to the seat, thus placing the child at an increased risk of both fatal and non-fatal injuries (49, 51).



Children who are strapped into age-appropriate restraints are considerably less likely to die, in the event of a road crash than those who are unrestrained.

photo © T. Toroyan/WHO

In many places, the use of appropriate child restraints is limited by access and cost, while in some countries the large size of a typical family makes their use impractical. Furthermore, unlike with seat-belts which are relatively simple to use, parents must make a number of decisions about what seat to choose, where they place it and how they install it – all of which can affect the safety of the child passenger.

Child restraints are designed and manufactured to meet the safety standards applicable to a particular country or region. Increasing use of child restraints can be achieved by the following strategies.

Mandatory child-restraint laws and enforcement

Mandatory child-restraint laws and their enforcement also lead to an increase in the use of child restraints and have been shown to be effective in reducing deaths and injuries among children (42, 49). In some countries a penalty point system is used to encourage compliance with legislation. For example, in Latvia the mandatory legislation on child seat use was revised in October 2006 such that penalty points can now be incurred for not using child safety restraints.

Increasing public awareness

Research shows that community-wide information alongside enhanced enforcement campaigns can be effective at increasing the use of child restraints. The exact guidelines for the use of different restraints may vary somewhat between countries. While most countries use a child's age and weight as guides (see Box 12), others combine this information with height, particularly in the case of booster seats.

Distributing appropriate child restraints

Loan schemes have been introduced in many countries to help raise the uptake of child

Box 11: Are seat-belts effective for children, where restraints are not available?

Standard seat-belts are designed to restrain an adult at the pelvis. However, the size and anatomy of a child's pelvis cannot provide anchor points for the belt until the child is at least 10 years old. In addition, the belt may ride up into the abdomen, resulting in abdominal injuries. In addition, cervical spine injuries can also result in the event of a collision.

Although children are best protected when secured into restraints appropriate for their age, they are still better using an adult seat-belt than being left unrestrained. Research suggests that although a standard lap belt may cause injuries in some children in the event of a crash, this is very rare, and thus where no child restraints are available in the car, parents should use standard lap belts to reduce their child's risk of injury.



restraints in populations where use is low. Such programmes can increase the accessibility and availability of appropriate restraints. They may also address the problems of cost that many lower-income families face. Child or booster seats, for example, are often given out free, along with education on how to use them. Programmes also provide seats to parents by means of loans or cheap rental schemes, or else may use incentives, such as coupons for discounts on booster seats or gift

certificates. Such initiatives have been shown to have a marked beneficial effect on the use of appropriate restraints (49, 52). For example, a programme in Greece to increase the use of infant car seats through a loan scheme involved car manufacturers who lent restraints for a six-month period to parents at a maternity

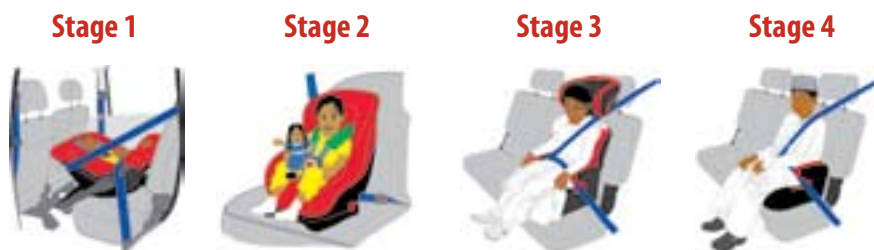
hospital, in return for a modest fee. After six months, over 90% of the parents who had borrowed a restraint were using it properly, and 82% had already bought the second-stage car restraint themselves. The scheme was also found to be highly cost-effective (53).

Box 12: Developing culturally appropriate materials on child restraint use

In 2004, in the light of rapidly increasing death rates on Oman's roads, the nongovernmental organization Al-Mustadaama launched its campaign, "Salim and Salimah – Safe and Sound", aiming to boost the previously low usage rate of child restraints. The organization has website with information in both English and Arabic on culturally appropriate materials to prevent road traffic injuries.

Riding unrestrained, as do most children in Oman, is the single greatest risk factor for death and injury among child passengers in a car crash, or even in the event of a sudden halt. The best protection for children is a child safety seat appropriate to their size. In a crash, properly restrained children come to a gradual stop along with the vehicle. But any child inside the vehicle who is not restrained, or who is only loosely restrained, will continue to move forward at the same speed of the vehicle before the crash until hitting the car's hard, sharp interior or being catapulted through the windscreen.

Types of seats – the four stages:



The best seat for children is one that fits them and this is determined by their weight, not their age. Child safety seats are often described in terms of 'stages', corresponding to certain weight ranges. Some safety seats are convertible or designed to cover more than one stage. The manufacturer's instructions should be carefully checked to find a seat that is suitable for the child and that fits properly into the vehicle.

Stage	Type of child restraint	Weight range	Approximate age range
Stage 1	Rearward-facing infant seat (two types)	Babies up to 9 or 13 kg (depending on type of seat)	Birth to 12–15 months
Stage 2	Forward-facing child seat	9–18 kg	9 months to 4 years
Stage 3	Booster seat	15–25 kg	4–6 years
Stage 4	Booster cushion	22–36 kg (up to about 150 cm tall)	6–11 years

Source: Al Mustadaama; www.salimandsalimah.org/

conspicuity

Conspicuity

Conspicuity is the ability of the road user to be seen by other road users. To see and be seen is fundamental for the safety of all road users. Late detection of other road users by drivers is a common reason for road traffic collisions. Vulnerable road users are at increased risk for road traffic injuries compared to drivers and passengers in cars – in part as a result of their reduced visibility.

Young people and conspicuity — Pedestrians and cyclists can be difficult to detect in road traffic, especially at night and in overcast conditions. Children, whose small stature means that they are less likely to be seen by motorists, are at an even increased risk of being undetected.

Improving the visibility of non-motorized road users is one method for reducing the likelihood of road traffic crashes, as it gives drivers more time to notice and avoid a collision. The main interventions for non-motorized road users that may be employed to increase conspicuity include the following.



Pedestrians should:

- wear clothing that makes them more visible (such as white or light colours);
- wear retro-reflective strips on clothing or articles such as backpacks;
- walk where there is good lighting;
- walk facing oncoming traffic.

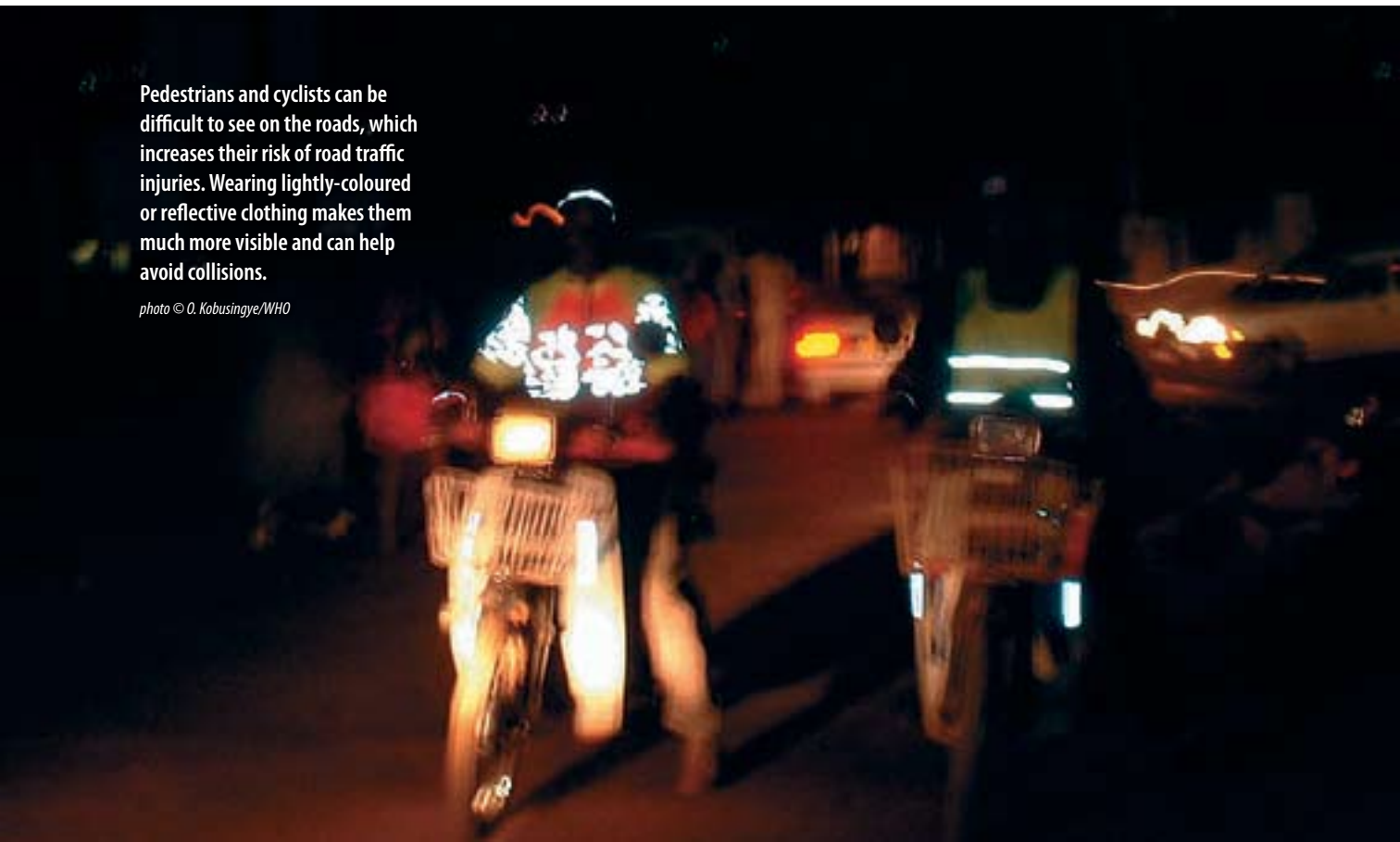


Cyclists should use:

- front, rear and wheel reflectors;
- bicycle lamps;
- retro-reflective jackets or vests, although these may be more difficult to implement in certain places because of their costs and also because of hot climates.

Pedestrians and cyclists can be difficult to see on the roads, which increases their risk of road traffic injuries. Wearing lightly-coloured or reflective clothing makes them much more visible and can help avoid collisions.

photo © O. Kobusingye/WHO



A study in New Zealand found that higher proportions of drivers who had been involved in crashes reported wearing black helmets, while fewer reported white helmets. Similarly, having a “light-coloured” helmet – compared with “dark-coloured” one – was found to be associated with a lower risk of a crash. The researchers concluded that some 18% of crashes could be avoided if non-white helmets were eliminated. Although these results cannot necessarily be generalized to other settings, it seems reasonable to assume that there is greater protection from white helmets as opposed to black ones, and from lighter-coloured ones generally as against darker ones (54).

photo © P. Virat/WHO



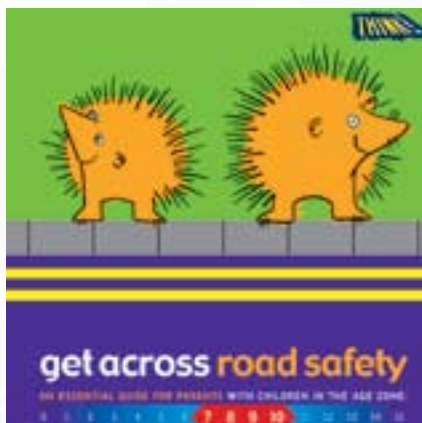
Motorized two-wheelers should use:

- daytime running lights – studies show that motorized two-wheelers that use daytime running lights have a crash rate of up to 29% lower than those that do not (55);
- retro-reflective or fluorescent clothing – for example, legislation introduced in Colombia obliges motorcycle riders and passengers alike to wear reflective vests to increase their conspicuity;
- light-coloured clothing;
- light-coloured helmets;
- reflectors on the backs of the vehicle.

However, while some of these aids to visibility appear to have potential, in that they have been shown to increase visibility, enabling drivers to detect pedestrians and cyclists earlier, the actual effectiveness of several of them – particularly the use of retro-reflective clothing – in increasing the safety of pedestrians and cyclists remains to be established (56).

Box 13: The United Kingdom Government targets young road users (known as “hedgehogs”) for their lack of conspicuity among motorists

“Be Safe Be Seen”



Source: Department for Transport, United Kingdom. © Crown.

These are the key points in the “Hedgehogs” campaign:

- Make sure you can be easily seen, especially at night, on dark days and in bad weather.
- Bright or fluorescent clothes show up best by day, especially in dull or misty weather.
- By night, reflective material is best and shows up in car headlights – fluorescent clothing doesn’t work after dark. Reflective tape can be put on clothing, school bags and equipment.
- It is an offence to cycle at night without a white front light, a red back light and a red reflector at the back, so make sure all bicycles are properly equipped and working.
- Cross the road at the safest place possible. e.g. zebra, pelican, puffin and patrolled crossings.
- Use the Green Cross Code: Stop, Look, Listen, Live.
- If you are out at night, choose routes that are well-lit by streetlights and cross at well-lit places.

More information is available at:

<<http://www.thinkroadsafety.gov.uk/campaigns/hedgehogs/hedgehogs.htm>>

3.3 The importance of emergency medical services

Many initiatives for cutting the volume of road traffic injuries focus on preventing crashes and on stopping their consequences from occurring. Much, though, can be done to reduce the deaths and injuries that occur as a result of road traffic crashes by strengthening a country's emergency medical services – not only for children and young people, but for all road traffic victims. This includes pre-hospital care, hospital care and rehabilitation.

Pre-hospital care

At the scene of the crash, prompt high-quality pre-hospital care can save many lives after a road traffic crash has occurred. In places where formal emergency medical services exist, usually with ambulances, they are most effective if their equipment, training, infrastructure and operations are standardized. These vehicles need to be equipped

with supplies and medical devices for children as well as for adults, e.g. airway tubes, cervical collars, blood pressure cuffs, etc. In addition, staff need to be trained on how to evaluate and manage injured children who are not “just little adults” - what is normal in an adult may not necessarily be normal in a child and vice versa.

Where no pre-hospital trauma care system exists, the first and most basic tier of a system can be established by teaching interested community members basic first aid techniques (57). In many countries, organizations like the the International Federation of Red Cross and Red Crescent Societies or St John's Ambulance teach young, interested members of a community how to recognize an emergency, call for help and provide basic first aid until formally trained health-care personnel arrive to give additional care.



Children are physically, psychologically and physiologically different from adults so emergency care providers must be trained to recognize the different ways that children's bodies respond to traumatic injury.

photo © M Peden/WHO

Starting a new emergency medical service can be a reasonable step, especially along busy roads with high crash rates. However, these services can be costly. In all cases, and especially in those where there are no formal emergency medical services, pre-hospital care can be improved by building upon existing, even if informal, systems of pre-hospital care and transport (57).

Hospital care

The moment that an injured child enters the hospital is another point at which lives can be saved (58). Improving the organization and planning of trauma care services is an affordable and sustainable way to raising the quality and outcome of care. This includes improving the human resources that are required to provide this care – including skills, training and staffing – and the physical resources, such as the equipment and supplies needed for the services. Although the essential elements of trauma care need not be expensive, the cost of care can be a barrier to access, especially when user fees are required in advance of services in emergency situations.

Rehabilitation

Finally, many injured survivors of traffic crashes lead lives of disability. Much of this disability, particularly among youth, could be avoided with improved rehabilitation services. This includes improved services in health care facilities and improved access to community-based rehabilitation. Strengthening such rehabilitation services globally is needed to help minimize the extent of disability after injury and to help those with persistent disabilities achieve their highest potential, leading full and meaningful lives.



The quality of care that a young road traffic victim receives has a considerable impact on the outcome from their injuries, and on their ability to continue living as fully functional members of their communities.

photo © WHO

Box 14: The need for a less intimidating environment in emergency care settings

A study in the United Kingdom found that a visit to the accident and emergency department after a road crash is often a young person's first encounter with a hospital. This experience can add to their physical distress because of a lack of information, a lack of understanding and feelings of exclusion or loneliness.

When treating a young road traffic victim, health personnel should provide more information, communicating it in a manner appropriate for young people, and try to offer an environment that is less intimidating.

Source: reference 59.

4 Conclusion

This document has highlighted the problem of road traffic injuries among youth as a serious public health problem in many countries, and especially in low-income and middle-income countries. At a global level, it describes how for those under 25 years of age, road traffic injuries are a leading cause of death, and that this problem is consistently more serious among young men compared to young women. While in high-income countries the problem is more acute among young drivers, in most low-income and middle-income countries, it is vulnerable road users – pedestrians, cyclists and motorcyclists and users of public transport – who are most at risk. Road traffic injuries place an enormous strain on a country's health care system and on the national economy more generally, and the problem becomes even more acute in regions where young people constitute a major part of the population.

Understanding why young road users are at risk for road traffic crashes is critical to developing effective strategies to reduce the deaths and injuries resulting from them. There are physical and developmental factors that differentiate children and young people from their adult counterparts in relation to the risk of road traffic injuries. There are also infrastructural factors that increase the exposure of children and young people to traffic and hence their risk of being involved in a crash. In addition, there are some risk factors applying to the general population that are equally pertinent to young road users, and which in some cases may even be elevated among them – such as speed, drink-driving, lack of seat-belt and child restraint use, lack of helmet use and lack of conspicuity. For each of these, the document describes effective interventions that can be put

in place to tackle these risk factors among young road users.

The *World report on road traffic injury prevention* made six recommendations that countries could follow to reduce their toll of road traffic injuries (1):

1. Identify a lead agency in government to guide the national road traffic safety effort.
2. Assess the problem, policies and institutional settings relating to road traffic injury and the capacity for road traffic injury prevention in each country.
3. Prepare a national road safety strategy and plan of action.
4. Allocate financial and human resources to address the problem.
5. Implement specific actions to prevent road traffic crashes, minimize injuries and their consequences and evaluate the impact of these actions.
6. Support the development of national capacity and international cooperation.

These recommendations, while aimed at reducing traffic injuries among the general population, apply equally to policy-makers working to cut the volume of road traffic injuries among youth. This document builds on the recommendations of the World Report by focussing specifically on those interventions which have been shown to be most effective in

reducing road traffic injuries among youth. For example increased consideration by policymakers of the modifications that can be made to the road environment in order to separate high speed or heavy traffic flow from areas where there are young children on the roads would be an effective way of reducing road crashes involving children. Similarly, the document has shown how certain risk factors can be addressed by interventions that are targeted at youth, such as lower blood alcohol concentration limits for younger drivers, or the promotion of helmet use among young drivers and passengers of

motorized two-wheelers. Policy-makers must learn from those youth-specific interventions proven in other countries to be effective, and adapt them for implementation in their own country.

The future of a country is its young people. Those who share this belief this should heed the warning of Costa Rican president Óscar Arias Sánchez and act swiftly to make their roads safer. His fear that time may very soon run out should not be allowed to materialize.

the future

Peace on the roads

By Óscar Arias Sánchez

The following is an excerpt from an editorial in the Washington Post by the Costa Rican president and Nobel peace prize winner (60). The article urges Central American countries to address the escalating problem of road traffic injuries in the same way that previous decades saw the region successfully overcome political dictatorships and human rights abuses.

We face a danger that not only kills people but lulls us into an unconscious silence. It doesn't attract media and global attention as wars and murders do, but it is violence nonetheless – violence on our roads.

We have an opportunity to address this threat, to substitute peace and survival for violence and death. We have faced such choices in the past and we have won. The people of this region have the same right to safety as those in other parts of the world. I am committed to promoting road safety because I know it will benefit Costa Rica and every other country in our region. We hope our success will also be a beacon of hope for many others in Asia, Africa and other parts of the world. I know we can succeed; I only fear that we are running out of time.

photo © N. du Toit



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