3 The state of road safety around the world

Road traffic injuries remain a global public health problem

Road traffic injuries remain an important public health problem at global, regional and national levels. While steps are being taken in many countries to improve road safety, much still needs to be done if the rising trend in road traffic deaths is to be halted or reversed.

Over the past few years a range of methods has been used by different organizations to estimate the number of global road traffic fatalities. The WHO Global Burden of Disease project (2004), which uses vital registration (death certificate) data irrespective of the time period between collision and death, estimates that 1.27 million people died as a result of a road traffic collision in that year (1). The total number of deaths reported in this survey is approximately 660 000 (using a 30-day definition), indicating vast underreporting. When these data are modelled (see Statistical Annex) the total 30-day number for the 178 countries included in the study is 1.23 million. Almost all data sources show that about three-quarters of road traffic deaths are among men and that the highest impact is in the economically active age ranges.

Figure 3. Population, road traffic deaths\textsuperscript{a}, and registered motorized vehicles, by income group

\textsuperscript{a} 30-day definition, modelled data.
HIC = high-income countries, MIC = middle-income countries, LIC = low-income countries
Over 90% of the world’s fatalities on the roads occur in low-income and middle-income countries, which have less than half of the world’s vehicles.

Low-income and middle-income countries have the highest burden and road traffic death rates

Most (91%) of the world’s fatalities on the roads occur in low-income and middle-income countries, which have only 48% of the world’s registered vehicles.

Approximately 62% of reported road traffic deaths occur in 10 countries – which in order of magnitude are India, China, the United States, the Russian Federation, Brazil, Iran, Mexico, Indonesia, South Africa, and Egypt – and account for 56% of the world’s population. However, based on modelled numbers, the 10 countries with the highest number of deaths are: China, India, Nigeria, the United States, Pakistan, Indonesia, the Russian Federation, Brazil, Egypt and Ethiopia (see Table A.2 in Statistical Annex). While the total number of deaths is clearly related to both the population and motorization levels within a country and does not give an assessment of risk, it nonetheless gives an indication of where intervention could help significantly to reduce the total number of road traffic deaths at a global level.

From a public health perspective and for the purpose of making comparisons, the use of rates per 100 000 population is a more useful measure of the size of a problem than absolute numbers, and is also useful for assessing performance over time and for giving an indication of risk. As well as accounting for the highest absolute burden of road traffic deaths, fatality rates relative to population are also highest in low-income and middle-income countries (Table 3).

It is evident that, although the highest rates are in low-income and middle-income countries, road traffic injuries remain very relevant to high-income countries as well. A number of high-income countries have
African region well above the average for this income group. For instance, high-income countries in the Eastern Mediterranean Region have a modelled road traffic injury fatality rate of 28.5 per 100 000 population, which is well above the global average for countries in this broad income group, as shown in Table 3. Similarly, while a number of high-income countries have managed to reduce their road traffic fatality rates in recent decades, in other high-income countries the downward trends in road traffic fatalities that began in the 1970s and 1980s have started to flatten, suggesting that extra steps are needed to reduce these rates further (see Figure 4).

The 10 countries with the lowest modelled road traffic fatality rates are almost all high-income countries, where rates vary between 3.4 and 5.4 deaths per 100 000 population. While these countries, the Netherlands, Sweden and United Kingdom for instance, may be top performers globally with regard to road safety, they too still have considerable

### Table 3. Modelled road traffic injury fatality rates (per 100 000 population), by WHO region and income group

<table>
<thead>
<tr>
<th>WHO REGION</th>
<th>HIGH-INCOME</th>
<th>MIDDLE-INCOME</th>
<th>LOW-INCOME</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>AFRICAN REGION</td>
<td>—</td>
<td>32.2</td>
<td>32.3</td>
<td>32.2</td>
</tr>
<tr>
<td>REGION OF THE AMERICAS</td>
<td>13.4</td>
<td>17.3</td>
<td>—</td>
<td>15.8</td>
</tr>
<tr>
<td>SOUTH-EAST ASIA REGION</td>
<td>—</td>
<td>16.7</td>
<td>16.5</td>
<td>16.6</td>
</tr>
<tr>
<td>EASTERN MEDITERRANEAN REGION</td>
<td>28.5</td>
<td>35.8</td>
<td>27.5</td>
<td>32.2</td>
</tr>
<tr>
<td>EUROPEAN REGION</td>
<td>7.9</td>
<td>19.3</td>
<td>12.2</td>
<td>13.4</td>
</tr>
<tr>
<td>WESTERN PACIFIC REGION</td>
<td>7.2</td>
<td>16.9</td>
<td>15.6</td>
<td>15.6</td>
</tr>
<tr>
<td>GLOBAL</td>
<td>10.3</td>
<td>19.5</td>
<td>21.5</td>
<td>18.8</td>
</tr>
</tbody>
</table>

* 30-day definition.
* No high-income countries.
* No low-income countries.

Figure 4. Trends in road traffic fatality rates in selected high-income countries
room for improvement. For example, road traffic injuries are still an important cause of death in Sweden, despite a relatively low rate of road traffic fatalities and the successful implementation of a comprehensive approach to the problem. In Sweden, road traffic crashes are responsible for 20% of deaths of children aged between 5 and 19 (16). Similarly, the road transport system in Sweden is responsible for many more deaths – notably of children and young adults – than other forms of transport such as aviation or rail travel. Thus, even countries which appear to be performing well at the global level have a long way to go to achieve a truly safe road transport system.

Nearly half of those dying on the world’s roads are vulnerable road users

In most low-income and middle-income countries the majority of road users are vulnerable road users – pedestrians, cyclists, and those using motorized two- or three-wheelers. These groups of road users do not have a protective “shell” around them and are therefore more at risk than those in vehicles. Public transport users may also be vulnerable road users, particularly where public transport vehicles are unsafe, overcrowded or unregulated (see Box 1).

Vulnerable road users are at additional risk where their needs have not been taken into consideration during the planning of land use or road construction. In many countries roads are planned and built to allow motor vehicles to travel faster while insufficient thought is given to the needs of pedestrians and cyclists, which means that these vulnerable road users face increasing risks in using and crossing the roads (17, 18).

This global survey shows that pedestrians, cyclists, and riders of motorized two-wheelers and their passengers account for around 46% of global road traffic deaths.¹ Vulnerable road users make up the highest reported proportion of total deaths in the South-East Asia and Western Pacific regions (Figure 5). Within regions the proportion of deaths among

¹ If users of unsafe public transport are included as vulnerable road users then this figure of 46% is likely to be an underestimate: in this survey data on public transport fatalities was not collected separately from data related to other four-wheeled vehicles.
Box 1: Unsafe public transportation

Overcrowded and unsafe modes of public transport contribute to road traffic injuries and deaths, particularly in low-income and middle-income countries. Choice of transport modes is frequently related to socioeconomic status, with those who can afford it avoiding these unregulated and unsafe vehicles. A study in Kenya found that buses and matatus are the vehicles most frequently involved in fatal crashes and that passengers in these vehicles account for 38% of the total road deaths (11, 19). This may be explained in part by deregulation in the public transport market without concurrent regulations on safety measures. In Sri Lanka, for example, public transport buses are either owned by the government or privately owned, with studies showing an increased risk associated with travel on privately-owned buses. Government buses are maintained by the Ministry of Transport and regulated to ensure safety, while regulations are much less stringent for private owners running parallel public bus services. For instance, there are almost no restrictions on driver eligibility or on the maintenance of privately operated public transportation vehicles (20).

While liberalization of the public transport market can increase the supply of vehicles, protection of public safety needs to be an essential feature of this market. Maximization of profits must not be allowed to lead to a reduction in safety standards.

* Matatus are small-scale public transport service vehicles in Kenya.

---

Figure 5. Reported deaths by type of road user (%), by WHO region and income group

<table>
<thead>
<tr>
<th>Region</th>
<th>LIC</th>
<th>MIC</th>
<th>HIC</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>AFRICAN REGION</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>REGION OF THE AMERICAS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>SOUTH-EAST ASIA REGION</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>EASTERN MEDITERREAN REGION</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>EUROPEAN REGION</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>WESTERN PACIFIC REGION</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*See Table A.2 in Statistical Annex for information on WHO regions and income level classifications.

HIC = high-income countries; MIC = middle-income countries; LIC = low-income countries.
vulnerable road users varies considerably. In the South-East Asia Region, for instance, vulnerable road users are reported to account for over 80% of those killed on the roads in Thailand, while in neighbouring Myanmar the figure is 51%. In Colombia, Guatemala and Peru over 70% of fatalities are among vulnerable road users while in other countries of the region such as the Dominican Republic, Honduras or the United States – the proportion is considerably lower at less than 25%.

Results of this survey suggest that as motorization increases globally many countries are not giving sufficient attention to the needs of vulnerable groups of road users in their transport policies. Many of the proven interventions being implemented globally – such as use of seat-belts and child restraints, vehicle standards, and crash tests – are relevant to car occupants. More research is needed on interventions that address vulnerable road users, while land use planning and road design should also take the needs of these road users into consideration.

Reducing speed will have an impact on both vehicle occupants and vulnerable road users. Setting and enforcing appropriate speed limits is essential. This survey showed that only 9% of countries rate their speed enforcement as more than 7 on a scale of 0 to 10 (see page 20).

Reducing exposure to the risk of injury or death on the road can also be achieved by reducing the total amount of motorized road transport. This in turn requires considerable investment in infrastructure that allows pedestrians and cyclists to walk and cycle safely (see Box 2).

Reducing the volume of traffic on roads being used by vulnerable road users can also reduce exposure to the risk of a crash occurring, provided that low speeds can be maintained. Policy-makers need to address the ability of road users to walk and cycle safely, ensure the availability of affordable and safe public transport, and seek ways to reduce dependency on the use of private cars. This survey found that only one-third (32%) of the world’s countries have national or local policies that promote walking and cycling as an alternative to motorized transport. Forty-four per cent of countries do not have policies (either national or local)
Prioritizing the needs of vulnerable road users includes recognizing the importance of the built environment when making political and planning decisions. Some of the solutions lie in appropriate modifications to the physical road environment and setting up a supportive policy framework rather than focusing only on human behaviour as the primary cause of road traffic crashes. The examples presented below show efforts in four settings to incorporate the needs of vulnerable road users in planning for land use and transport.

**Bogota**, the capital of Colombia, implemented land use and transport measures intended to meet the needs of the city’s non-motorized road users and to improve public transport in the period 1995–2001. The measures included: building specific cycling and pedestrian-only routes, including a car-free route; excluding cars from the city centre at peak times in the morning and afternoon; developing a high-capacity bus system at a cost of US$ 300 million that carries about 700 000 people a day. These measures contributed to reducing the number of road traffic fatalities from 1387 in 1995 to 697 in 2002. They also improved access to jobs and created a more liveable urban environment (14, 17, 21).

**Sweden’s** model of road safety is frequently cited as good practice. The “Vision Zero” road safety policy adopted in the late 1990s is based on an understanding that the environment needs to be modified to take account of humans’ lack of tolerance to mechanical forces and the human tendency to make errors. Sweden’s sustainable road strategy thus aims to modify the environment while protecting road users from unacceptable levels of risk. As well as building bicycle and pedestrian lanes, tunnels and car-free play areas, other environmental solutions are being implemented to separate and protect these road users. Where road users cannot be separated, the strategy acknowledges the need to give pedestrian safety priority over car traffic – particularly by reducing speed.

**Delhi**, India, has recently completed the first phase of a corridor with segregated pedestrian, bicycle and bus lanes on a major arterial road of the city. The pedestrian lane has been designed with due concern for the needs of the elderly, children and physically-challenged persons. Since street vendors are an integral part of urban streets in Delhi, special consideration has been given to providing space for them without disturbing the flow of bicycles and pedestrians. In the first 10 months of operation there were no car, motorcycle or bicycle fatalities in the corridor (22).

**Lagos**, Nigeria, is the sixth largest city in the world with a population of 17 million people. For years, the city has grown rapidly and struggled without reliable public transportation. The public transport system largely consists of minibuses and taxi motorcycles, many of which are not roadworthy and contribute substantially to pollution and road traffic crashes. In 2002, the state government created an agency called the Lagos Metropolitan Transport Authority (LAMATA) with the mission to “transform the state transport system by facilitating an enabling environment”. One initiative of LAMATA and the state government was the development of a bus rapid transit system which was completed and launched in March 2009. This system provides Lagos commuters with a clean, affordable, reliable and safe means of getting around the city (23, 24).
that encourage public transport as an alternative to car transport, reflecting a similar neglect in meeting the needs of non-motorized road users (see Table A.7 in Statistical Annex). These figures are perhaps surprising given that decreased dependency on the use of private cars can have other positive impacts such as improved respiratory health (as a result of less transport-related air pollution) and reduced levels of obesity (as a result of more physical activity associated with walking and cycling).

**Few countries have comprehensive road safety laws that are well enforced**

Enacting and enforcing legislation on a number of risk factors for road traffic injuries and deaths is critical in influencing exposure to risk, crash occurrence, injury severity, and post-crash injury outcomes. Comprehensive and clear legislation, enforced with appropriate penalties and accompanied by public awareness campaigns, has been shown to be a critical factor in reducing road traffic injuries and deaths associated with speed, drink–driving, and the non-use of occupant protection measures (helmets, seat-belts, and child restraints). The results of the global survey suggest that the legislation on these risk factors is not comprehensive in many countries, and enforcement is often lacking. Similarly, many countries lack the institutional mechanisms and resources that would allow them to implement planned activities in a coordinated fashion – including adopting and enforcing laws – which may result in a “piecemeal” approach to road safety efforts that is seen in many countries (see Box 3).

**Speed**

**What is known?**

- An increase in average speed is directly related both to the likelihood of a crash occurring and to the severity of the crash consequences (25, 26).
- A 5% increase in average speed leads to an approximately 10% increase in crashes that cause injuries, and a 20% increase in fatal crashes (27).
- Pedestrians have a 90% chance of surviving a car crash at 30 km/h or below, but less than a 50% chance of surviving impacts of 45 km/h or above (27, 28).
- Safe speed thresholds vary according to different types of road, different types of collision and different road users, with their inherent vulnerabilities. Effective speed management needs to take these and other variables into account (27).
- Zones of 30 km/h can reduce crash risk and injury severity and are recommended in areas where vulnerable road users are particularly at risk (27, 29).
- Apart from reducing road traffic injuries and deaths, lowering the average traffic speed can have other positive effects on health outcomes (e.g. by reducing respiratory problems associated with car emissions) (27).

**What this survey found**

Research on effective speed management indicates that the speed limits on urban roads should not exceed 50 km/h. While there remains a fairly high fatality risk at this speed (or even lower for pedestrians, cyclists and other vulnerable road users), many countries with good road safety records have adopted this recommendation, while also giving provincial or local decision-makers the authority to reduce these national speed limits. In this way traffic calming measures
Box 3: A coordinated approach to road safety

The World report on road traffic injury prevention developed by WHO and the World Bank recommends that countries identify an agency with the authority and responsibility to make decisions and coordinate road safety activities across multiple sectors, and with adequate finances for road safety activities. The World report also recommends that each country should prepare a multisectoral national road safety strategy, with targets for the achievement of specific outcomes and with resources allocated to ensure implementation of relevant activities.

Although 153 countries (86%) report having a lead agency for road safety, this survey was unable to obtain information on the precise role or effectiveness of these agencies in fulfilling the functions required (see Table A.7 in Statistical Annex). Indeed, in the qualitative comments of the survey, respondents highlighted the considerable difficulty that they had during the consensus meetings in identifying the lead agency for road safety in their country.

The global survey also found that while 58% (n=103) of countries report having a national strategy on road safety, only 86 countries (48% of the total) have government endorsement of this strategy (see Table A.7 in Statistical Annex). Furthermore, only 34% (n=61) of countries have government endorsement of a strategy that has both precise targets and earmarked funding. These results suggest that the high positive responses obtained on lead agencies and national strategies may belie weaker institutional frameworks with insufficient financial resources to support either the effective functioning of these agencies, or the implementation of their activities.
that have been shown to be very effective at reducing road traffic injuries can be made and implemented at the subnational level as needed – for example in residential areas, or near schools. In the analysis of the results of this survey the criteria used for assessing urban speed management were therefore:

- speed limits on urban roads are set at less than or equal to 50 km/h;
- local authorities are able to lower these speed limits where necessary.

The results suggest that urban speed management is poor in many countries. While 62% of countries have speed limits on urban roads of less than or equal to 50 km/h, these countries account for half (50%) of the world’s population. Just over half (53%) of participating countries allow local authorities to reduce national speed limits (see Table A.5 in Statistical Annex). The global survey showed that only 29% of participating countries meet both these conditions – i.e. they have speed limits of 50 km/h or below on urban roads and they allow local authorities to reduce the national speed limits. Figure 6 shows the proportion of countries with different speed limit ranges, suggesting that in most countries additional efforts to reduce urban speed limits are still needed.

Furthermore, the results of the global survey show that only 9% of countries rate the enforcement of their national speed limits at more than 7 on a scale of 0 to 10 (see Table A.5 in Statistical Annex). This suggests that, even in countries where speed limits may be more restrictive, enforcement is frequently lacking.

**WHAT CAN BE DONE**

- Countries need to set speed limits that reflect the function of individual roads. In doing so, they should consider the types of vehicles using the road, the nature and purpose of the road, roadside activities, provision of facilities for vulnerable road users, and the frequency of use by pedestrians and cyclists. Increased priority should be given to vulnerable road users, notably in urban areas, where speed limits should not exceed 50 km/h.
- Local authorities need to be given the authority, resources and political support to implement measures to reduce speed limits to levels that may be lower than national limits where vulnerable road users are particularly at risk.
- Programmes put into place to address speeding need to foster a public awareness and understanding of the effects of speeding and the reasons for enforcing speed limits.
Drinking and driving

What is known?

• Drinking and driving increases both the risk of a crash and the likelihood that death or a serious injury will result (4).

• The risk of involvement in a crash increases significantly above a blood alcohol concentration (BAC) of 0.04 g/dl (30, 31).

• Laws which establish lower BACs (between zero and 0.02 g/dl) for young/novice drivers can lead to reductions of between 4% and 24% in the number of crashes involving young people (32).

• Enforcing sobriety checkpoints and random breath-testing can lead to reductions in alcohol-related crashes of about 20%, and has been shown to be very cost-effective (33, 34).

What this survey found

Ninety-six per cent (n=171) of participating countries report having either national or subnational laws on drink–driving. However, only 88 countries (49%) have a drink–driving law that uses a BAC limit of less than or equal to 0.05 g/dl, as recommended in the World report (see Table A.3 in Statistical Annex). While most countries (86%) in the European region have BAC laws in line with this recommendation, in other regions of the world most countries either do not have BAC limits or have limits that are above 0.05 g/dl (see Figure 7).

Young or novice drivers are at a much increased risk of having a road traffic crash when under the influence of alcohol. Consequently, the World report advised that BAC limits for this group be set lower than limits for the general population. Only 19 of the 139 countries which have BAC limits for the general population have stipulated lower BAC limits for these young and novice drivers, and most of these countries are in the European Region.

Figure 7. Blood alcohol concentration limits (g/dl) by country/area
Random breath-testing and police checkpoints are important enforcement mechanisms that have been shown to reduce alcohol-related crashes. Seventy-nine per cent of countries report that they use one or both of these methods of enforcement. However, only 23 countries (13%) report an enforcement rating of over 7 on a scale of 0 to 10 (see Table A.3 in Statistical Annex). This represents 21% of high-income countries, 11% of middle-income countries and just 9% of low-income countries. Taken together, these findings show that only 10% of participating countries, covering 24% of the world’s population, have both adequate drink–driving laws (as defined by a BAC limit of less than or equal to 0.05 g/dl) and enforcement ratings of over 7.

**Use of motorcycle helmets**

**What is known?**

- Wearing a motorcycle helmet correctly can reduce the risk of death by almost 40% and the risk of severe injury by over 70% (35).
- When motorcycle helmet laws are enforced effectively, helmet-wearing rates can increase to over 90% (36, 37).
- The effectiveness of motorcycle helmets in reducing head injuries is in part a result of the quality of the helmets. Requiring helmets to meet a recognized safety standard is important to ensure that helmets can effectively reduce the impact of a collision to the head in the event of a crash (38).

**What this survey found**

Over 90% (n=163) of countries participating in this global survey have laws set at either the national or subnational level that require helmets to be worn by users of motorized two-wheelers. However, legislation is incomplete in many of these countries. For instance, some countries make exceptions for motorcyclists using low-
powered engines, while other countries exempt all passengers, or persons with religious headgear. This survey found that 74% of participating countries have helmet laws that are comprehensive in scope, i.e. that require both drivers and passengers of motorized two-wheelers to wear helmets on all roads and regardless of engine type\(^1\) (see Table A.6 in Statistical Annex). Furthermore, the results show that helmet standards are lacking in a high proportion (43%, \(n=76\)) of countries, thus calling into question the ability of a law on helmet-wearing to achieve its purpose. Taken together these findings mean that only 40% \((n=70)\) of countries have comprehensive helmet laws and require helmets to meet a specific standard (see Figure 8).

\(^1\) Some of these have exceptions, such as exempting those for medical reasons or for religious reasons.

---

**Figure 8. Motorcycle helmet laws and helmet standards by country/area**

![Map showing motorcycle helmet laws and helmet standards by country/area](map.png)

Only 40% of countries have a comprehensive helmet law and require helmets to meet a specific standard.
Even where comprehensive laws are in place, enforcement is low in most countries. Only 25% (n=45) of countries rate their enforcement of helmet-use laws as higher than 7 on a scale of 0 to 10 (see Table A.6 in Statistical Annex). Finally, the impact of helmet laws that are in place is also difficult to ascertain in many countries. Only 34% of countries have data on helmet-wearing rates, and both the reliability and the generalizability of the results vary considerably (see page 35).

**Seat-belt use**

**What is known?**
- Wearing a seat-belt reduces the risk of a fatality among front seat passengers by 40–50% (39–41).
- Studies suggest that seat-belts can reduce fatalities among rear-seat car occupants by 25–75% (39, 42).
- Mandatory seat-belt laws, their enforcement, and appropriate public awareness campaigns have been shown to be very effective in increasing rates of seat-belt wearing (4, 39, 43).

**What this survey found**
While seat-belt laws are widespread – with 88% (n=156) of countries participating in the global survey reporting national or subnational laws – in many countries the law does not apply to all car occupants (i.e. to front and rear-seat occupants). Only 57% (n=101) of countries require all car occupants to wear seat-belts, and this figure is much higher in high-income countries (76%) than in middle-income countries (54%) or low-income countries (38%) (see Table A.4 in Statistical Annex).

**What can be done**
- All countries should have mandatory laws on helmet use on motorized two- and three-wheelers.
- These laws should cover all riders who are legally allowed to ride on motorized two- or three-wheelers, all engine types and all road types.
- Countries need to enact laws requiring helmets to meet a national or international standard.
- Countries need to establish systems to collect data on rates of helmet-wearing.

Only 38% of low-income countries and 54% of middle-income countries require seat-belts to be used in cars by both front-seat and rear-seat passengers.
Twelve per cent (n=21) of countries have no seat-belt law at all (see Figure 9).

Enforcement of seat-belt laws is weak in many countries. Only 19% (n=34) of countries rate enforcement of their seat-belt laws above 7 on a scale of 0 to 10. Only 14% of countries (n=25) have a seat-belt law that applies to all occupants and an enforcement rating of greater than 7 on a scale of 0 to 10 (see Table A.4 in Statistical Annex).

The ability to ascertain the effectiveness of these laws is difficult if relevant data are not available: in this survey over 47% of countries reported having no data on rates of seat-belt use in front seats, and 71% reported no data on rates of wearing rear seat-belts.

Seat-belt laws cannot be effective if large numbers of cars are not fitted with seat-belts, as is the case in many low-income countries. Although the survey did not collect information on seat-belt requirements for imported cars, data from the survey show that of the 59 countries that manufacture or assemble cars, over one quarter (29%) do not require seat-belts to be fitted in both front and rear seats.

**WHAT CAN BE DONE**

- Vehicle manufacturers and assemblers should be required to fit seat-belts in both front and rear seats of all vehicles, irrespective of the end market.
- Seat-belt laws must be improved to cover all occupants.
- Enforcement efforts must be strengthened in many countries and must be equally applied to the occupants of both front and rear-seats in cars.
- Countries need to establish systems to collect data on rates of seat-belt use.
- Enforcement efforts must be backed by intensive mass-media education programmes that highlight the risk of injury when not wearing a seat-belt and increase the perceived likelihood of being detected and penalized.

**Figure 9. Seat-belt laws by country/area**

- National law applies to all car occupants
- Law at subnational level
- No law or law does not apply to all car occupants
- No data
Use of child restraints

What is known?

- Children who are unrestrained in a car are at increased risk of injury and death in the event of a collision. Appropriate child restraint systems, which include child seats for infants and booster seats for older children, are designed with the child’s developmental stage in mind. They work to secure the child in a way that reduces the chance of a severe injury occurring.

- If correctly installed and used, child restraints reduce deaths among infants by approximately 70% and deaths of small children by between 54% and 80% (39, 44).

- Mandatory child restraint laws and their enforcement lead to an increase in the use of child restraints (41, 44).

What this survey found

The global survey found that just under half of participating countries (n=87) report any legislation at all on the use of child restraints (see Figure 10). However, this figure hides considerable variation by region and income status (see Table A.4 in Statistical Annex). More than 90% of high-income countries have national legislation on child restraints, while the proportion in low-income countries is only 20%.

Even where legislation is in place, the results of the survey suggest that enforcement of child restraint laws is very low in most countries: only 14% of those countries with national legislation on the use of child restraints report enforcement as being above 7 on a scale of 0 to 10. This means that only 6% of all participating countries have a child restraint law and rate its enforcement as over 7 on a scale of 0 to 10 (and these are all high-income or middle-income countries). As well as weak legislation and poor enforcement, previous research indicates that the prohibitive cost of child restraints in many countries is also an important factor that affects usage.
Legislation: summary

While positive steps towards enacting appropriate legislation have been taken in all regions of the world, much remains to be done.

Although all countries reported national or subnational legislation related to at least one of the five key risk factors (speed, drink–driving, helmets, seat-belts and child restraints) only 48% of countries have national or subnational laws relating to all five risk factors. In addition, legislation on risk factors is still incomplete in its coverage in many (85%) countries. Where laws on these risk factors exist, they are often inadequately enforced – particularly in low-income and middle-income countries.

Governments need to enact and enforce comprehensive laws that require all road users to be protected by means of appropriate occupant restraints and to respect alcohol and speed limits that reduce the risk of a road traffic crash. These laws need to ensure that legal loopholes are avoided that could exempt particular road users. Enforcement efforts must be highly visible, well-publicized,
sustained, and implemented by the use of appropriate measures and penalties for infringement. Nongovernmental organizations and other civil society groups can play an important role in generating public and political support for evidence-based road safety measures.

Enforcement is most effective when supported by intensive public awareness campaigns that both highlight the safety benefits of complying with the legislation and also increase the perception of being detected and penalized when not complying with the law. As well as increasing awareness of the laws – and of the penalties for not respecting them – public awareness campaigns need to work towards building a culture of safety so that the general public are aware of the safety reasons behind these laws.

**Few countries have reliable data on road traffic injuries**

Data on the magnitude of the problem and the risk factors involved are essential to developing a systems approach to road safety. A comprehensive assessment of the magnitude of road traffic injuries should consider not only mortality but also non-fatal injuries and resulting disability, as well as the economic cost of road traffic injuries and the cost-effectiveness of interventions.

A number of other indicators can, if monitored accurately and regularly, provide essential information to governments in targeting their interventions and in evaluating the effectiveness of their current national road safety programmes. These include the proportion of road traffic deaths that are attributed to alcohol as well as helmet and seat-belt use rates.

Only 22% of all countries responding to the survey had:
- data on fatal and non-fatal road traffic injuries, plus
- estimates of the cost to the economy, plus
- data on monitoring and evaluation indicators such as rates of helmet and seat-belt use.

**Data on fatalities**

Comparing data across nations requires a standardized definition of a road traffic fatality. However, countries report a wide range of definitions for a road traffic death. These definitions use different time periods between a road crash and death and include or exclude different types of road users. The same definitions are also not always used consistently in the same country.

The current recommended definition of a road traffic fatality for harmonization of surveillance purposes is “any person killed immediately or dying within 30 days as a result of a road traffic injury accident” (45). The choice of 30 days was based on research which showed that most persons who die as a result of a crash succumb to their injuries within 30 days of sustaining them and that, while extension of this 30-day period resulted in a marginal increase in numbers, it required a disproportionately large increase in surveillance efforts (7).

Although there are moves within some regions to make this 30-day definition the standard, the results of this survey indicate that this goal remains largely unattained. The time periods used in definitions of road traffic-related deaths range from “died at the scene of the crash”, through a 7-day period and a 30-day period, to any death that results from a road traffic crash regardless of the time that has elapsed. At the global level
only 80 countries (45%) use a 30-day definition for a road traffic fatality (see Figure 11). Even within the European Region, which has made considerable efforts to bring countries in line with the 30-day definition of a road traffic fatality, there is wide variation. Although definitional issues can be overcome by applying correction factors, for harmonization and comparison purposes it would be easier if all countries used the same definition.

Underreporting has been acknowledged for many years as another important reason why it is difficult to compare road traffic crash data between countries. Some countries have taken steps to address this issue and to adjust their own data or link their different databases, but many have not. Factors that can affect the quality of data reported include political influences, competing priorities and availability of resources.

**Figure 11. Time period used to define a road traffic fatality by country/area and income group**

![Figure 11](image)

Simple casualty registers can be used to obtain a minimum dataset which provides information on non-fatal injuries.
The extent of underreporting is also influenced by:

- the sector that records the information;
- the proportion of crashes involving vulnerable road users (in many countries these types of crashes are more likely to be underreported);
- poor or absent links between police, transport and health service data, which means that figures for people who die after admission to hospital may not be reflected;
- exemptions from reporting certain crashes, such as those involving non-motorized or military vehicles; and
- whether sampling strategies are employed and extrapolated.

Finally, an important factor in the quality of a country’s health data in general is the equality of access of its people to health care facilities.

One way of improving this problem is to link data sources. Studies have shown higher levels of underreporting in data collected by the police and transport sectors compared to health sector data, which suggests the need for links to improve data quality (46). This survey showed that only 14% of countries used health data as a source of their fatality information, either alone or in combination with data from another source (Figure 12). Half of the countries reported data on road traffic fatalities on the basis of police records only.

All the above complexities limit transnational comparisons. Consequently a number of mechanisms have been developed to try to address some of the issues of underreporting and to make data more comparable. In this global survey we used (a) the Smedd Coefficient (47) to adjust all countries’ road traffic fatality data to a 30-day definition, and (b) developed a special model using negative binomial regression (see Statistical Annex for more information). Table 4 shows the reported data and rate per 100,000 population versus that obtained by the model, indicating a 46% difference globally.

Figure 12. Proportion of countries using different data sources for road traffic fatalities
In addition to mortality data, information on non-fatal injuries is important because it provides a complete picture of the impact of road traffic crashes for policy-making. It can, for example, guide hospital staffing, doctor and nurse training, and allocation of funds for hospital admissions and rehabilitation. However, it is not always essential to set up a sophisticated injury information system; when resources are scarce some type of “casualty register” or repeated surveys can be equally useful.

Problems relating to the quality and reliability of data on non-fatal injuries are probably even more complex than those relating to data on deaths. Reliable assessment of the severity of injury requires some clinical experience or medical expertise. A few countries employ hospital staff to code injuries when the patient is discharged from care – using a standardized scoring method such as the Abbreviated Injury Scale, Injury Severity Score or the International Classification of Diseases codes – and then link these data to police/transport databases (48–50).

However, in many countries the level of severity of an injury is recorded by the police at the site of the crash. This results in less reliable categorization of injuries. The lack of harmonization in terminology used also makes country comparisons difficult. In some countries, “serious” is defined as “requiring hospital attention”, while in others it is “inpatient care for at least 24 hours”, while yet others have longer admission times. There is usually little liaison between the police and health facilities to track

### Data on non-fatal injuries

#### WHAT CAN BE DONE

- Encourage the use of the 30-day definition of road traffic fatality for harmonization across data sources.
- Improve data linkages between police, transport and health sectors.
- Increase human capacity to undertake data collection, analysis and interpretation.
- Improve the use of ICD coding in vital registration to adequately reflect road traffic deaths.

#### Table 4. Road traffic deaths by WHO region using reported and modelled data

<table>
<thead>
<tr>
<th>WHO REGION</th>
<th>REPORTED DATA*</th>
<th></th>
<th>MODELLED DATA*</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>#</td>
<td>RATE PER 100 000 POPULATION</td>
<td>#</td>
<td>RATE PER 100 000 POPULATION</td>
</tr>
<tr>
<td>AFRICAN REGION</td>
<td>52 302</td>
<td>7.2</td>
<td>234 768</td>
<td>32.2</td>
</tr>
<tr>
<td>REGION OF THE AMERICAS</td>
<td>139 466</td>
<td>15.5</td>
<td>142 252</td>
<td>15.8</td>
</tr>
<tr>
<td>SOUTH-EAST ASIA REGION</td>
<td>143 977</td>
<td>8.4</td>
<td>285 020</td>
<td>16.6</td>
</tr>
<tr>
<td>EASTERN MEDITERRANEAN REGION</td>
<td>76 912</td>
<td>14.1</td>
<td>175 668</td>
<td>32.2</td>
</tr>
<tr>
<td>EUROPEAN REGION</td>
<td>113 346</td>
<td>12.8</td>
<td>117 997</td>
<td>13.4</td>
</tr>
<tr>
<td>WESTERN PACIFIC REGION</td>
<td>135 316</td>
<td>7.6</td>
<td>278 321</td>
<td>15.6</td>
</tr>
<tr>
<td>GLOBAL</td>
<td>661 319</td>
<td>10.1</td>
<td>1 234 026</td>
<td>18.8</td>
</tr>
</tbody>
</table>

* Adjusted for 30-day definition.

---

1. The International Classification of Diseases (ICD) is used to classify diseases and other health problems recorded on many types of records, including death certificates and health records. The most recent (10th) revision of the ICD codes came into use in 1994 but some countries still use previous versions.

---

### Table 4. Road traffic deaths by WHO region using reported and modelled data

<table>
<thead>
<tr>
<th>WHO REGION</th>
<th>REPORTED DATA</th>
<th>MODELLED DATA</th>
</tr>
</thead>
<tbody>
<tr>
<td>AFRICAN REGION</td>
<td>52 302</td>
<td>234 768</td>
</tr>
<tr>
<td>REGION OF THE AMERICAS</td>
<td>139 466</td>
<td>142 252</td>
</tr>
<tr>
<td>SOUTH-EAST ASIA REGION</td>
<td>143 977</td>
<td>285 020</td>
</tr>
<tr>
<td>EASTERN MEDITERRANEAN REGION</td>
<td>76 912</td>
<td>175 668</td>
</tr>
<tr>
<td>EUROPEAN REGION</td>
<td>113 346</td>
<td>117 997</td>
</tr>
<tr>
<td>WESTERN PACIFIC REGION</td>
<td>135 316</td>
<td>278 321</td>
</tr>
<tr>
<td>GLOBAL</td>
<td>661 319</td>
<td>1 234 026</td>
</tr>
</tbody>
</table>

* Adjusted for 30-day definition.

---

1. The International Classification of Diseases (ICD) is used to classify diseases and other health problems recorded on many types of records, including death certificates and health records. The most recent (10th) revision of the ICD codes came into use in 1994 but some countries still use previous versions.
how long a patient is admitted for and so the category of serious can range from a few cuts and bruises to severe head injuries. To compound this, in most high-income countries those involved in a crash with any type of injury are usually seen in an accident and emergency room for insurance purposes, while in low-income and middle-income countries this depends on access to care, a good pre-hospital care system, finances, and other variables (see Box 4).

This survey showed a 1:20 ratio between deaths and severe injuries. If this were applied to the global total of 1.27 million deaths, it would mean that approximately 25.4 million people are injured severely enough to be seen in an emergency room. This supports previous estimates of the total number of non-fatal injuries (all severity levels) as between 20 and 50 million (4, 7).

The majority of countries do not have robust data on non-fatal road traffic injuries.

**WHAT CAN BE DONE**

- The data collected by the health sector need to be improved. This is particularly true with regard to data on non-fatal injuries. This can take the form of discharge data using ICD coding, injury surveillance systems or, where this is not feasible, intermittent surveys or “casualty registers” which collect only minimum data (5).
- There is a need for standard definitions of levels of severity of non-fatal injuries to allow them to be accurately recorded and collated. The definitions should be simple enough to be administered by both health and non-health personnel.
- Countries should be encouraged to link all data sources on road traffic injuries in order to help address underreporting.
Box 4: Pre-hospital care

Much can be done to lower the burden of death and disability from road traffic injuries by strengthening trauma care services across the spectrum from pre-hospital care through to rehabilitation. The chain of survival starts at the scene of the incident. Prompt, good quality pre-hospital care can save the lives of many injured persons.

This global survey showed that 76% of the 178 countries have formal pre-hospital care systems. The quality of these systems, however, was not evaluated. They could range from sophisticated systems with highly qualified staff to those that rely only on first responders, e.g. bystanders.

The quick arrival of emergency response teams is an important factor in reducing adverse health consequences of a crash. Although most countries have one universal pre-hospital care access telephone number, 13 countries have up to three different national telephone numbers and a further 25 countries have local or region-specific numbers. This can be confusing for the lay person who has to remember the different numbers and then decide which number to use. For example, in South Africa if you are using a mobile phone you are required to dial 112, while on a landline the number is 10177. To compound matters, a number of private ambulance companies cannot be accessed unless one has medical insurance which covers this service.

The most common pre-hospital care access number used is 112 (used by 26 countries), followed by 911 (used predominantly in the Americas) and 999 (used predominantly in Africa) (see Table A.8 in Statistical Annex). As international travel increases, it will be increasingly important to work towards one global or regional phone number. For instance, the European Union is moving towards the adoption of one universal number (112) for all its member countries.

Where no pre-hospital trauma care system exists, trained community members can provide first aid.
Data on economic costs

Considerable economic and social costs result from deaths, injuries and disability caused by road traffic crashes. The survey results showed that:

• Less than half of all participating countries have conducted a study on the cost of road traffic deaths and/or injuries (see Table 5).

• Most surveys are not national but based on a sample and are usually conducted in a teaching hospital. Data drawn from them, while useful, therefore have limited generalizability.

• Gross output methodology is the most common method used to assess costs. While this type of costing is useful for health services, it shows only the tip of the iceberg. Loss of productivity, damages, reduced quality of life and other factors are important indirect costs that need to be included if the true cost to society is to be calculated.

However, this type of information at country level is extremely important for showing the impact of road traffic crashes on all the sectors involved and for convincing politicians to invest in prevention. Knowing the effectiveness of interventions and consequent cost–benefit ratios would be most beneficial to countries.

> Countries should be encouraged to conduct national studies on the costs of road traffic crashes as well as on the cost-effectiveness of interventions they put into place.

> Where possible, costing should include both direct and indirect costs.

Table 5. Countries with one or more studies on the economic cost of road traffic crashes by WHO region

<table>
<thead>
<tr>
<th>WHO REGION</th>
<th>DEATHS AND INJURIES</th>
<th>DEATHS ONLY</th>
<th>INJURIES ONLY</th>
<th>OTHER TYPES OF STUDIES</th>
<th>COUNTRIES REPORTING AT LEAST 1 STUDY</th>
</tr>
</thead>
<tbody>
<tr>
<td>AFRICAN REGION</td>
<td>15</td>
<td>2</td>
<td>0</td>
<td>17</td>
<td></td>
</tr>
<tr>
<td>REGION OF THE AMERICAS</td>
<td>14</td>
<td>0</td>
<td>1</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>SOUTH-EAST ASIA REGION</td>
<td>6</td>
<td></td>
<td></td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>EASTERN MEDITERRANEAN REGION</td>
<td>10</td>
<td>1</td>
<td></td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>EUROPEAN REGION</td>
<td>25</td>
<td>2</td>
<td></td>
<td>27</td>
<td></td>
</tr>
<tr>
<td>WESTERN PACIFIC REGION</td>
<td>11</td>
<td></td>
<td></td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>ALL</td>
<td>81</td>
<td>5</td>
<td>1</td>
<td>4</td>
<td>91</td>
</tr>
</tbody>
</table>
Data on monitoring and evaluation

Only 75 of the 178 countries surveyed (42%) have a national road safety strategy which includes targets. Over one-third of these countries are in Europe where a European Union target was set some years ago for achievement by 2010 (see Table 6). Other regions like Africa have also recently adopted targets although these have yet to be reflected at country level.

Targets are not the only method of monitoring or evaluating progress. Pages 18–28 describe the evidence on a number of proven interventions that are critical to improving road safety. These include reducing speed and drink–driving, and increasing the use of helmets, seat-belts and child restraints.

While some countries have put into place legislation to address these risk factors, few countries have established systems to collect data on monitoring or evaluating the success of these measures at a national level.

In this survey only 34% of countries reported data on motorcycle helmet-wearing rates, with the levels of helmet-wearing reported varying widely, as shown in Figure 13 and Table A.6 in the Statistical Annex. However, the methodologies used to determine these figures were not evaluated as part of this study, while for some countries the helmet-wearing rates reported were results of small studies in particular geographic areas, which limit their generalizability.

Levels of seat-belt wearing among front seat occupants were reported for 95 countries and range from under 10% to over 90% (see Figure 14 and Table A.4 in Statistical Annex). Limitations of the methodologies used are similar to those in Table 6. Countries with targets included in their road safety strategies by WHO region and income level

<table>
<thead>
<tr>
<th>WHO REGION</th>
<th>LOW-INCOME</th>
<th>MIDDLE-INCOME</th>
<th>HIGH-INCOME</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>AFRICAN REGION</td>
<td>9</td>
<td>2</td>
<td>—</td>
<td>11</td>
</tr>
<tr>
<td>REGION OF THE AMERICAS</td>
<td>—</td>
<td>9</td>
<td>3</td>
<td>12</td>
</tr>
<tr>
<td>SOUTH-EAST ASIA REGION</td>
<td>2</td>
<td>2</td>
<td>—</td>
<td>4</td>
</tr>
<tr>
<td>EASTERN MEDITERRANEAN REGION</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>EUROPEAN REGION</td>
<td>1</td>
<td>11</td>
<td>21</td>
<td>33</td>
</tr>
<tr>
<td>WESTERN PACIFIC REGION</td>
<td>1</td>
<td>6</td>
<td>5</td>
<td>12</td>
</tr>
<tr>
<td>GLOBAL</td>
<td>13</td>
<td>32</td>
<td>30</td>
<td>75</td>
</tr>
</tbody>
</table>

* No high-income countries.
* No low-income countries.

Figure 13. Levels of motorcycle helmet wearing in 60 countries

Figure 14. Seat-belt wearing rates in 95 countries

* In 51 countries this estimate was based on an observational study, the source of which is noted in the country profiles. In 9 countries the estimated wearing rate is the opinion of the consensus group.

* In 86 countries this estimate was based on an observational study, the source of which is noted in the country profiles. In 9 countries the estimated seat-belt wearing rate is the opinion of the consensus group.
Countries need to step up efforts to collect robust data on a number of intermediate indicators that relate to road traffic injury prevention and that can be used for monitoring and evaluation research. These include:

- rates of helmet use;
- rates of seat-belt use;
- the proportion of drivers with blood alcohol concentration over the legal limit;
- rates of child restraint use.

While high-income countries often use sophisticated survey methodology, basic helmet and seat-belt wearing surveys are relatively simple and cheap to conduct. Surveys are essential for comprehensive monitoring to take place.

These data are pivotal to making policy decisions based on evidence, and to evaluating measures that are put in place.

The health sector should play an important role in research related to risk factors.

The proportion of deaths related to alcohol reported in this study varies from countries where this figure is under 5%, to those where alcohol contributes to over half of all road traffic fatalities (see Figure 15 and Table A.3 in Statistical Annex). However, only half of participating countries have any data on the proportion of road traffic deaths attributable to alcohol – and those that do frequently only have data from more sophisticated tertiary hospitals, which limits the possibility of making generalizations on the basis of the information.

Figure 15. Proportion of alcohol-related fatal crashes in 93 countries

* In 90 countries this estimate was based on official data, the source of which is noted in the country profiles. In 3 countries the proportion given is the opinion of the consensus group.

<table>
<thead>
<tr>
<th>% alcohol-relatedness (range)</th>
<th>% of countries</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;5%</td>
<td>17%</td>
</tr>
<tr>
<td>5–9%</td>
<td>15%</td>
</tr>
<tr>
<td>10–19%</td>
<td>11%</td>
</tr>
<tr>
<td>20–29%</td>
<td>11%</td>
</tr>
<tr>
<td>30–39%</td>
<td>3%</td>
</tr>
<tr>
<td>40–49%</td>
<td>15%</td>
</tr>
<tr>
<td>&gt;50%</td>
<td>28%</td>
</tr>
</tbody>
</table>

Global Status Report on Road Safety