

GLOBAL STATUS REPORT ON ROAD SAFETY 2015



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Foreword

Road traffic injuries claim more than 1.2 million lives each year and have a huge impact on health and development. They are the leading cause of death among young people aged between 15 and 29 years, and cost governments approximately 3% of GDP. Despite this massive – and largely preventable – human and economic toll, action to combat this global challenge has been insufficient.

This report, the third *Global status report on road safety*, shows that low- and middle-income countries are hardest hit, with double the fatality rates of high-income countries and 90% of global road traffic deaths. Vulnerable road users – pedestrians, cyclists and motorcyclists – make up half of these fatalities.

The report illustrates that the number of road traffic deaths globally has plateaued at 1.25 million a year. In the face of rapid motorization, notably in low- and middle-income countries, this is good news as it reflects the efforts of a number of countries to put in place measures known to make roads safer. The report also describes progress made by governments and nongovernmental organizations in implementing measures known to be effective, such as improving road safety legislation; managing speeds around schools; harmonizing data collection relating to road traffic deaths; and rolling out minimum standards on vehicle safety. These commendable national efforts have taken place against the backdrop of the Decade of Action for Road Safety 2011–2020, a global framework guiding national-level action across a number of areas relevant to road safety.

In addition to the Decade of Action, international attention to the

urgency of road safety has increased recently with the adoption of the 2030 Agenda for Sustainable Development. Setting a goal of reducing road traffic deaths and injuries by 50% by 2020 as part of this agenda is a reflection of the growing recognition of the contribution of road safety to health, development and broader environmental objectives, and the potential for action.

This recognition is needed: while a plateau in numbers is a welcome first step in the fight to reduce road traffic deaths, it is insufficient. In the past three years there has been a 16% increase in the number of vehicles on the world's roads – in 2014 alone, a record 67 million passenger cars came into circulation. Set against this inexorable rise, much more must be done to stop the death and destruction on the world's roads and to achieve the ambitious target for road safety set out in the Sustainable Development Goals (SDGs).

The report highlights that across many measures, countries have not done enough to implement what we know works. For example:

- laws on key behavioural risk factors for road traffic injuries do not meet best practice in most countries, while enforcement of good laws where they do exist is frequently too weak to allow the potential impact of these laws to be fully realized;
- speed management, which lies at the heart of an effective approach to reducing deaths and injuries, is notably poor in many countries;
- vehicles sold in the majority of the world's countries do not meet minimum safety standards;
- roads continue to be designed and built without sufficient attention to the needs of the most vulnerable road users.

While much progress has been achieved over the past decade, the pace has been too slow. The SDG target of a 50% reduction in road traffic deaths and injuries by 2020 offers a powerful focus around which governments and the international community can galvanize action – the challenge now is to seize the opportunity to do so, and to turn the current plateau in road deaths into a measurable decline.



A handwritten signature in black ink, reading "M. Chan".

Dr Margaret Chan
Director General
WHO



Executive summary

More than 1.2 million people die each year on the world's roads, making road traffic injuries a leading cause of death globally. Most of these deaths are in low- and middle-income countries where rapid economic growth has been accompanied by increased motorization and road traffic injuries. As well as being a public health problem, road traffic injuries are a development issue: low- and middle-income countries lose approximately 3% of GDP as a result of road traffic crashes.

Although road traffic injuries have been a leading cause of mortality for many years, most traffic crashes are both predictable and preventable. There is considerable evidence on interventions that are effective at making roads safer: countries that have successfully implemented these interventions have seen corresponding reductions in road traffic deaths. Rolling out these interventions globally offers huge potential to mitigate future damage and save lives at a global level.

In recognition of the scale of this health and development problem – and the possibility to impact positively upon it – the United Nations General Assembly adopted a resolution in 2010 that led to the establishment of the Decade of Action for Road Safety (2011–2020). The resolution called on Member States to take the necessary steps to make their roads safer, and for WHO to monitor the situation through its *Global status report on road safety* series. This report, the third in the series, serves as a tool to assess the impact of changes three years into the Decade of Action and to highlight where more action is needed.

This report shows that the number of road traffic deaths – 1.25 million in 2013 – has remained fairly constant since 2007, despite the increase in global motorization and population, and the predicted rise in deaths. This suggests that interventions to improve global road safety are preventing increases that otherwise would have occurred. The report highlights that the situation is worst in low-income countries, where rates are more than double those in high-income countries and there are a disproportionate number of deaths relative to the (lower) level of motorization. The African Region continues to have the highest road traffic death rates, while the lowest rates are in the European Region, notably among its high-income countries, many of which have been very successful at achieving and sustaining reductions in death rates despite increasing motorization.

Changing road user behaviour is a critical component of the holistic “Safe Systems” approach advocated in this report. Adopting and enforcing good laws is effective in changing of changing road user behaviour on key risk factors for road traffic injuries – speed, drink-driving, and the failure to use helmets, seat-belts and child restraints properly or at all. The report highlights that 17 countries have changed laws to bring their legislation on one or more of these five risk factors into line with best practice in the past three years. This represents 409 million people or 5.7% of the world's population. The situation is most advanced on seat-belt laws, where 105 countries, representing 67% of the world's population, now have laws that meet best practice. While the report highlights encouraging examples

of countries that have brought their laws into line with best practice on particular risk factors, the potential for appropriate road safety laws to reduce road traffic deaths is largely unmet at a global level. Enforcement of these laws – essential to their success at reducing injuries – is also inadequate across all five behavioural risk factors.

The report further highlights the important role of safe infrastructure and safe vehicles in reducing road traffic injuries. Road infrastructure is mainly constructed with the needs of motorists in mind, although the report indicates that 49% of all road traffic deaths occur among pedestrians, cyclists and motorcyclists. Real, sustained successes at reducing global road traffic deaths will only happen when road design takes into consideration the needs of all road users. Making walking and cycling safer is also important to support other moves to reduce carbon emissions and increase physical activity. While vehicles in high-income countries are increasingly safe, the report provides worrying data showing that less than half of countries implement minimum standards on vehicle safety, and that these standards are notably absent in many of the large middle-income countries that are major car manufacturers.

With the launch of the Sustainable Development Goals, road safety is receiving increased international attention, and is included in two of the 17 Goals of this new global agenda. This is welcomed. The evidence on what works to save lives on the roads exists: the international community, national governments and civil society now need to act on it.

Background

Road traffic injuries are the number one cause of death among those aged 15–29.

Road traffic injuries are a leading cause of preventable death

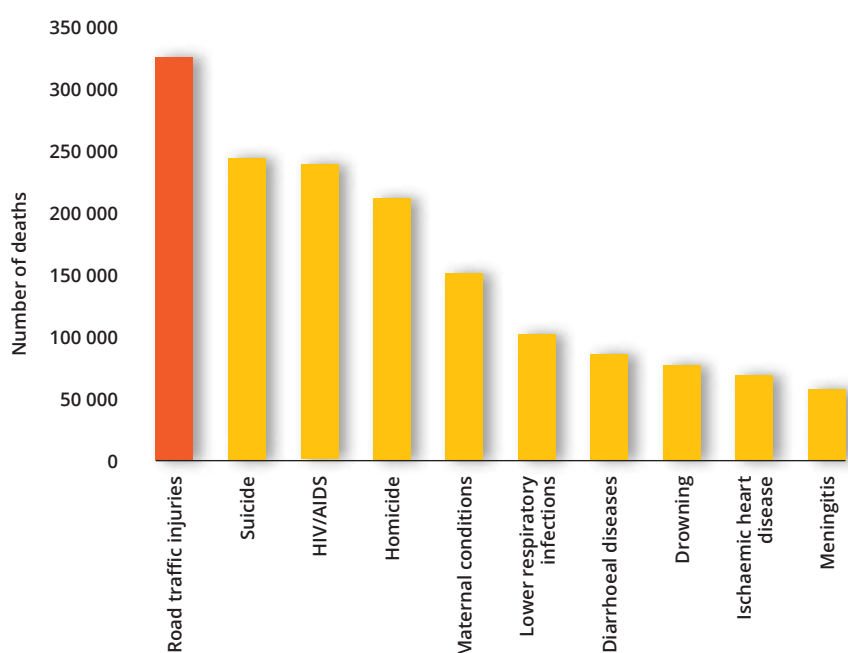
Over 1.2 million people die each year on the world's roads, with millions more sustaining serious injuries and living with long-term adverse health consequences. Globally, road traffic crashes are a leading cause of death among young people, and the main cause of death among those aged 15–29 years (see Figure 1).

Road traffic injuries are currently estimated to be the ninth leading cause of death across all age groups globally, and are predicted to become the seventh leading cause of death by 2030 (1). This rise is driven by the escalating death toll on roads in low- and middle-income countries – particularly in emerging economies where urbanization and motorization accompany rapid economic growth. In many of these countries, necessary

infrastructural developments, policy changes and levels of enforcement have not kept pace with vehicle use. In contrast, many high-income countries have managed to break the link between rising motorization and road traffic deaths, with some managing to dramatically reduce such deaths. These achievements are the result of making infrastructure safer, improving the safety of vehicles, and implementing a number of other interventions known to be effective at reducing road traffic injuries (2). Having good quality data to monitor the impact of these efforts is also critical to demonstrating their success.

In addition to deaths on the roads, up to 50 million people incur non-fatal injuries each year as a result of road traffic crashes, while there are additional indirect health consequences that are associated with this growing epidemic (3). As vehicle ownership grows, many countries face

FIGURE 1
Top ten causes of death among people aged 15–29 years, 2012



Source: (1).

the twin problems of traffic congestion and rising vehicle tailpipe emissions, resulting in higher rates of respiratory illness (4). Rising car ownership has also resulted in reduced physical activities such as walking and cycling, with associated health consequences.

The economic burden of road traffic injury and death

Road traffic injuries place a heavy burden on national economies as well as on households. In low- and middle-income countries they particularly affect the economically active age group, or those set to contribute to family, society and the workforce in general. Many families are driven deeper into poverty by the loss of a breadwinner, or by the expenses of prolonged medical care, or the added burden of caring for a family member who is disabled from a road traffic injury (5,6). The economic costs also strike hard at a national level, imposing a significant burden on health, insurance and legal systems. This is particularly true in countries struggling with other development needs, where investment in road safety is not commensurate with the scale of the problem. Data suggest that road traffic deaths and injuries in low- and middle-income countries are estimated to cause economic losses of up to 5% of GDP. Globally an estimated 3% of GDP is lost to road traffic deaths and injuries (7).

The Decade of Action for Road Safety: a response to the road traffic injury epidemic

In response to this growing epidemic, in 2010 the UN General Assembly adopted Resolution 64/255 to

establish the Decade of Action for Road Safety (2011–2020),¹ the goal of which is to stabilize and reduce predicted levels of road traffic fatalities around the world. A Global Plan of Action² provides the roadmap towards this goal, promoting proven, cost-effective solutions for making roads safer, including those pertaining to: (i) road safety management; (ii) safer roads and mobility; (iii) safer vehicles; (iv) making road users safer; and (v) improved post-crash response and hospital care. It also provides a framework for coordinating action at an international level.

The UN General Assembly Resolution 64/255 also called for regular monitoring of the impact of the Decade of Action through publishing the *Global status report on road safety* series (8,9). This report provides an assessment of the situation three years into the Decade.

Global status report on road safety 2015: objectives

This report has the following specific objectives:

- describing the road safety situation in all Member States;
- identifying gaps in road safety in all Member States and thereby stimulate road safety action;
- monitoring countries' progress in implementing measures identified in the Global Plan of Action for the Decade of Action for Road Safety (2011–2020); and
- providing baseline information and data that allow monitoring of other international policy processes that set road safety targets.

¹ See <http://www.who.int/roadsafety/about/resolutions/download/en/index.html>

² Global Plan for the UN Decade of Action for Road Safety 2011–2020, http://www.who.int/roadsafety/decade_of_action/plan/en/index.html

Road traffic deaths and injuries in low- and middle-income countries are estimated to cause economic losses of up to 5% of GDP.

Methodology

Data were collected from each participating country and area –hereinafter referred to, for readability purposes only, as “countries” (see Statistical Annex and Table A1). Experts from different sectors within each country completed a self-administered questionnaire with information on key variables. The group of experts then met to reach consensus on the dataset that best represented their individual country’s road safety situation. The expert consensus data for each country is presented in this report. The data were validated with support from Regional Data Coordinators and analysed at WHO headquarters. Fatality data, collected through the questionnaires, were reviewed according to a set of criteria that determined how robust the data were, and an estimation process was carried out accordingly. More information on this process can be found in Explanatory Notes 1–3.

A major new element in this (third) *Global status report on road safety* was the comprehensive collection of legislative documents from all participating countries. The team at WHO performed an extensive search of online legislative databases and country-level government websites for legislative road safety documents. In addition, National Data Coordinators were asked to submit laws relating to the key risk factors¹. All legislative documents were reviewed by lawyers at WHO headquarters who extracted and analysed relevant information using the same criteria to assess all countries’ laws. In addition, the scope

of the legal analysis was extended: new indicators for child restraint and motorcycle helmet use were added for the first time in this report.

The application of the same criteria to all countries as well as the addition of new indicators resulted (in some cases) in discrepancies with the analysis published in the previous report, where data were provided exclusively by each country applying its own methods of interpretation.

To resolve any data conflicts, the WHO headquarter’s legal analysis was then shared with National Data Coordinators and a validation process clarified any data conflicts through discussion and, when appropriate, submission of new legal documents. More information on this process can be found in Explanatory Note 1.

A second new element to this report was the collection of data on vehicle standards. This information was compiled using data from the United Nations Economic Commission for Europe² (see Explanatory Note 1).

The report includes data from 180 countries/areas out of a total of 195 WHO Member States, covering 6.97 billion people or 97% of the world’s population (see Statistical Annex). Data on legislation and policies represent the country situation in 2014, while data on fatalities and numbers of vehicles are for 2013, the most recent year for which data were available.³

¹ Speed, drink-driving, drug-driving, use of motorcycle helmets, seat-belts, child restraints and mobile phones.

² See <http://www.unecce.org/trans/main/wp29/introduction.htm>

³ Note that the second *Global status report on road safety* assessed fatality data relating to 2010, and legislative data relating to 2011.



SECTION 1

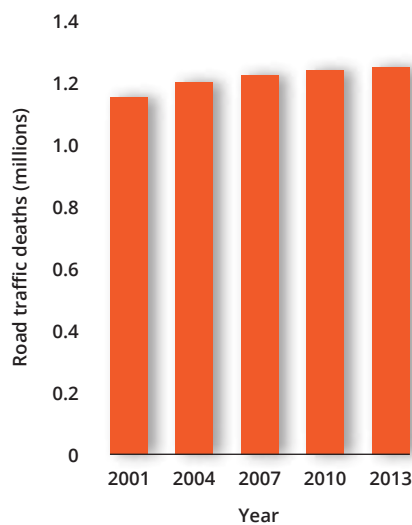
THE CURRENT STATE OF GLOBAL ROAD SAFETY

The number of road traffic deaths has plateaued since 2007

There were 1.25 million road traffic deaths globally in 2013 – a figure that has plateaued since 2007 (see Figure 2).

This plateau must be seen against the backdrop of global population growth and motorization. The population increase of 4% between 2010 and 2013 and an increase of 16% in registered vehicles over the same period suggest that efforts to slow the increase in road traffic deaths may have prevented deaths that would otherwise have occurred.

FIGURE 2
Number of road traffic deaths, worldwide, 2013



But while the levelling out of road traffic deaths in a context of rising motorization is encouraging, there are still no signs of an actual decline, which is essential if the Decade of Action and Sustainable Development Goal targets are to be realized (see Box 1). This suggests that while progress is possible, much more attention, political will and resources are needed.

The plateau in road traffic deaths, set against a 4% increase in global population and 16% increase in motorization, suggests that road safety efforts over the past 3 years have saved lives.



BOX 1

Road safety in the Sustainable Development Goals

In September 2015 the United Nations launched the 2030 Agenda for Sustainable Development – the development framework that replaces and builds on the achievements of the Millennium Development Goals. Road safety was absent from the Millennium Development Goals but road safety targets have been integrated into the new 2030 Agenda.

The 17 Sustainable Development Goals (SDGs) and their 169 targets are intended to balance the economic, social and environmental dimensions of sustainable development, and stimulate action over the next 15 years in these critical areas. They include two targets that relate to road safety, one in SDG 3 (on health), and one in SDG 11 (on transport for sustainable cities).

The SDG 3 target is far more demanding than the 2020 goal set for the UN Decade of Action for Road Safety (to “stabilize and reduce” road deaths by 2020). Although the document qualifies that these global targets may be modified at country level “with each government setting its own national targets guided by the global level of ambition but taking into account national circumstances”.

Inclusion of such an ambitious road traffic target in the SDGs is a significant advance for road safety. It acknowledges that there is a strong scientific base around what works, as evidenced through the success of a number of countries in reducing the burden of road traffic deaths. It also recognizes the importance of this issue to broader global health and development, and the need for countries and the international community to prioritize action towards achieving results even before the end of the SDG period.

See <http://www.globalgoals.org/>

SUSTAINABLE DEVELOPMENT GOAL 3

Ensure healthy lives and promote well-being for all at all ages:

3.6. By 2020, halve the number of global deaths and injuries from road traffic accidents.

SUSTAINABLE DEVELOPMENT GOAL 11

Make cities and human settlements inclusive, safe, resilient and sustainable:

11.2. By 2030, provide access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons.

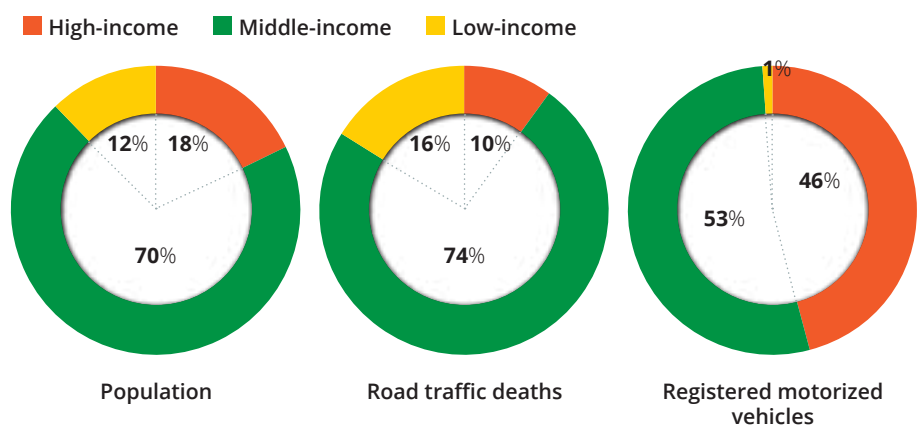
Low- and middle-income countries bear a disproportionate burden of road traffic deaths

Road traffic death rates in low- and middle-income countries are more than double those in high-income countries.

Ninety-percent of road traffic deaths occur in low- and middle-income countries, and while these countries also account for 82% of the world's population, they nevertheless bear a

disproportionate number of deaths relative to their level of motorization, as they account for only 54% of the world's registered vehicles (see Figure 3).

FIGURE 3
Population, road traffic deaths and registered motorized vehicles^a, by country income status



^a Population relates to 2013, see Explanatory Note 1. Registered vehicle data provided only for countries participating in the survey.



The risk of dying in a road crash remains highest in low- and middle-income countries

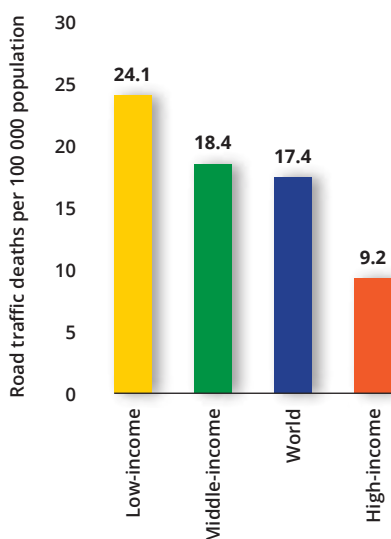
While absolute numbers of deaths are important in terms of seeing where road traffic deaths are occurring and being able to target efforts to prevent them, a more useful indicator is to compare the risk of dying as the result of a road traffic crash using rates per 100 000 population. While the global rate for road traffic deaths is 17.4 per 100 000, there is great disparity by income, with rates more than twice as high in low- and middle-income

countries than in the world's high-income countries (see Figure 4).

This report shows that 68 countries have seen a rise in the number of road traffic deaths since 2010, of which 84% are low- or middle-income countries. Seventy-nine countries have seen a decrease in the absolute number of deaths, of which 56% are low- and middle-income (see Figure 5).

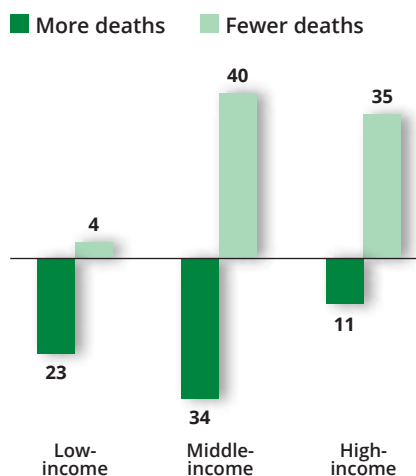
68 countries have seen a rise in road traffic deaths since 2010, while 79 have seen a decrease.

FIGURE 4
Road traffic deaths per 100 000 population, by country income status^a



^a Country income status was determined based on data from the World Development Indicators database, World Bank, March 2015 (see <http://data.worldbank.org/indicator/NY.GNP.PCAP.CD/countries>). Data relate to 2013, whereby low-income = ≤ US\$ 1045 per capita; middle-income = US\$ 1046 to US\$ 12 745; high income = ≥ US\$ 12 746.

FIGURE 5
Countries showing changes in the number of road traffic deaths, 2010–2013, by country income status^a



^a These data represent countries that have seen more than a 2% change in their number of deaths since 2010, and excludes countries with populations under 200 000. Data shown are for 48 out of 52 participating high-income countries, 86 out of 98 middle-income countries, and all 30 participating low-income countries.

The risk of a road traffic death is highest in the African Region

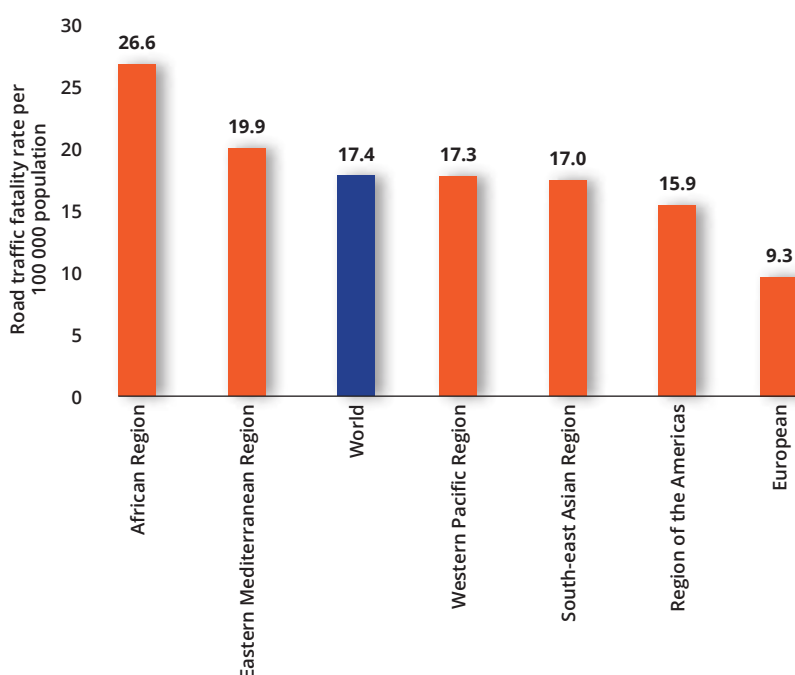
The Eastern Mediterranean Region is the only region where high-income countries have a higher road traffic death rate than low- or middle-income countries.

The risk of a road traffic death varies significantly by region, and there has been little change in the regional rates of death since 2010. The highest rates are still in the African Region, while the European Region has a rate far below the global average (9.3 per 100 000 population, relative to the global rate of 17.4, see Figure 6).

However, there continues to be a large disparity in rates within particular regions. For example, rates in some of the high-income countries in the Western Pacific Region (such as Australia) are among the lowest in the world, while some of the region's middle-income countries have rates high above the global average at 24 per 100 000. Similarly, while high-income countries generally have lower rates than low- and middle-income countries, high-income countries in the Eastern Mediterranean Region

have a *higher* rate than those of their less-affluent neighbours in the region (22.4 compared to 19.7) and more than double the average rate of high-income countries globally (9.2). This suggests that in some of the more affluent Eastern Mediterranean countries, rapid economic development that has resulted in increased motorization and road infrastructure construction has not been accompanied by sufficient investment in institutional capacity, nor in the interventions needed to cope with these changes and ensure that roads are safe. Section 2 of this report examines the extent to which interventions on key risk factors are adopted in different regions, while Section 3 considers the adoption of vehicle standards and infrastructure audits, all of which play an important role in determining overall road traffic fatality rates.

FIGURE 6
Road traffic fatality rates per 100 000 population, by WHO region





Road traffic deaths among pedestrians, cyclists and motorcyclists are intolerably high

More than half of countries (92) report policies to increase walking and cycling, compared to 68 in 2010.

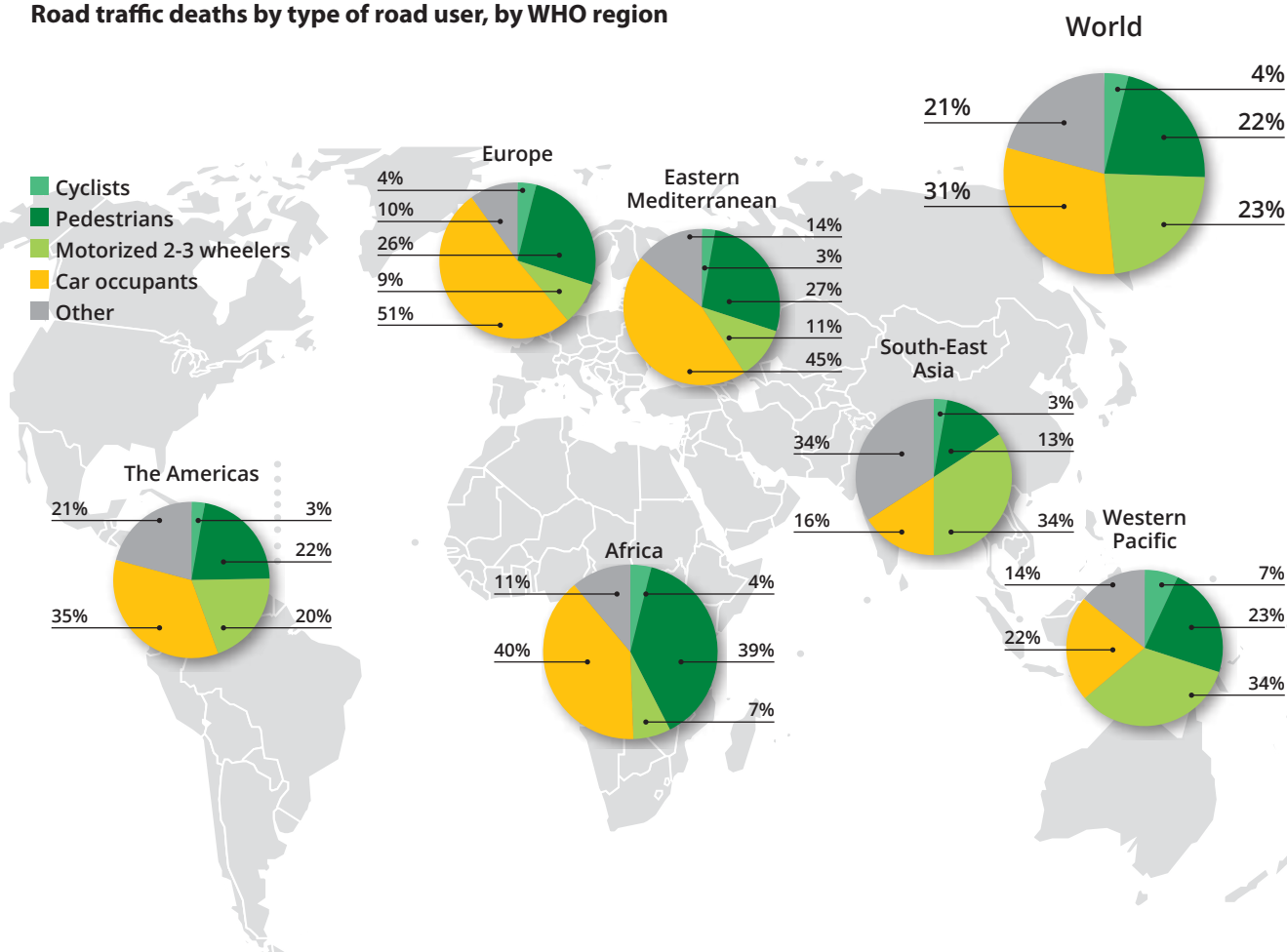
Almost half of all deaths on the world's roads are among those with the least protection – motorcyclists, cyclists¹ and pedestrians. However, the likelihood of dying on the road as a motorcyclist, cyclist or pedestrian varies by region: the African Region has the highest proportion of pedestrian and cyclist deaths at 43% of all road traffic deaths, while these rates are relatively low in the

South-East Asia Region (see Figure 7). This partly reflects the level of safety measures in place to protect different road users and the predominant forms of mobility in the different regions – for example, walking and cycling are important forms of mobility in the African Region, while in the South-East Asia Region and the Western Pacific Region, motorcycles are frequently used as the family vehicle.

¹ The term cyclist refers to users of two- or three-wheeled pedal cycles, but does not include those riding motorcycles or E-bikes.

FIGURE 7

Road traffic deaths by type of road user, by WHO region



More attention must be given to the needs of pedestrians and cyclists

Making walking and cycling safer is critical to reducing the number of road traffic deaths and is important for achieving the Decade of Action for Road Safety's aim to promote non-motorized forms of transport. During this assessment, 92 countries reported having policies to increase walking and cycling (see Section 3). This indicates progress relative to the 68 countries reporting such policies in 2010. And if public health is to be improved by encouraging forms of travel involving physical activity, making walking and cycling safer needs to be given special attention.

Motorcyclist safety must be prioritized too

Globally, nearly a quarter of all road traffic deaths are among motorcyclists. However, this too is disproportionately distributed across the world, with the South-East Asian Region and Western Pacific Region each accounting for 34% of the world's motorcyclist deaths,

compared to the African Region which account for 7%. This reflects the continuing situation whereby the use of motorcycles is much higher in Asian countries than elsewhere. Data from this report show that the proportion of motorcyclist deaths is largely unchanged since 2010 in all regions, except in the Region of the Americas: here the proportion of motorcycle deaths has increased from 15% to 20% of the total road traffic deaths over the 3-year period between 2010 and 2013, reflecting rapid growth in the number of motorcycles in the region's fleet. While this report found no change in the proportion of deaths among motorcyclists in the African Region, this may be due to the fact that only 15 of the 43 participating African countries provided data on deaths by type of road user. However, at country level, many African nations report a rise in motorcycle use of motorcycles and this shift is beginning to be reflected where data are available. Tanzania, for example, has seen motorcycles rise from 46% to 54% of its registered fleet in the last three years, and motorcycle deaths rise from 13% to 22% of its total number of road traffic deaths.

In the Region of the Americas, the proportion of motorcycle deaths rose from 15% to 20% of the total road traffic deaths between 2010 and 2013.





Greater progress in harmonizing data on road traffic deaths is needed

Data on road traffic fatalities are not robust in many countries

Data on road traffic fatalities are essential for monitoring country-level trends, tailoring prevention efforts, assessing progress and comparing the scale of road traffic deaths relative to deaths from other causes (10).

Vital registration data fulfil these needs best as they are a record of all officially registered deaths and are not time-limited. For example, a person who dies from injury complications 18 months after a road traffic crash will have a death certificate showing the road traffic injury as the contributing cause of death, and will be coded accordingly. However, not all countries have vital registration systems that provide cause of death information: in 2009, only 34 countries produced high-quality cause-of-death data, 85 countries produced lower quality data and 74 countries produced none (11).

Where countries do not have vital registration data of good quality,

police data is often a reliable source of information on road traffic fatalities. However, countries still have no consistent definition of a road traffic death for use in police databases; research for this report reveals that 100 countries now use a 30-day definition for their official road traffic fatality data – representing progress since 2010 when only 92 countries applied this definition to their fatality data¹. And while greater consistency such as this is a step in the right direction, the 30-day definition means that those dying of their injuries after 30 days are not necessarily recorded as road traffic fatalities in police databases.

Linking data sources (i.e. vital registration records, police data, insurance data, etc.) can improve official road traffic fatality estimates, but this process is not widely adopted. Only 25 countries report the use of combined (health and transport) data for their official fatality numbers.

1 This means that in most countries, police will follow up on the outcome of a crash for a month, but someone who dies as a result of a road traffic crash beyond this time period will not be counted as a road traffic fatality in police databases.

BOX 2

WHO estimates deaths: vital registration data versus police and other data

Many countries regularly submit vital registration data to WHO on all causes of death (usually annually). This survey asked countries to provide WHO with their official road traffic data. For some countries this meant that WHO had two estimates of road traffic deaths from one country (vital registration estimates, and estimates from police, transport ministries or other sources). In general, vital registration estimates are higher.

Where vital registration data were considered complete, these figures were used to generate a fatality estimate as indicated in the country profiles and Table A2. However, in countries not submitting regular vital registration data, estimates provided from this survey were subject to a mathematical estimation process (see Explanatory Note 3). In such cases the point estimate is shown with a 95% confidence interval.



Data on non-fatal injuries

For every person that dies in a road traffic crash there are at least 20 others that sustain non-fatal injuries (2). These injuries can have considerable impact on quality of life, and often carry with them significant economic costs. While progress has been made in allowing international comparisons of *fatality* data using comparable methods, it is much harder to make cross-country comparisons of *non-fatal* injuries.¹

Most official data for road traffic injuries are collected by police, yet not all crashes are reported to – or recorded by – the police. Furthermore, accurate assessment of injury severity requires specialized training. Absence of such training means police often rely on proxy indicators such as whether the injured person

required hospital admission. However, severity indicators such as this are not standardized across countries – a situation further complicated by issues related to access to care.

As a result, many countries now use hospital data as the basis for figures on non-fatal injuries. On their own, hospital data are not a substitute for police data, but using hospital data in addition to police data can provide valuable in-depth information on outcomes and costs.

Lack of emergency care creates injury outcome disparities

The gross disparities in injury outcomes between high-income countries and low- and middle-income countries relate directly to the level of care received immediately post-crash,

¹ Due to a lack of a standardised definition for non-fatal injuries this information was not collected as part of this survey.

and later in a health-care facility. Some estimate that if trauma care systems for seriously injured patients in low- and middle-income countries could be brought up to the levels of high-performing countries, an estimated half a million lives could be saved each year (12).¹

Quality of care at scene of the crash

In high-income countries, delivering emergency care at the scene of the collision and getting crash victims quickly to a health-care facility is often performed by professionally trained providers using sophisticated equipment and designated vehicles. However, in low-income countries, laypeople such as community leaders, police, or taxi drivers who are trained in basic injury care and the coordination of transportation to a health-care facility can also fulfil these roles.

The most efficient way to activate an emergency response is through a universal, centralized access number with central dispatch (see Box 3). However, when universal access numbers are unavailable (under development or during disasters), partial measures to facilitate access include simple mechanisms to advise patients on the nearest facility and transport options, such

as public broadcasts, mobile phone applications, electronic billboards or other mechanisms that provide real-time updates on available care resources.

Health-care staff must be trained in emergency care

Once at a health-care facility, a systematic clinical approach to the management of road traffic victim's injuries can improve outcomes. A consistent approach and systematic evaluation of every injured person ensures that life-threatening injuries are not missed, and that they are treated in order of the danger they pose. Hospitals in low- and middle-income countries are often staffed by general practitioners and nurses who treat a high volume of trauma patients every day, frequently without the support of dedicated trauma care training. Implementing accredited courses on trauma care for doctors and nurses in hospitals receiving a high-volume of trauma victims is an effective way of improving this care. In this assessment, 139 countries report having some type of emergency specialty for doctors, with this proportion higher in both high-income and middle-income countries (85% and 81% respectively) compared to low-income countries (53%). This indicates progress on rolling out such programmes relative to 2010 when 112 countries had such specialty

116 countries have a universal access number to activate emergency service response.

¹ Based on calculations showing approximately 2 million injury lives can be saved by such improvements. Of the current deaths and disability adjusted life years resulting from injuries 28% are from road traffic injuries.

BOX 3

Single emergency national access numbers

Currently, 116 countries have a universal access number to activate emergency service response. This compares to 111 countries which had this number in place in 2010. Ideally, a universal emergency telephone number should:

- be valid throughout the catchment area;
- be available from every telephone device (landline or mobile);
- be easy to remember and dial (i.e. limited to 3 or 4 digits);
- be free of charge;
- provide access to a nearby vehicle dispatch centre;
- guarantee the confidentiality of the caller.

BOX 4

Trauma care improvement in Khon Khaen, Thailand^a

In 2006, a review of data from Thailand's northeastern province of Khon Khaen indicated about 10 000 road traffic injured patients visited the hospital's emergency room each year, of whom 4000 were admitted to the hospital.

To examine if patient care was optimal, the hospital's managers created a multidisciplinary trauma care team to design a quality improvement programme. This required the regular review of cases of patients who had died in the hospital as a result of a road traffic crash in order to assess where care could have been better. As a result, opportunities for improved care were identified and a number of quality improvement activities were incorporated into the regular hospital routines. These included regular review of severe and critical patients each week, identification of gaps in care, and implementing simple corrective actions, such as provider training, monitoring protocols for severe cases and resource checks in the clinical setting. Most activities were simple and inexpensive.



The mortality rate among moderately and severely injured road traffic victims was reduced by almost 50% (13).

^a For a summary of this see *Strengthening care for the injured: success stories and lessons learned from around the world, 2004* (http://www.who.int/violence_injury_prevention/services/success/en/, accessed 16 September 2015).

programmes. Similarly, while the number of countries with a dedicated emergency training programme for nurses is lower at 113, there is nonetheless progress compared to the 96 countries that had such programmes in 2010.

Other solutions to improving the outcome of road traffic injuries include streamlining procedures as part of trauma care quality improvement programmes (see Box 4). These programmes involve examining data on the care and outcomes of injured patients in order to target improvements in such care (14). These programmes require limited costs and have been shown to reduce injuries and deaths (15).

Multisectoral action is essential for effective national road safety strategies

Coordination of road safety efforts across multiple sectors and

stakeholders is critical for success. In many countries this role is fulfilled by a lead agency that should ideally have the authority and resources needed to coordinate the implementation of a national strategy.

Currently 167 countries report having an agency that leads national road safety efforts, compared to 162 in 2010. In some countries these take the form of a designated stand-alone agency: for example, the Norwegian Public Roads Administration (NPRA) is a stand-alone entity that coordinates road safety across different sectors and levels of government in Norway, and is involved in reviewing legislation and in data collection and dissemination. In other countries, however, the lead agency is situated within a government ministry: France's inter-ministerial committee is housed within the Ministry of Internal Affairs, while in Vietnam the Ministry of Transport takes the lead in coordinating the country's road safety efforts.



Target-setting is important to the implementation of road safety strategies: 126 countries have specified fatality targets in their national road safety strategies.

Achieving sustained reductions in road traffic injuries requires countries to have a long-term vision and strategy for road safety, and to define the objectives to be attained within the strategy's time period. The process for developing such a national strategy should involve a considerable degree of stakeholder engagement at the national level so that all relevant sectors – health, transport, police, and nongovernmental agencies – invest in a strategy that is itself based on the best possible evidence.

Currently 150 countries have a national strategy for road traffic safety, most of which (131) are partially or fully funded. This is progress relative to the 139 countries that reported the existence of such a strategy in 2010, of which 119 were partially or fully funded.

While a national strategy is essential to defining the vision behind a road safety programme, its implementation requires tangible objectives and, in particular, intermediate targets (16). Target-setting is a valuable means to get – and keep – traffic safety on the political agenda. Most high-performing countries articulate time-bound reduction targets for road traffic fatalities and serious injuries. This survey found that 126 countries have set out fatality targets in their national strategies, with a much lower number (68) specifying reductions in non-fatal injuries¹. This shows progress relative to 2010, when 112 countries had fatality targets articulated in their strategy and 62 had targets on non-fatal injuries.

¹ The lower number of countries with non-fatal targets within their national strategy is likely to be related to the difficulties in defining non-fatal injuries, see page 12.



SECTION 2

LEGISLATION AND ROAD USER BEHAVIOUR

Many countries need to strengthen road safety legislation

In the last three years
17 countries
representing
409 million
people
have amended
their laws on one
or more key risk
factors for road
traffic injuries to
bring them into
line with best
practice.

Road safety laws improve road user behaviour – a critical factor in road safety – to reduce road traffic crashes, injuries and deaths. A number of countries have achieved sustained reductions in traffic-related injuries and fatalities through effective road safety programmes that have included legislative change (2,9). The most positive changes to road user behaviour happen when road safety legislation is supported by strong and sustained enforcement, and where the public is made aware of the reasons behind the new law and the consequences of noncompliance.

This section reports on an assessment of countries' current legislation to meet five key behavioural risk factors for road traffic injuries: speed, drink-driving, failure to use motorcycle helmets, seat-belts and child restraints¹. There is a strong evidence base showing the positive impacts that legislation on each of these risk factors can have on reducing crashes, injuries and deaths (2).

Best practice in drafting and implementing good road safety laws can be used by countries embarking on road safety legislative reform, though it should be recognized that road safety legislation is a dynamic field and that best practice evolves over time. This means that even high-performing countries constantly need to review their legislation, revising and updating it to meet the latest evidence base (this report explores two strong examples of this – drug-driving and mobile phone use while driving – where strong evidence bases have yet to be developed). Additionally, while the

evidence base may act as a “blueprint” for laws relating to many risk factors for road traffic injuries,² countries must take account of their local legislative context, the traffic situation, and a number of other country-specific factors that may all impact road safety legislation and the manner and speed at which legislative reform should be pursued (9).

This report highlights the progress that has been made in road safety legislation. It shows that between 2011 and 2014 there were 17 countries that made legislative revisions to laws relating to one or more of the five key behavioural risk factors. This represents 409 million people or 5.7% of the world's population. Figure 8 shows the number of countries that have made changes to their laws, by risk factor, and the population represented by these changes.

Enforcement is vital to the success of road safety laws

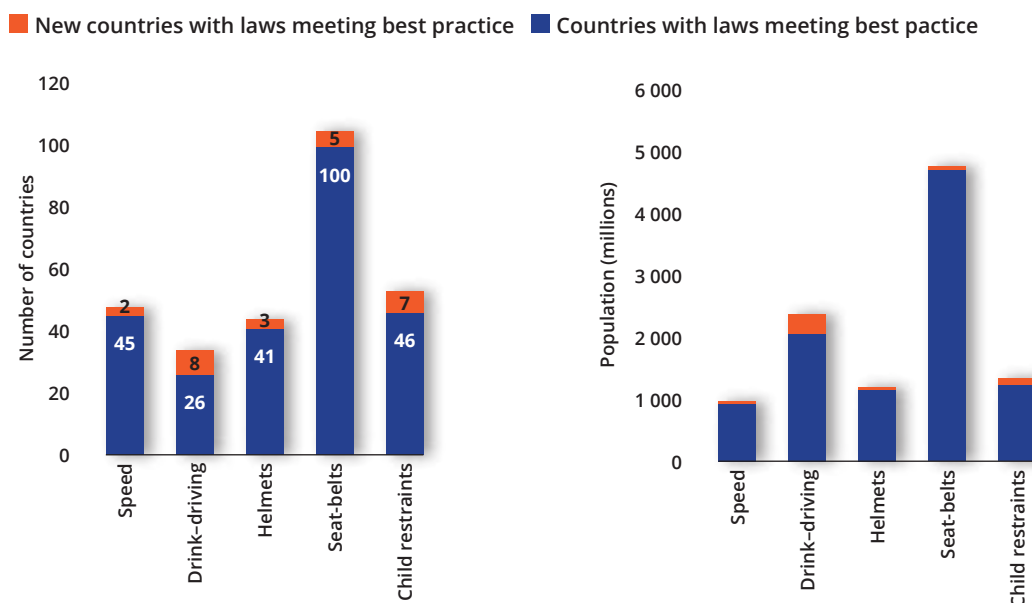
While there is clear evidence that enforcement is critical to the success of laws, the levels of enforcement required for maximum impact are often less readily available and depend on factors such as political will, available resources and competing priorities at a national level. In countries where legislation has not previously been accompanied by enforcement, particularly visible and high levels of enforcement may be needed to persuade the public that breaking the law in future may well result in a penalty. Furthermore, while some countries have dedicated traffic

¹ Legislation is also reported on an additional 2 risk factors (drug-driving and the use of mobile phones) but for which evidence on best practice is still being developed.

² See relevant sections on the five key behavioural risk factors.

FIGURE 8

Changes in legislation on behavioural risk factors 2011–2014 (number of countries and population represented)



police, in many countries the cadre of police officers who are in charge of enforcing road safety laws have many other responsibilities, and their focus on traffic law enforcement can quickly slip down the priority list when faced with other pressing concerns, such as national security.

Poor enforcement of traffic laws and regulations can also result from inadequate resources, administrative problems and corruption, all of which can restrict good laws in achieving their potential (17,18).

In such situations, advocacy efforts are critical to keep road safety high on the government and public agenda. Public awareness campaigns can be an effective way to do this, increasing understanding and support for enforcement measures and helping sustain a high perception of enforcement, which can itself work as an effective incentive for compliance (9,19).



Reducing speed

Speed is a critical risk factor for road traffic injuries

As average traffic speed increases, so too does the likelihood of a crash (20). If a crash does happen, the risk of death and serious injury is greater at higher speeds (21), especially for pedestrians, cyclists and motorcyclists (22). Male and young drivers are more likely to speed, while other factors likely to influence speed include alcohol, road layout, traffic density and weather conditions.

Ease of mobility must not be at the expense of safety

Easy, quick and relatively low-cost travel is important for people's work and personal lives, and at a national level it is important for economic growth. Safety must lie at the heart of speed management (bringing road users to a safe speed using an integrated set of measures), yet governments and those involved in speed management at local level face challenges when balancing mobility and safety. However, shifting the emphasis towards safety is at the heart of the "Safe System" approach (see Box 5) – a system that underpins successful speed management in high-performing road safety countries such as Sweden.

Within this framework, the speed limit on a section of road takes account of safety, mobility and environmental considerations, as well as the impact of the speed on the quality of life for people living along the road. Where motorized traffic mixes with pedestrians, cyclists, and moped riders, the speed limit must be under 30 km/h. This is due to the vulnerability of these road users at increasing speed: an adult pedestrian has less than a 20% chance of dying if struck by a car at less than 50 km/h but almost a 60% risk of dying if hit at 80 km/h (22). The type of crash that is likely in a particular situation is also an indicator for determining a safe speed. For example, on roads where front impacts with other road users are possible (such as on non-divided rural roads) a "safe speed" will be lower than on motorways, where head on collisions crashes are unlikely.

National speed limits are crucial for effective speed management

Setting and enforcing national speed limits is an important step in reducing speed. Most countries set a limited number of general national speed limits, for example for motorways, urban, and rural roads, with some providing further divisions (for

An adult pedestrian has less than a 20% chance of dying if struck by a car at less than 50 km/h but almost a 60% risk of dying if hit at 80 km/h.

BOX 5

The Safe System approach: accommodating human error

The Safe System approach to road safety ensures that, in a crash, impact energy remains below the threshold likely to result in death or serious injury. It goes beyond establishing speed limits to managing interactions between the environment, infrastructure and physical vulnerability. Within this approach, speed limits are a complementary intervention to creating safer roads, roadsides and vehicles that together work to accommodate driver error. All parts of the system need to be strengthened – roads, roadsides, speed restrictions and vehicles – so that if one part of the system fails, other parts will still protect people involved (24,25,26).

**47 countries,
representing
approximately 950
million people,
have urban speed
laws that meet
best practice.**

example between “urban residential” and “urban industrial” areas). Of the 180 participating countries, 97 set maximum urban speed limits of less than or equal to 50 km/h, in line with best practice¹. Although the definition of urban may vary between countries, given that these areas usually involve a high concentration of pedestrians and cyclists, speeds above 50 km/h would be unsafe. Many countries that set an urban speed limit of 50 km/h have exceptions to allow this speed to be increased in specific circumstances – for example on urban ring roads.

Enforcement of speed limits is essential to make them truly effective (23). Indeed, where countries have changed their national speed limits but have taken little supporting action to enforce them, there have been very limited benefits. This assessment found that only 27 countries (15% of participating countries) rate their enforcement of speed laws as “good” (8 or above on a scale of 0 to 10), suggesting that without ongoing and visible enforcement of speed limit legislation, the potential impact of speed legislation to save lives globally remains vastly unattained.

**Local authorities need
legislative power to reduce
national speed limits
where necessary**

A safe speed is one tailored to fit the road’s function and traffic composition

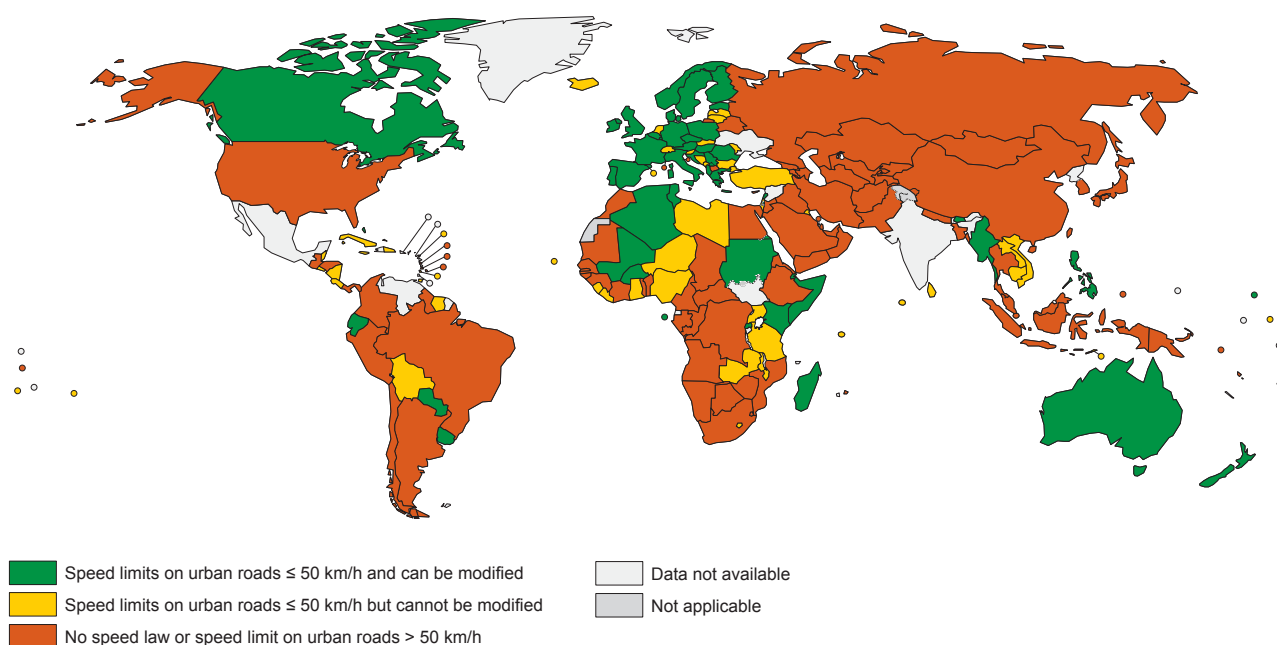
¹ Countries where legislation on risk factors is set at a subnational level were analysed according to whether or not a threshold level of subnational jurisdictions met specific criteria. For more information on this see Explanatory Note 1.

and is particularly important on roads with no median barrier and more mixing of traffic and road user types. So, while a country may set a national rural speed limit of 90 km/h, local authorities may need to reduce this on a particular stretch of road that is dangerously curved, or cuts through a residential community.

It is important that local authorities not only have the legal authority to reduce national limits, but also to manage local speeds according to particular road situations and in conjunction with other traffic calming or speed management policies. Such legal authority may be spelled out within the road traffic act itself, or in regulations, decrees or other legal documents beyond those relating to road traffic. However, this survey shows that only 88 of the 180 participating countries allow local authorities to reduce national speed limits.

Additionally, only 47 countries, representing approximately 950 million people, meet both legislative criteria for best practice on urban speed management – a national urban maximum speed limit of 50 km/h, *and* local authority power to reduce this limit to ensure safe speeds locally. Of these 47 countries, 24 are high-income, suggesting that speed management has a long way to go in the countries where it is most needed.

FIGURE 9
Urban speed laws, by country/area



BOX 6

Local authorities take the lead on speed

Giving local authorities the legal power to reduce national speed limits in their jurisdictions could produce a variety of results, as local authorities may have different views as to what constitutes an appropriate limit. The United Kingdom's Department for Transport addressed this challenge in 2006 by issuing *Setting local speed limits*, a publication aimed at local authorities.^a

This publication includes the most important considerations and principles in establishing speed limits, and is a good example of how to harmonize the setting of local speed limits within a country.

^a See <http://www.dft.gov.uk/pgr/roadsafety/speedmanagement/dftcircular106>.



Increasing motorcycle helmet use

Preventing motorcyclist head injuries is becoming increasingly urgent as motorcycle use rises

Data collected for this report shows that between 2010 and 2013 there was a 27% growth in the number of motorized two-wheelers globally. Motorcycles form a high proportion of vehicle fleets in many low- and middle-income countries, and motorcyclists comprise a large proportion of those injured or killed on the roads. While in high-income countries motorcycle deaths typically comprise about 12% of overall traffic deaths, in middle-income countries this more than doubles to 26%. There are also important regional differences: the South-East Asian and Western Pacific Regions have the highest proportions of motorcyclists killed (34% in each), while the African Region has the lowest (7%¹).

Motorcyclists are at an increased risk because they often share the traffic space with fast-moving cars, buses and trucks, and because they are less visible. In addition, their lack of physical protection makes them vulnerable to injury.

Injuries to the head and neck are the main cause of death, severe injury and disability among motorcyclists. The social costs of head injuries for survivors, their families and communities are high, in part because they frequently require specialized or long-term care (27). Head injuries also result in much higher medical costs than any other type of injury, meaning

these injuries can exert a high toll on a country's health care costs and its economy.

Wearing a motorcycle helmet can reduce the risk of death by almost 40% and the risk of severe injury by approximately 70%. Effective enforcement of motorcycle helmet laws can increase helmet-wearing rates and thereby reduce head injuries (28).

Helmet laws should cover all riders and specify a helmet quality standard

While 169 countries (94%) have a national law requiring the use of helmets among motorcyclists, there are a large number of countries where loopholes in these laws potentially limit their effectiveness. For example, of the 169 countries that have a helmet law, only 151 stipulate that the law applies to drivers and passengers, all road types and all engine types. Furthermore, only 74 of the 169 countries (41% of countries responding to the survey) explicitly state that the helmet needs to be correctly worn (i.e. properly fastened with the chin strap) in order to meet the law. While most countries have well-defined (and limited) exemptions to their laws, others contain exemptions that are open to interpretation and therefore harder to enforce: for example, some countries require helmets to be worn only "in built-up areas" or only on roads "where vehicles may be driven at a speed higher than the normal limit". Only 70 countries have national helmet laws that apply to all drivers and passengers, all road types and all engine types, and require the helmet to be properly fastened.

¹ This may be influenced by the relatively low proportion of countries in the region that provide data on deaths by road user

Helmets must be of good quality to be effective

The effectiveness of national helmet legislation in reducing injuries also depends on the quality of helmets worn. While there is a high quality international helmet standard (UN ECE regulation 22)¹, concerns with its accessibility and affordability in some low- and middle-income countries have led to some countries developing their own standard. These national standards may be more appropriate to local conditions, more affordable and more readily available, but the quality of helmets meeting these standards varies. Governments developing their own national standards must ensure that the standard meets minimum quality criteria, and that crash-testing facilities are available to test helmets produced to this standard.

Timing the introduction of a helmet standard can also affect its success, as newly set standards cannot be met if there are not enough helmets on the market that meet them (see

Box 7). Similarly, new regulations and standards should be rolled out carefully and in coordination with civil society, to help make them as widely accepted as possible. However, many countries (despite having a helmet law) still have no standard at all, or have legislation that is vague about the standard to which it refers. A study in nine low- and middle-income countries found that about half the helmets being used were non-standard helmets, limiting the potential gains of helmet use programmes (29).

Few countries meet best practice when it comes to helmet laws and helmet standards

This report found that only 44 countries, representing 1.2 billion people, have laws that: apply to all drivers and passengers, all roads and engine types, require the helmet to be fastened, and make reference to a particular helmet standard. Those that do are disproportionately high-income

¹ See <http://www.bbc.com/news/world-africa-31815807>

BOX 7

Setting helmet standards in Kenya: a stepwise process

The Kenyan Road Traffic Act requires motorcycle drivers and their passengers to wear helmets that meet a national standard.

Rather than articulating the standard itself, the law makes reference to a standard set out in a separate legal text by the Kenyan Board of Standards (KEBS), established in 1974 as the body in charge of testing, approving, stamping and monitoring a variety of products. So while the helmet legislation in the Road Traffic Act may remain constant over the years, the way it is written allows the standard to be modified and updated without the need to change the legislation. Indeed, in 2012 the Kenya Board of Standards/Vehicles Technical Committee (TC122) finalized a revision to the national helmet standard (KS77).

Although the law is in place and the standard approved, in order for the helmet standard to be put into effect the standard needs to be “published” by regulation and gazetted by the Minister of Transport. However, a 2014 study commissioned through the Bloomberg Initiative for Global Road Safety in Kenya into the availability and access to helmets meeting the new standard found that such helmets were largely unavailable on the Kenyan market. Thus, to date, the new standard has yet to be gazetted by the Ministry of Transport, allowing implementation of the standard and enforcement of the related law to be delayed until standard helmets are more widely available.

countries from the European Region (see Figure 10). This is particularly worrying as South-East Asia Region and the Western Pacific Region are known to have a high proportion of motorcycle deaths, while in the Region of the Americas the proportion of road traffic deaths among motorcyclists is on the rise – increasing from 15% to 20% between 2010 and 2013. The low number of countries meeting best practice on helmet laws in these regions suggests that much stronger laws are needed in most parts of the world.

Enforcement of helmet laws is critical to their effectiveness, yet only 68 countries rate the enforcement of their helmet laws as “good” (8 or above on a scale of 0 to 10). This shows that the issue of ensuring helmets are up to standard and properly worn needs urgent attention.

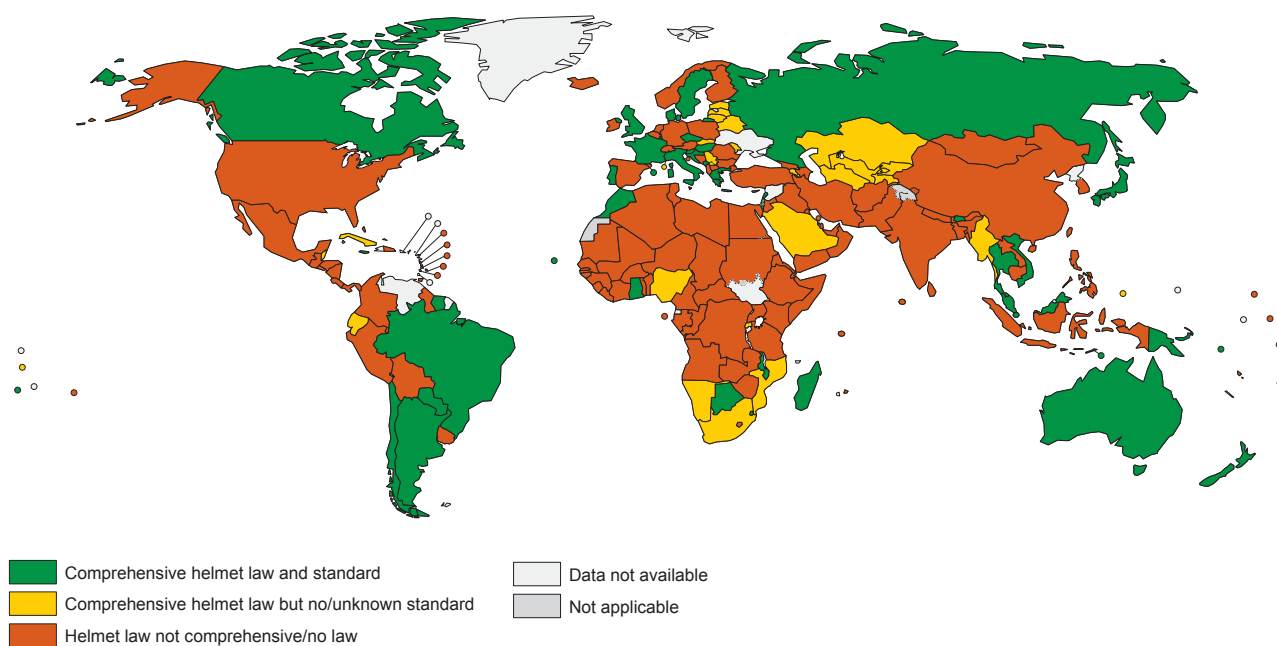
Children legally allowed as motorcycle passengers must be required to wear a helmet

In 46 countries, motorcycle helmet laws specify a minimum age at which children can ride as passengers, ranging from 3 to 14 years old. Other countries do not specify a minimum age in their law, but require that children on motorcycles are tall enough for their feet to reach the foot rests. Generally, children who are legally permitted to ride as passengers are also subject to the country’s laws on helmet use and standards¹. For example, an 8-year-old child in Australia is legally allowed to ride as a motorcycle passenger and is required to wear a helmet meeting the national standard. However, the

Only 44 countries, representing 1.2 billion people, have helmet laws that meet best practice and apply a helmet standard.

¹ UN Regulation 22 on motorcycle helmets also contains provision for child helmets.

FIGURE 10
Motorcycle helmet laws and helmet standards, by country/area



situation becomes more complicated in situations where no minimum age is prescribed or where children aged just 2 or 3 years are legally allowed as motorcycle passengers: providing protective headwear for young children is difficult for several reasons, including the fact that the size and shape of the human head evolves rapidly during the first four years of life (30). Nonetheless, some countries in South-East Asia (notably Viet Nam and Malaysia, where motorcycles are frequently the family vehicle) have set national child helmet standards and other countries in the region continue to explore how to address this issue.

More effort is needed to collect data on helmet-wearing rates

In order to assess the effectiveness of efforts to increase helmet wearing, countries need to collect regular data on helmet-wearing rates. However, less than half (41%) of all participating

countries have these data available, and in many that do, the data has been gathered using differing methodologies. This often makes comparisons over time and between regions impossible.

Other promising strategies that protect motorcyclists

While this report only addresses helmets as a critical factor to the safety of motorcyclists, there is an increasing body of evidence that relates to other measures that can enhance safety among this group. For example, mandating advanced braking systems (ABS) for all motorcycles, as recently introduced in the European Union, has shown to mitigate injuries and be cost effective; creating lanes exclusive to motorcycle use and requiring daytime running lights that increase motorcyclist visibility are both effective injury reduction strategies, while the use of protective clothing is considered a promising strategy.



Reducing drink-driving

Only 34 countries, representing 2.1 billion people, have drink-driving laws in line with best practice.

Laws based on blood alcohol concentration (BAC) limits can reduce road traffic crashes

Drink-driving increases the chance of a road traffic crash, as well as the likelihood that death or serious injury will result (21). The risk of impairment starts at very low levels of alcohol consumption and rises exponentially with alcohol intake. Drivers with a BAC of between 0.02 g/dl and 0.05 g/dl have at least a three times greater risk of dying in a vehicle crash. This risk increases to at least six times with a BAC between 0.05 g/dl and 0.08 g/dl, and rises exponentially above 0.08 g/dl (31). Drinking and driving is also associated with other high-risk road use behaviours such as speeding or not using seat-belts (32).

Drink-driving legislation, accompanied by visible and rapid enforcement following enactment, is an effective means of reducing alcohol-related crashes. Of those assessed for this report, 176 countries (98%) have a national drink-driving law in place, but only 134 of these are based on BAC limits (or equivalent breath alcohol concentrations). Eighty-four countries (47%) have a drink-driving law based on BAC with a limit of less than or equal to 0.05 g/dl for the general population, in line with best practice. Such laws are much more likely among high-income countries (73%) than middle- or low-income countries (43% and 13% respectively).

This means that 47% of all countries have yet to implement drink-driving laws for the general population that are based on best practice. Even in the 18 countries where alcohol consumption is legally prohibited, a drink-driving law

based on BAC of less than or equal to 0.05 g/dl is recommended and in place in some countries, such as in Morocco¹.

Young and novice drivers at increased risk

Young and novice drivers are at a much-increased risk of road traffic crashes when under the influence of alcohol compared to older and more experienced drivers (31). This increased risk has led many countries to implement lower BAC limits for this group. Laws that establish lower BAC limits (≤ 0.02 g/dl) for young and novice drivers can lead to reductions in the number of crashes involving young people of up to 24% while graduated licensing schemes (which may include lower BAC limits or zero tolerance limits for this group) are also effective at reducing alcohol-related injuries and deaths (31,32). Thirty-five countries (19%) apply limits less than or equal to 0.02 g/dl for this high-risk group.

Taken together these data show that only 34 countries, representing 2.1 billion people, have national drink-driving laws with a BAC limit of less than or equal to 0.05 g/dl as well as lower limits of less than or equal to 0.02 g/dl for young and novice drivers (see Figure 11). Twenty-one of these countries are in the European Region, suggesting the need to extend good practice globally. Nonetheless, progress has been made since 2011, during which time eight countries (representing 287 million people) have brought their drink-driving laws into line with best practice.

¹ Enforcing a zero alcohol law can be challenging. In addition some countries where alcohol consumption is legally prohibited do allow limited consumption among non-nationals. A drink-driving law based on BAC is therefore optimal, even in countries where alcohol consumption is legally prohibited.

BOX 8

Reforming drink-driving legislation in Jalisco, Mexico

In 2008, as part of the Bloomberg Philanthropies Global Road Safety Programme, a new road safety initiative was piloted in four locations in Mexico, including the state of Jalisco. One focus of the initiative was to help the government identify gaps in legislation relating to key risk factors and provide support to facilitate improvements to these laws. To this end, a review of road safety laws in Jalisco identified the need to strengthen the law on drink-driving, including reducing the existing BAC limit, which was above recommended best practice.

Strong relationships were established with different stakeholders, including federal and state authorities, local legislators and civil society in order to advocate for legislative change. These efforts included: open forums with civil society and media; expert meetings and informative sessions; and sessions with local authorities and legislators from the main political parties.

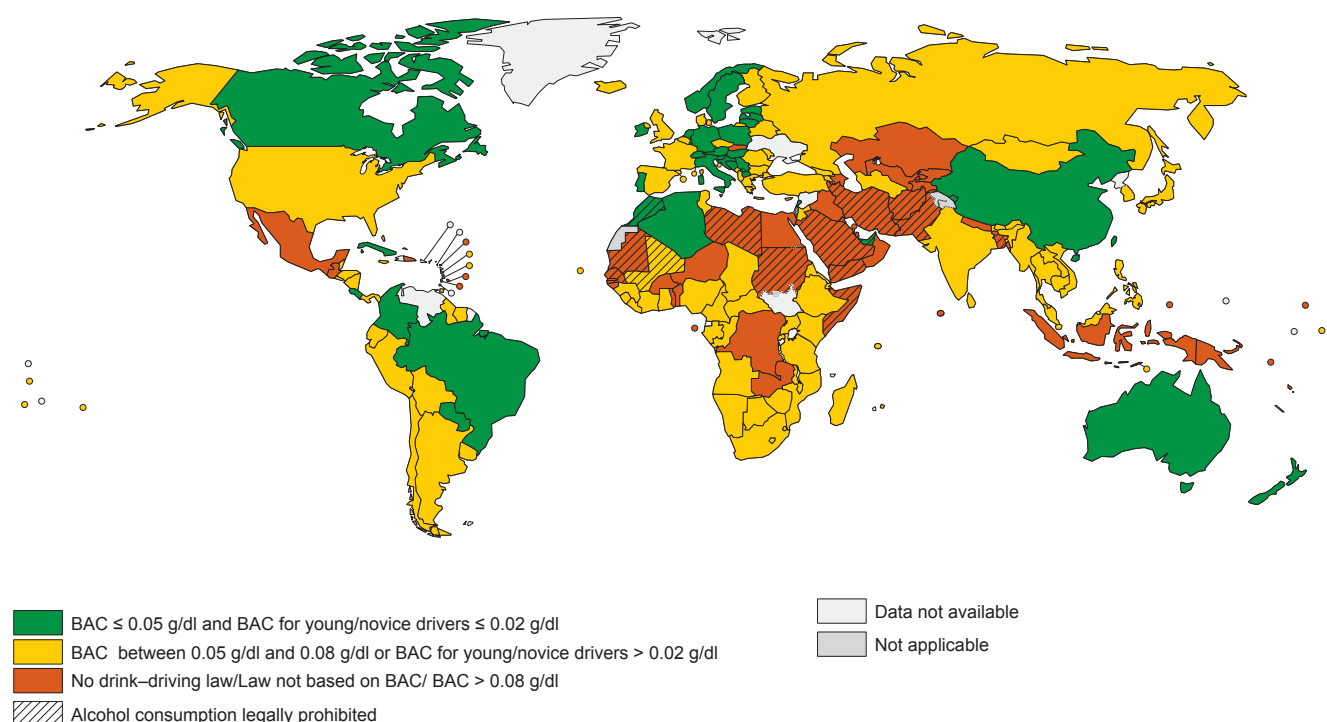
After extensive consultation among local, national and international stakeholders, legislative recommendations were drafted. In November 2010 the new state law, locally known as the “Ley Salvavidas” (“Lifeguard/life-saving law”), was amended to incorporate these provisions, which included lowering the blood alcohol concentration limit from 0.15 g/dl to 0.05 g/dl (in line with international best practice) and stiffer penalties for transgressing this law. Continued monitoring of the law’s implementation resulted in findings that it was not having the intended impact because of enforcement challenges. Notably the 2010 law specifically did not provide for the establishment of random alcohol checkpoints, shown to be effective at reducing drink-driving. Between 2010 and 2012, civil society and international road safety organizations engaged with policy-makers to advocate for regulations that would allow for random breath testing, a process which culminated in 2013, when the Jalisco state government adopted an amendment to the 2010 law that formally provided for the establishment of random alcohol checkpoints and a protocol for their implementation. The occasion of amending the law was also used to further increase penalties related to drink-driving.

The law amendment was accompanied by a hard-hitting social marketing campaign^a that supported dissemination of the new regulations and penalties, and communicated the risk of drink-driving. Alongside this legislative reform process and its dissemination, major capacity building efforts also took place to train and support police in effectively running random alcohol checkpoints.

The effects of the initiative are being monitored. Short-term results have shown significant changes in the proportion of alcohol-related deaths and collision rates in Jalisco following the implementation of the Global Road Safety Programme (33).

^a See <https://www.youtube.com/watch?v=boxRNvHSWEo&index=29&list=PL9S6xGsoqIBWAhPnNtIDoxP3OcRYqaQa0>.

FIGURE 11
Drink-driving laws, by country/area



**121 countries
 use random
 breath testing at
 checkpoints at
 specific times.**

Commercial drivers involved in drink-driving have more serious outcomes

Commercial drivers are another important group in relation to drink-driving: while drink-driving does not appear to be more prevalent in commercial than private transport, alcohol-related road crashes in commercial transport may result in more serious outcomes because of the greater size and mass of many commercial vehicles, notably those operated by public transport companies (34). Forty-six countries have set legal BAC limits for commercial drivers at less than or equal to 0.02 g/dl.

make potential offenders feel more likely they will be caught, leading to a swift fall in the number of offenders. Random breath testing and police sobriety checkpoints are enforcement mechanisms that have been shown to lead to significant reductions in alcohol-related crashes (31,35)¹. One hundred and one countries report using breath testing at checkpoints at specific times (e.g. holiday periods, when drink-driving prevalence is expected to be higher) while 121 countries use random breath testing, which is more effective at reducing drink-driving. However, only 46 countries rate their enforcement of drink-driving laws as “good”.

Enforcement of drink-driving legislation is critical to its effectiveness

Strong enforcement of drink-driving laws improves both their effectiveness and longevity (21,31). Enforcement is also more effective when supported by public awareness campaigns that

Other effective strategies to reduce drink-driving

Other mechanisms have strong evidence of effectiveness at reducing

¹ Random breath testing (RBT) requires stopping drivers and random, testing all who are stopped. Sobriety checks involve setting up particular checkpoints or road blocks and only testing those suspected of alcohol impairment. While RBT is most effective, both approaches are shown to reduce alcohol-related crashes.

drink-driving. Graduated driver 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. Evaluations of these systems have reported significant reductions in crashes and fatalities, with estimates of effectiveness varying from 4% to up to 60% (21). 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.

Alcohol ignition interlocks (or alcolocks), are automatic control systems designed to prevent driving with excess alcohol. They require the driver to blow into an in-car breathalyser before starting the ignition. If the device detects alcohol in excess of the threshold value (which can be set at different levels), the vehicle will not start. Alcolocks have been shown to be effective in preventing recidivism for both first time and repeat offenders and can play an important role in rehabilitation programmes (36,37).

More work is needed collecting data on drink-driving

Measuring the contribution of drink-driving to road traffic crashes helps countries evaluate the impact of efforts to prevent it. Only 95 countries have any data on the proportion of road traffic deaths attributable to alcohol, ranging from less than 1% of deaths in Costa Rica and Oman, up to 58% in South Africa¹. In some countries these data may be available from police crash reports. Police data are likely to be an underestimation of the problem, however, as police test only a small proportion of drivers involved in a crash for alcohol consumption. In other countries, all drivers who are involved in a fatal crash are routinely tested for alcohol. Although considered good practice, this happens in just 53 countries (31%).

¹ This does not include countries with very small populations and small numbers of road traffic deaths, where up to 100% of deaths may be attributable to alcohol.

Only 53 countries test all drivers who die in a crash for alcohol use.

Increasing seat-belt use

Seat-belts limit the movement of vehicle occupants in the event of a crash, dispersing the force of the restraint to reduce the likelihood of serious or fatal injury. They work as part of the wider occupant restraint system that includes airbags, seats, head rests and the vehicle structure itself (see Section 3).

Wearing a seat-belt reduces the risk of a fatality among drivers and front-seat occupants by 45–50%, and the risk of minor and serious injuries by 20% and 45% respectively. Among rear-seat occupants seat-belts reduce fatal and serious injuries by 25% and minor injuries by up to 75% (21). Wearing a seat-belt also significantly decreases the risk of being thrown from the vehicle in the event of a crash.

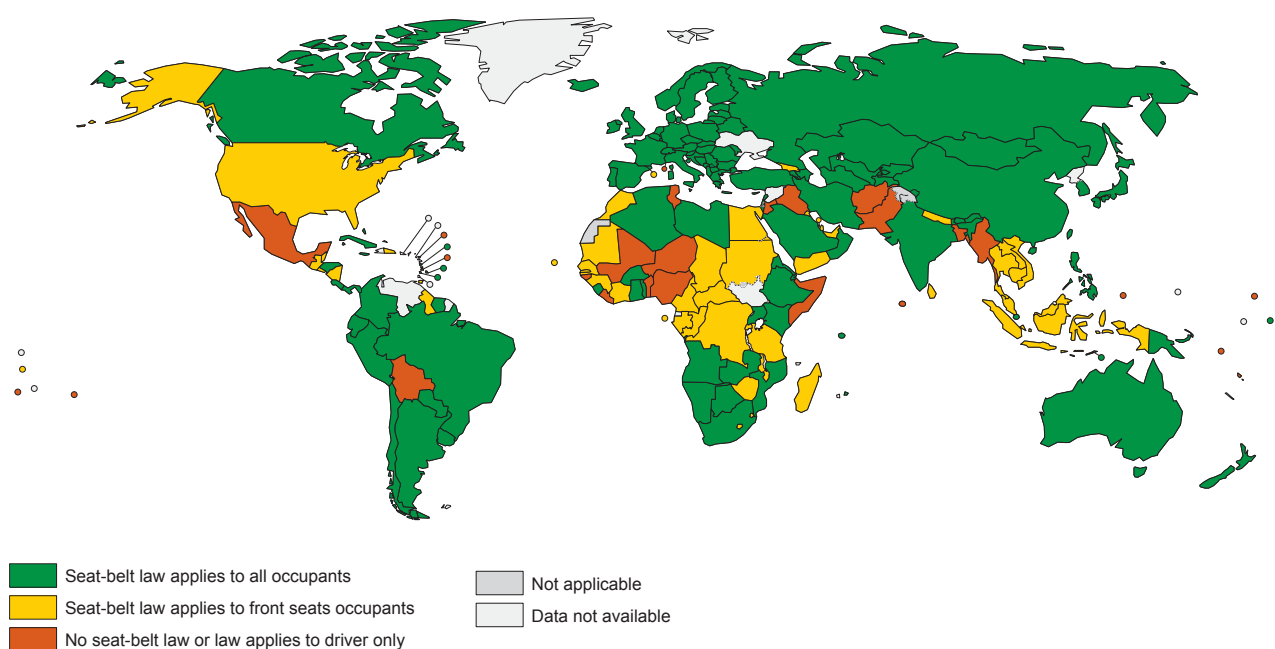
There are factors that can reduce seat-belt wearing rates – for example

where there are more passengers than available seating positions in a car, or where there are no anchorage points, or where these have been tampered with – but seat-belt legislation, when combined with strong and sustained enforcement, is an effective mechanism for increasing seat-belt wearing rates (38). Requiring standards for vehicles to ensure seat-belt anchorage points is also an important strategy to maximize the success of seat-belt wearing initiatives.

Just over half of all countries have enacted good seat-belt laws

The report shows that some progress has been made in countries modifying their seat-belt laws. Specifically, five countries, representing 36 million people, have brought their seat-

FIGURE 12
Seat-belt laws, by country/area



belt laws into line with best practice since 2011. While 161 countries have national seat-belt laws, only 105 countries, representing 4.8 billion people, meet best practice by including rear-seat occupants as well as front-seat occupants (see Figure 12). Other countries have seat-belt laws that, while they might apply to all passengers, have exclusions that weaken the law: for example, some countries apply a seat-belt law only on roads where vehicles may be driven at a speed higher than the normal limit, and others require seat-belt use only inside or outside cities. Such clauses dilute the impact of seat-belt law and create challenges for police tasked with implementing it.

In a number of high-income countries, seat-belt wearing rates are high among both front and rear-seat occupants. For example, France has a seat-belt wearing rate of 99% among front-seat occupants and 87% among rear-seat

passengers. Enforcement is key to achieving such high-compliance with legislation, but only 52 countries rate their enforcement of laws as “good” (8 or above on a scale of 0 to 10).

Almost half of all countries collect seat-belt wearing data

To assess the impact of interventions to promote seat-belt wearing, countries need to collect regular, robust data on seat-belt wearing rates. Such data are important as an intermediate indicator of the broader goal of reducing injuries and fatalities, and can help sustain political and public support for these efforts. Only 84 countries have any data on seat-belt wearing rates, with this number disproportionately higher in high-income countries (77%) than in low- and middle-income countries (7% and 43% respectively).

105 countries, representing 4.8 billion people, have seat-belt laws that cover both front and rear-seat occupants.



Increasing child restraint use

Protecting children requires properly fitting restraints

Seat-belts are not designed for children and do not offer the protection they give adults, but restraining them with adult seat-belts is preferable to letting them travel unrestrained. However, the best solution is to use age-appropriate child restraints. Children in an appropriate restraint are significantly less likely to be killed or injured than unrestrained children, and are also less likely to be killed or injured than children using adult seat-belts (21).

The effectiveness of child restraints in reducing injury or death varies by type of restraint. Rear-facing restraints for babies and infants (under 1 year) have been shown to reduce the risk of death or injury by 90% compared to being unrestrained (39). Forward-facing child restraints reduce the risk of serious injury by almost 80% compared to children restrained only by seat-belts. Children in booster seats, generally aged 4 to 10 years, have a 77% reduced risk of being injured in a crash compared to unrestrained children (39).

Additionally, children are safer seated in the rear of a vehicle than in the

front (21,39). Eighty-four countries have enacted laws preventing children sitting in the front of the vehicle – most such laws restrict children from sitting in the front if they are under a certain age (usually between 10 and 12 years) or under a specific height (usually between 135 and 150 cm).

Legislation mandating the use of child restraints can be an effective way to increase the use of restraints and reduce injuries (21). While 96 countries have a child restraint law of some type, only 85 countries base this law on age, weight or height – an important factor in achieving effectiveness. Most high-income countries have such a law while only a third of low- and middle-income countries base their child restraint law on one or more of these criteria.

Child restraint laws are notably lacking in some regions of the world: only one country in the South-East Asia Region – Timor Leste – and countries/areas in the Eastern Mediterranean Region (Lebanon, Saudi Arabia and the West Bank and Gaza Strip) have child restraints laws.

In this report, two criteria were considered necessary to meet best practice on child restraint legislation:

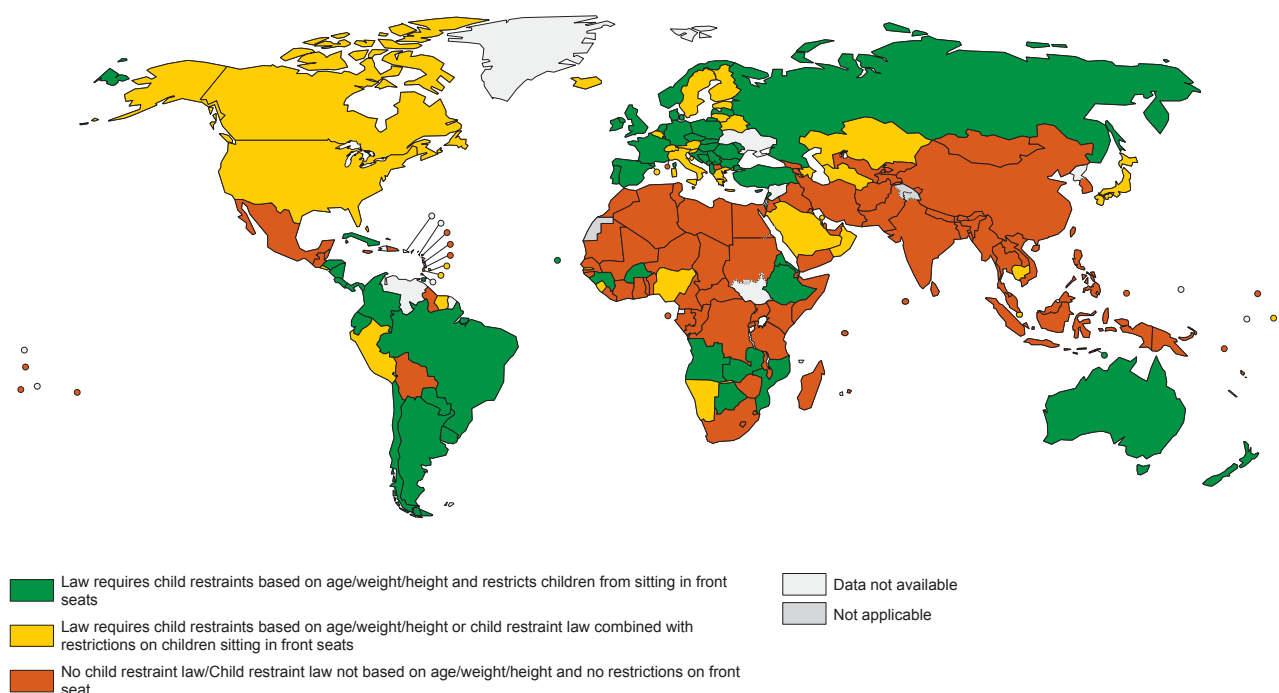
BOX 9

Meeting the child restraint challenge: ISOFIX

A 2011 EU study found that the average rate of misuse of child restraints was about 65%, confirming that many children are still incorrectly secured in cars (40). The ISOFIX system was developed to reduce misuse of child restraints and make them more effective. However, further progress in 2013 was made with the adoption of a new UN Regulation on “i-size” child restraints, which should further simplify child restraint use while simultaneously increasing safety. Until such a system is universally used, however, some countries have “car seat check” systems at local levels that provide free advice on correct installation.

See <http://www.unece.org/fileadmin/DAM/trans/doc/2014/wp29grsp/GRSP-56-27e.pdf>

FIGURE 13
Countries meeting best practice criteria on child restraint laws



the existence of a law that applies an age, weight or height restriction on children sitting in the front seat, and a national child restraint law based on age, height or weight. When taken together, the report shows that only 53 countries meet both these criteria, representing just 17% of the world's population (see Figure 13). Nonetheless, progress is being made: seven of these countries, representing 101 million people, have brought their child restraint laws into line with best practice in the past three years.

Compliance with child restraint laws is low

Even though legislation has an important role in increasing child restraint use, achieving compliance with child restraint laws is challenging, even in high-income countries. For example, in the United Kingdom, 75% of children aged 1–4 years were using an appropriate child car restraint but this rate is much lower for children aged 5–9 years (41). Studies

in a number of high-income countries have shown that in a large proportion of vehicles, child restraints are not fitted into the car nor used correctly. Incorrect fitment and use seriously compromises the effectiveness of the restraint system. The cost of child restraints can also be prohibitive to many families and may be a challenge to the effectiveness of legislation. While enforcement of child restraint laws is frequently weak- this report found that only 22 countries rate their enforcement of child restraint laws as 'good' (8 or above on a scale of 0 to 10).

Increasing compliance requires additional efforts that address these challenges – facilitating access-distribution of restraints, supporting correct usage, and addressing issues of access and cost (42,43). Community-based education and distribution schemes, maternity hospital loan schemes, voucher programmes to encourage subsidized purchase of restraints, and checking programmes that verify correct fitting are many of the strategies that have had promising

53 countries, representing 1.2 billion people, have a child restraint law that meets best practice.

results in many high-income countries (43,44). Enforcement of child restraint laws remains critical to their success, but it is also important (as more low- and middle-income countries adopt child restraint laws in line with good practice) that learnings from high-income countries on boosting child restraint use are applied, helping laws

achieve their maximum potential more quickly.

Assessing the impact of child restraint laws is further complicated by the low number of countries with data on child restraint use by age group. Only 25 countries have any data at all on child restraint rates.

BOX 10

Weak laws in the world's 10 most populous countries put 4.2 billion lives at risk

The world's 10 most populous countries account for almost 4.2 billion people and 56% of the world's road traffic deaths (703 000). None of these countries has laws on all five risk factors, in line with best practice.^a If these countries were all to bring their road safety laws in line with best practice, and adequately enforce them, there would be huge potential to save lives and reduce injuries resulting from road traffic crashes. Furthermore, this would go a long way towards reaching the target reduction in road traffic deaths identified in the Sustainable Development Goals.

An analysis of legislation of these countries (see Figure 14) shows that:

- none of the 10 countries meets best practice criteria across all 5 risk factors;
- no country meets best practice legislation for speed;
- only two countries meet best practice criteria on drinking and driving, representing 1.6 billion people;
- three countries, representing 470 million people, have laws meeting best practice on helmets;
- five countries have seat-belt laws that meet best practice, representing 3.1 billion people;
- only two out of 10 countries have child restraint laws meeting best practice, representing 340 million people.

^a Countries where legislation on risk factors is set at a subnational level were analysed according to whether or not a threshold level of subnational jurisdictions met specific criteria. For more information on this see Explanatory Note 1.

FIGURE 14

Ten most populous countries and best practice legislation

	Speed	Drink-driving	Helmets	Seat-belts	Child restraints
China		✓		✓	
India				✓	
USA					
Indonesia					
Brazil		✓	✓	✓	✓
Pakistan					
Nigeria					
Bangladesh					
Russian Federation			✓	✓	✓
Japan			✓	✓	



Reducing drug-driving

Drug-driving is an emerging road safety issue

While a considerable amount is known about the magnitude of problems associated with drink-driving and the effectiveness of related countermeasures, much less is known about driving when impaired by other psychoactive substances. To date, there are no global estimates of deaths resulting from drug-driving, nor is the prevalence of drug-driving known, either at global or regional levels. However, growing recognition of the problem of drug-driving has led to increased focus on this area among road safety policy-makers and researchers (45).

There are a wide variety of psychoactive substances that have the potential to adversely affect driver behaviour. These include:

- many illicit drugs (e.g. cannabis, cocaine)

- psychoactive¹ and analgesic prescription medicines (such as benzodiazepines, opioids)
- new psychoactive substances coming on the market.²

The effects of such substances on driver behaviour and crash risk vary considerably depending on the substance itself. A meta-analysis that compiled information from 66 studies showed an increase in risk of a crash for 11 different drugs tested (46).

The difficulties of addressing drug-driving

Efforts to reduce drug-driving are, to a large degree, influenced by the wealth of experience gained in

¹ A psychoactive drug is any chemical substance that changes brain function and results in alterations in perception, mood, or consciousness.

² New psychoactive substances that are on the global drugs market are substances that are not under international control, but mimic the effects of controlled substances. These substances also have the potential to pose serious risks to public health and safety (45).



BOX 11

Drug-driving legislation in the United Kingdom

In 2012, the UK government announced a new offence in relation to driving with specific controlled drugs in the body above the drugs accepted limit. The aim was to reduce expense, effort and time wasted from prosecutions that fail because of difficulties proving a particular drug impaired a driver.

Following a report from a panel of experts and a drug-driving consultation the government decided to take:

- a zero tolerance approach to eight drugs most associated with illegal use – for example, cocaine;
- a road safety risk based approach to eight drugs most associated with medical uses, such as methadone;
- a separate approach to amphetamine that balances its legitimate use for medical purposes against its abuse.

On 2 March 2015, eight general prescription and eight illicit drugs were added into new regulations that came into force in England and Wales. Regulations on amphetamines came into force on 14 April 2015.

See <https://www.gov.uk/government/collections/drug-driving#table-of-drugs-and-limits>

relation to drink-driving and usually involve a combination of laws, enforcement and primary prevention (45,47). However, the situation is more complex in relation to drug-driving for the following reasons.

- The term “drugs” encompasses a wide variety of substances – some illegal but widely used; others prescribed, legally purchased and taken; others bought over the counter.
- Detecting and measuring levels of psychoactive substances is more complicated than detecting alcohol in breath, and requires samples of blood, urine or saliva. It also requires sophisticated levels of expertise among police to recognize impairment and carry out tests.
- Crash risk for drugs is more complicated to ascertain than for alcohol and depends on the drug concerned. Since different types of drugs stay in the bloodstream for different lengths of time, this can complicate the ability to link a positive drug presence with crash risk.

- Lack of scientific evidence on the links between drug levels, impairment and crash risk for many drugs makes it difficult to set threshold limits for each substance.

Countries are enacting drug-driving legislation based on evolving evidence

As a result of these complicating factors, objective measures akin to BAC limits are largely lacking in most countries’ laws on drug-driving. While 159 countries (93% of those assessed) have national legislation prohibiting drug-driving, most of these laws do not define what substances are considered to be drugs. Some countries get around citing specific substances in their drug-driving laws by applying “zero tolerance”, which simply reinforces laws relating to the illegal possession and consumption of drugs. A handful of countries, however, include a list of drugs in their road traffic laws. For example, Luxembourg prohibits

159 countries address drug-driving in their road safety legislation but in most cases these laws are too vague to be effective.

driving under the influence of cannabis (tetrahydrocannabinol, or THC), amphetamine, methamphetamine, morphine and cocaine. Other countries have moved towards specifying limits of drugs where threshold levels for crash risk have been established (see Box 11). This strategy is in accordance with recommendations of the meta-analysis already referred to which recommend: establishing threshold levels for certain drugs where there is a solid science base linking consumption levels with crash risk; a standardized approach to testing for specific drugs; and for consensus to be articulated on optimal enforcement procedures relating to specific drug-driving laws (46).

Training police to recognize and test for drug-driving

Where a threshold level has been articulated in legislation, enforcement

officers must be trained to collect samples of bodily fluid for testing. However, for drugs that as yet have no set threshold, enforcement officers must be trained to recognize signs and symptoms of drug use; assess impairment, and take samples to determine the type and level of substance present.

Random checkpoints are a widely used and effective way to reduce drink-driving, but the same body of evidence around checkpoints for drug-driving does not yet exist. Some countries allow random drug testing, while others allow it but only if another offence (e.g. speeding or dangerous driving) seems to have been underway at the time. What is clear is that investing in enforcement of drug-driving at the expense of drink-driving programmes is not effective since drink-driving remains a higher priority for most countries' road safety.

Reducing distracted driving

Distracted driving is a serious and growing threat to road safety

While there are different types of driver distraction¹, the rapid growth in possession and use of mobile phones – as well as other in-vehicle technologies – is an area of great concern to policy-makers involved in improving road safety.

Mobile phone use creates various types of distraction: visual, auditory, manual and cognitive (48,49,50). Texting involves cognitive distraction, as well as longer periods of both manual and visual distraction.

Evidence shows that the distraction caused by talking on mobile phones can impair driving performance in a number of ways, e.g. longer reaction times (notably braking reaction time), impaired ability to keep in the correct lane, and shorter following distances. Texting also results in considerably reduced driving performance, with young drivers at particular risk (51).

Four-fold increase in crash risk when talking on a mobile phone while driving

One study found that 69% of drivers in the United States of America (USA) had used their mobile phone while driving within the previous 30 days – a percentage higher than in Europe, where it ranged from 21% in the United Kingdom to 59% in Portugal (52). The contribution of mobile phone use to

crashes, however, is unknown in many countries, as data on mobile phone use is not routinely collected when a crash occurs: only 47 countries collect data as part of regular police crash reports, while another 19 carry out regular observational studies to obtain such data. An overview of available data suggests that drivers talking on a mobile phone are approximately four times more likely to be involved in a crash than those who are not. Hands-free phones appear to have no significant advantage over hand-held phones – most likely because the most dangerous type of distraction (cognitive) applies equally to both.

Although most of the research carried out in this area relates to driver of four-wheeled vehicles, the role of mobile phone use in motorcycle crashes is also becoming an increasing concern. As motorcycle fleets increase in many parts of the world, monitoring the prevalence of mobile phone use among drivers of two-wheelers and estimating the contribution of this behaviour to road traffic injuries will become increasingly important (53).

Evidence on effective ways to reduce mobile phone use while driving is still evolving

To date, there is little information on the effectiveness of interventions to reduce mobile phone use while driving (48,54). As a result, a number of countries are following an approach that has been known to be successful in addressing other key risk factors for road traffic injuries. Legislation prohibiting the use of hand-held mobile phones while driving exists

Legislation prohibiting the use of hand-held phones while driving exists in 139 countries, while a further 31 countries prohibit both hand-held and hands-free phones.

¹ These include “internal” distractions, including behaviour in the vehicle that may be distracting (e.g. smoking, eating), as well as external distractions, such as the visual distraction associated with looking at billboards and other roadside advertising.



in 138 countries, and a further 31 countries prohibit both hand-held and hands-free phones. However, due perhaps to difficulties enforcing this legislation, there remains little evidence of the effectiveness of such measures: in the Netherlands, mobile phone use has been banned since 2002 but there is mixed evidence about the impact of this measure (55).

Other measures also being considered and implemented at a subnational level to reduce mobile phone use include:

- phone apps that divert calls to an answerphone while driving above 10 km/h;¹

- in-car features that warn the driver of sudden lane departures;
- employer action – many companies now address distracted driving among employees by limiting or prohibiting the use of mobile phones while driving.

Such measures need better evaluation but given the current challenges with enforcing legislation on mobile phone use in cars, they may serve as effective additional strategies to reducing the prevalence of distracted driving and the injuries that result.

¹ An example is the 'Auto Reply App' introduced by the Dutch Traffic Safety Association. This app prevents the phone from ringing at speeds higher than 10 km/h. At the same time a message is sent to the person who is calling which says that the driver is presently not available as he or she is behind the wheel (55).



SECTION 3

SAFER VEHICLES
AND ROADS

Policymakers must give more attention to making vehicles and roads safer

Electronic stability control (ESC) is effective at reducing crashes and saving lives but only 46 countries apply a mandatory ESC regulation.

Most countries fail to apply minimum UN safety standards to new cars

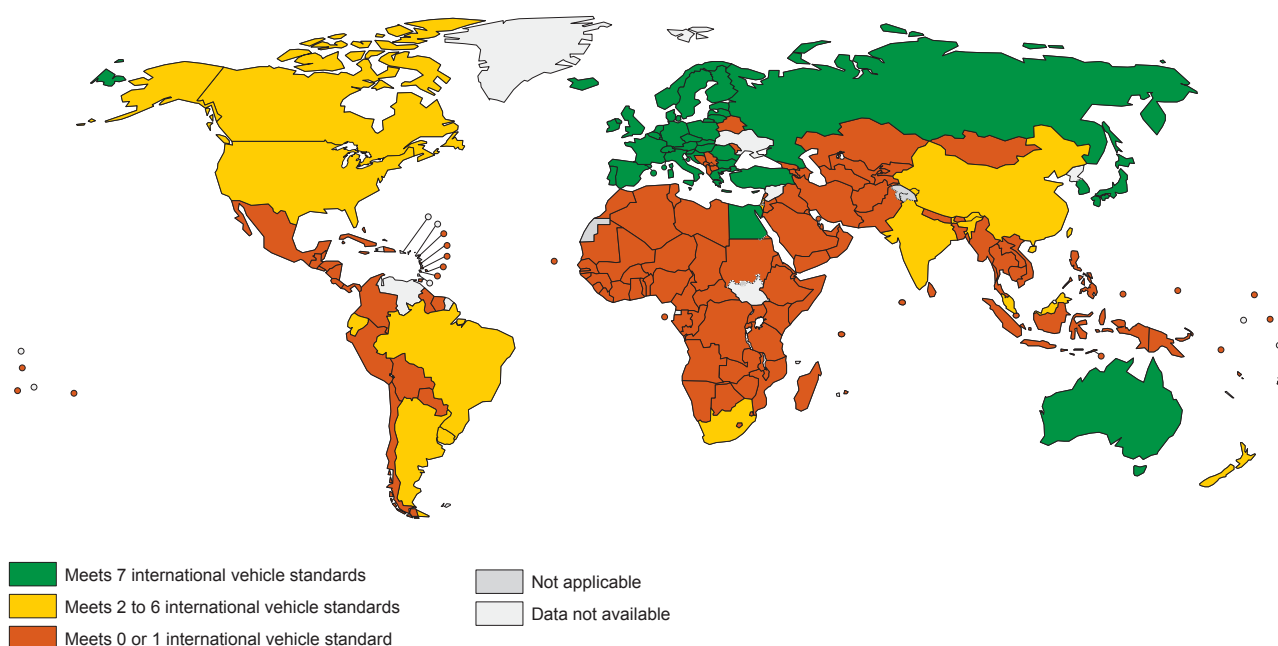
The massive investment in road infrastructure over the past decade has been accompanied by rapid global motorization (56). Indeed, this report shows that the past three years alone have seen a 16% increase in the number of registered motorized vehicles. This growth is highest in the world's emerging economies: in 2014 there were a record 67 million new passenger cars on the world's roads, with nearly 50% of these produced in middle-income countries (57).

Safe vehicles are an important part of the Safe Systems approach (see page 21), as they play a critical role both in averting crashes and reducing the likelihood of serious injury in the event of a crash.

Over the past few decades a combination of regulatory requirements and consumer demand has led to increasingly safe cars in many high-income countries. Many of the features that began as relatively expensive safety “add-ons” in high-end vehicles have since become much cheaper and – in some countries – are now mandatory requirements for all vehicles (40).¹ However, rapid motorization in low- and middle-income countries – where the risk of a road traffic crash is highest – and the growing manufacture and use of vehicles taking place in these emerging economies means there is an urgent need for these minimum vehicle standards to be implemented by every country.

¹ Note that this report focuses on safety regulations of new cars, although the need for these regulations to be extended to older cars in existing vehicle fleets is also very important. Some countries apply such standards to new cars as a first step and then phase-in their application to vehicles already in circulation.

FIGURE 15
Countries applying priority UN vehicle safety standards



Vehicle safety regulations function differently around the world. In some countries or regions they are extremely strict, while in others they are weak or non-existent. In the absence of appropriate standards automobile companies are able to sell old designs no longer legal in well-regulated countries. Alternatively, automobile companies may “de-specify” life-saving technologies in newer models sold in countries where regulations are weak or non-existent. For example, a global car manufacturer required to ensure that the vehicles it sells in high-income countries all have electronic stability control (ESC) can sell the same model to markets without this life saving technology if the country does not apply the ESC regulation.

Nonetheless, at the international level there are efforts to harmonize this system of regulations, ultimately facilitating the roll-out of best practice and making practices such as de-specification more difficult. The UN World Forum for Harmonization of Vehicle Regulations¹ is the primary global body responsible for the development of passenger car safety standards and its regulations provide a legal framework covering a range of vehicle standards for UN Member States to apply voluntarily. Through the World Forum, motor vehicles can now be internationally approved without further tests, provided they meet the relevant UN regulations that include both “crash-worthiness” (providing protection when an incident occurs) and “crash avoidance” (preventing a collision from happening at all) (58). This report considers seven priority regulations of the UN World Forum that apply to passenger vehicles. Figure 15 highlights countries applying the three regulations considered to be

the most important, as well as those applying all seven priority regulations.²

Standards protecting occupants in front and side impact crashes are poorly implemented

The World Forum’s most important crash-worthiness regulations help to protect occupants withstand front and side impact crashes.³ During simulated tests, energy absorbed by the crash-test dummy must be below a certain threshold for the car to pass the tests. However, these requirements are poorly implemented globally: 49 countries (27%) apply the UN frontal impact test regulation and 47 (26%) apply the side impact test regulation. These are predominantly high-income countries.

Electronic stability control is highly effective and should be mandatory in all vehicles

The most important UN regulation for crash avoidance is electronic stability control. ESC aims to prevent skidding and loss of control in cases of oversteering or understeering, and is effective at preventing different types of crashes (single car crashes, head-on and rollover crashes, and crashes involving multiple vehicles), reducing both serious and fatal injuries (59,60). The success of ESC has led to it rapidly becoming mandatory in many high-income countries.

Nonetheless, at a global level only 46 countries adhere to the UN regulation⁴

Pedestrians account for 39% of road traffic deaths in the African Region, yet only one African country has signed up to the UN safety standard that protects pedestrians in the event of a crash.

¹ Hosted by the United Nations Economic Commission for Europe (UNECE).

² The first is the most important minimum standard for crashworthiness, the second is the most important for crash avoidance, and the third is important for non-car occupants.

³ UN Regulations 94 and 95. In the USA the corresponding tests are FMVSS 208 and 214.

⁴ UN Regulation 13H. In the USA the equivalent requirement is FM126.

on ESC, of which the majority are high-income countries. The technology is also effective in commercial vehicles such as trucks, coaches and mini-buses. This suggests that there is enormous life-saving potential for this technology across the world's entire vehicle fleet that has yet to be tapped globally.

Vehicles can be built to better protect pedestrians

This report shows that pedestrians comprise 22% of all road traffic deaths – approximately 275 000 deaths a year

globally. The most serious pedestrian injuries are usually caused by the direct impact of the vehicle rather than by being thrown into the road. The severity of injury is influenced by factors such as speed and type of vehicle, and by the design of the front of the vehicle.¹

Until recently, vehicle design incorporated few features to protect pedestrians, but there is an increasing effort to include design elements that reduce the likelihood of pedestrian

¹ Severity is also influenced by biological factors.

BOX 12

New Car Assessment Programmes drive consumer demand for safer vehicles

New Car Assessment Programmes (NCAPs) are highly successful in promoting supply and demand for safer vehicles. Typically, NCAPs carry out crash tests on dummies in new cars to rate the vehicle's performance – five stars represent the top score. In some areas NCAPs use tests that meet UN regulations, but they can also test the extent to which cars perform above these minimum standards. For example, they can test frontal impact performance at speeds higher than those used in the UN regulation test.

There are currently nine NCAPs or similar bodies around the world. Although all NCAPs use star ratings to rank vehicle safety, five stars do not necessarily represent the same level of car safety in all regions. For example, in some NCAPs, a five-star rating means the model has ESC, while in regions where ESC is not yet applied, a five-star NCAP rating does not include ESC.

NCAPs can play a powerful role in encouraging consumers to choose vehicles based on safety. For example, the Australasian NCAP (ANCAP) has crash-tested more than 490 vehicles and its results, published regularly, have been instrumental in pushing up the proportion of cars meeting ANCAP's five-star standard. A decade ago only 20% of cars tested by ANCAP achieved five stars, whereas in 2013 this figure had risen to 80%. Studies showing that the risk of being killed in a one-star vehicle are double those of a five-star have made ANCAP-tested vehicles a powerful consumer tool contributing to this progress.

In newer NCAP programmes, such as Latin America, results of the first NCAP programme in 2010 indicated that safety in top selling cars lagged 20 years behind North America and Europe. However, by 2014, five models were awarded five-stars and were well above regulatory requirements.

The Global NCAP organization supports new testing programmes in rapidly motorizing countries. In 2013, a testing project was initiated in India on five key models that together account for around 20% of all new cars sold in the country. The models were tested at both the UN frontal impact testing speed (56 km/h), and at the higher NCAP speed, 64 km/h. Four of the five models failed the UN regulation test and all scored zero at 64 km/h as a result of either poor structure or lack of air bags. Photographs of the tested cars – collapsed and showing high risks of life-threatening injuries to occupants – triggered important developments. Manufacturers have offered to adhere to particular standards to improve the safety of some of the tested vehicles, while discussions with the Government of India have led to pledges to apply UN-equivalent crash-test standards for front and side impact in two phases. A local NCAP (called the Bharat New Car Assessment Programme) is also being developed and will be operational when testing facilities are ready.



collision and/or reduce the severity of pedestrian injury in the event of a crash. Softer bumpers, combined with better bonnet area clearance and removal of unnecessarily rigid structures are required to reduce the severity of a pedestrian impact with a car. The UN regulation for pedestrian protection encourages the design of these more “forgiving” car fronts. However, only 44 countries apply this regulation and again, these are overwhelmingly high-income European countries. Indeed, only one African country (South Africa) applies this standard, and yet 39% of road traffic deaths in the African Region are among pedestrians.

Vehicle standards and fixtures are crucial to improving seat-belt and child restraint use

Seat-belts and child restraints are extremely effective at saving the lives of car occupants in the event of a crash. Ensuring that vehicle manufacturers fit seat-belts and the fixtures necessary for child restraints is therefore critical to reducing road traffic fatalities.

The seat-belt regulation that forms part of the UN’s vehicle standard regulations ensures that seat-belts are fitted in vehicles when they are manufactured and assembled; the anchorage regulation ensures that the seat-belt anchor points can withstand the impact incurred during a crash, to minimize the risk of belt slippage and ensure that passengers can be safely removed from their seats if there is a crash. Fifty-two countries apply regulations on seat-belts and seat-belt anchorages. The child restraint regulation means that instead of holding the child seat in place with the adult seat-belt, the vehicle is equipped

with ISOFIX child restraint anchorage points to secure the restraint that are attached directly to the frame of the vehicle. Forty-eight countries apply the regulation that supports the use of ISOFIX seats.¹

While much progress has been made in recent decades to make vehicles safer, there is enormous scope for many more lives to be saved if countries apply minimum safety standards to their manufacture and production.

The World Forum regulations are an important step in ensuring that this happens, and for rolling out good practice in vehicle safety. However, to date, only 40 countries meet all seven priority safety regulations surveyed in this report (and recommended by the Global New Car Assessment Programme),² and these are overwhelmingly high-income countries. There are also worrying disparities in where these regulations are applied: the Americas, Eastern Mediterranean, African and South East Asia regions are notably absent from applying these regulations (see Figure 15).

Given the increase in vehicle production in the emerging economies, it is important that these new vehicle-producing countries take steps to ensure basic standards for those to whom they sell cars. Similarly, ensuring that all low- and middle-income countries adhere to minimum vehicle safety regulations would make it difficult for automobile manufacturers to sell old models and de-specify safety technologies. Governments have a responsibility to take the steps needed to ensure their citizens have access to safe vehicles.

¹ See Box 9, page 36.

² See <http://www.globalncap.org/>

Vehicles sold in
80% of all
countries fail
to meet priority
safety standards.

Making roads safer

High-performing countries explore how to make transport more sustainable

Road infrastructure has traditionally maximized mobility and economic efficiency at the expense of safety, particularly for non-motorized road users who are the most vulnerable. Indeed, as motorization increases worldwide, walking and cycling have become less common and more dangerous in many countries. The traffic mix in many countries means that pedestrians and cyclists share the road with high-speed vehicles, forcing them to negotiate dangerous situations and fast-moving traffic. Planning decisions have been made without sufficient attention to the needs of these groups – for example, cycle paths and footpaths are frequently not part of an integrated network. At the same time, traffic congestion resulting from rapid motorization means the transport and mobility demands of local communities are frequently not met.

Changes are now required to optimize the movement of people and freight with road safety in mind. This optimization needs to take into account the mix and safety of all road users. In many industrialized countries these changes are already taking place, generally at a local level where communities have been involved promoting safe public transport and non-motorized means of transport (61).

Measures to promote walking and cycling are also in line with other global moves to fight obesity and reduce noncommunicable diseases (such as heart disease, diabetes) and improve the quality of urban life. These changes are more pertinent than ever for low- and middle-income countries,

which are now moving rapidly towards much higher levels of motorization, increased levels of air pollution and more sedentary lifestyles.

This report found that 92 countries have policies to promote walking and cycling (of which 49% are high-income countries), but if these strategies are not accompanied by other measures – such as effective speed management and the provision of pedestrian and cycling safety measures – they could actually lead to increases in road traffic injuries. Data reported in Section 2 suggest that not enough is being done to reduce speeds. Indeed, only 30 of these 92 countries also have urban speed laws in line with best practice (see Section 2, page 22). Similarly, comparative data from 60 countries show that 82% of roads where pedestrians are present, and where speeds are 40 km/h or above, do not have footpaths (see Box 14). As indicated in Section 2, at speeds below 30 km/h, pedestrians and cyclists can mix with motor vehicles in relative safety. Harmonising lower urban speed limits across urban areas can also provide an environment that is conducive to increasing these non-motorized forms of transport. For example, Fribourg in southern Germany has lowered the speed limit to 30 km/h on 90% of its streets and provided extensive car-free residential areas. The effect of this strategy is that 24% of trips every day are on foot, 28% by bicycle, 20% by public transport and 28% by car (62).

A key strategy for achieving a safe traffic system for pedestrians and cyclists is to separate these different kinds of road use, eliminating conflicts between high-speed and vulnerable road users. Safety benefits of measures such as building separate cycle lanes

are positive. Danish studies, for example, showed a 35% reduction in cyclist casualties after cycle tracks were constructed alongside urban roads(2). Separating road users is also relevant for countries with high proportions of motorcyclists, notably those in the South-East Asian Region and the Western Pacific Region. Yet currently only half (91) of all countries in the survey have policies to separate vulnerable road users from high-speed traffic.

have been well managed. Aside from reducing road traffic injuries, there are positive health benefits that are associated with increased physical activity, reduced pollution, noise levels and greenhouse gas emissions, reduced congestion and more pleasant cities.

Safe road systems consider the needs of all road users

91 countries have policies to separate vulnerable road users from high-speed traffic.

Moving towards more sustainable modes of transport has positive effects if the associated road safety impacts

Improving road infrastructure is a key mechanism for making roads safer. In a number of high-income countries,

BOX 13

Amend works to keep Africa's school children safe

Child pedestrians are among the most vulnerable road users in sub-Saharan Africa. This is because, compared to their school-going peers in other regions, they are more likely to walk to school, and do so over long distances on roads that put them in dangerous proximity to traffic (63). Relatively inexpensive, strategically placed infrastructure measures can make pedestrians safer on roads.

Amend, a nongovernmental organization in sub-Saharan Africa, has developed the School Area Road Safety Assessments and Improvement (SARSAI) programme. The SARSAI programme focuses on reducing injuries around primary schools in urban African cities, where children are known to be at exceptionally high risk of a road traffic injury. Typically, these are schools where more than 2% of students are injured in road traffic crashes in any given year (63,64).

SARSAI systematically assesses areas around schools and identifies and implements measures to improve road safety, including:

- small-scale infrastructure improvements, such as
 - road humps (to reduce vehicle speeds at crucial points)
 - bollards (to separate walkways from vehicles)
 - improved sidewalk areas (so children do not need to walk on the roads)
 - the relocation of school gates (so that children do not exit directly onto busy roads)
 - zebra crossings (to provide demarcated places for children to cross roads);
- signage to alert drivers to the presence of schools;
- road safety education for children and communities about the new infrastructure and its purpose.

At five primary schools where Amend implemented SARSAI in Dar es Salaam, Tanzania there was one death and eight injuries in road traffic among the student population in the 12 months preceding the implementation of SARSAI and just one injury in the 12 months following implementation. Amend is currently conducting a multi-year, population-based control impact evaluation of SARSAI in partnership with the US Centers for Disease Control, gathering data at 18 school areas in the country.

Once infrastructural improvements around a school have been made as part of the programme, ongoing upkeep is transferred to local government authorities in charge of the roads: the evaluation data collected over the implementation period will be important in advocating for the sustainability of the project.



138 countries currently assess parts of existing road safety networks.

decades of analysing the road network and determining where road crashes occur has helped identify how poor infrastructure contribute to road traffic injuries. Furthermore, an extensive evidence base has been built up about infrastructure countermeasures that can save lives. As a result, many high-performing countries have made significant investments in safer infrastructure. These include designing safer new road projects but also upgrading existing roads with proven interventions. Action across both these areas has contributed to declines in road traffic deaths in these countries.

Rapid urbanization, economic growth and the need for improved mobility have led to increased motorization in many low- and middle-income countries, and road infrastructure has not kept pace. This means that poor roads are the norm in many of the countries where the risk of road traffic death is highest, and are often built without sufficient planning to take into consideration the safety needs of vulnerable road users and the communities through which they pass.

Safety through design

Ensuring safety measures are implemented when road infrastructure projects are designed can result in important safety gains for all road users. This is particularly true where road design and maintenance are underpinned by a Safe System approach, that makes allowances for human error. The use of infrastructure treatments to help manage speed and reduce the likelihood of a crash (for example through widening of the

road, or raised pedestrian crossings), and treatments to mitigate the severity of the crash infrastructural (for example, using roadside barriers and roundabouts) all contribute to less death and injury on the road.

Decisions made at the design stage of a project can have a significant impact on the level of death and injury of the road. Specifying safety standards and acting on findings of a road safety design audit can all identify if further design modifications can increase safety. Currently 147 countries require some type of road safety audit on new roads, although these vary greatly in what they cover, and thus in quality. Existing road infrastructure should also be regularly assessed for safety, with a focus on roads with the highest crash risk: 138 countries currently assess parts of existing road safety networks.

Best practice road safety audits assess safety for all road users, including pedestrians, cyclists and motorcyclists. A key part of the solution for improving road infrastructure is assessing the road network – identifying which are the most dangerous roads, who uses these roads and which road users are most likely to be injured can all help to determine which affordable engineering countermeasures are most essential for upgrading the road and making it safer (see Box 14).

To reduce road deaths, simultaneous action is needed at national and local level on vehicle safety, road user behaviour and road design. Lessons on how infrastructure can impact road safety – learned over decades in developed countries – must be translated urgently into best practice in low- and middle-income countries.

BOX 14

Five-star roads: iRAP road assessments

International Road Assessment Programme (iRAP) safety assessments use road inspection data to provide star ratings for roads: five stars indicate the safest roads and one star the least safe. Star ratings are provided for vehicle occupants, motorcyclists, pedestrians and cyclists, while countries' roads are assessed for the percentage that meet certain star ratings for each type of road user. Star ratings alone have now been applied on over 500 000 km of road across 62 countries. The results show:

- less than 20% of roads are three-star or better for pedestrians in most regions of the world;
- 50% of roads assessed in the Region of the Americas, European Region and Western Pacific Region are three-star or better for vehicle occupants;
- for motorcyclists in South-East Asia, less than 20% of roads are three-star or better.

Star ratings are increasingly used to set targets for improvements within national road safety policies. For example Highways England has a 90% target for travel on three-star (or better) roads by 2020, while the Netherlands aims to eliminate all one- or two-star roads by 2020. And in terms of design, the World Bank has set minimum three-star targets for all road users as part of new road designs in India – a road upgrade programme worth an estimated at US\$ 4 billion.

While most countries carry out road safety audits on new and some existing road infrastructure, the rating by road users within iRAP assessments allows comparisons between and within countries that help reveal that in many countries there is poor provision for the most vulnerable road users in terms of infrastructure safety on a large part of the road network. This should be used to mobilize support for implementation of necessary countermeasures.





Conclusions and recommendations

This report shows that 1.25 million people are killed each year on the world's roads, and that this figure has plateaued since 2007. In the face of rapidly increasing motorization, this stabilization of an otherwise projected increase in deaths is an indication of the progress that has been made. However, efforts to reduce road traffic deaths are clearly insufficient if the international road safety targets set for the Sustainable Development Goals – a halving of deaths by 2020 – are to be met.

A multifaceted approach is required for the most effective and long-lasting changes to be made to national road safety. Such changes have been achieved in a number of high-performing countries that have taken on the Safe System approach, and have seen reductions in road traffic deaths and injuries despite increasing motorization. The challenge today is for the downward trends in road traffic deaths seen in these countries to be replicated in other (mainly low- and middle-income) countries, but in a shorter timeframe. Political will is crucial to driving such changes, but this report shows that action is particularly necessary on a number of specific issues:

- Changing road user behaviour is a key component of the Safe Systems approach. Setting and enforcing good laws relating to key behavioural risk factors can be effective at realizing such change. Although some progress has been made over the past three years with 17 countries (representing 5.7% of the world's population) improving legislation on key risk factors, many countries lag far behind in terms of

making sure their laws are in line with best practice.

- Lack of enforcement frequently undermines the potential of road safety laws to reduce injuries and deaths. More work is needed to explore the best ways to optimize enforcement of existing road safety laws. Social marketing campaigns need to be conducted to support and maximize the effects of enforcement.
- Insufficient attention has been paid to the needs of pedestrians, cyclists and motorcyclists, who together make up 49% of all global road traffic deaths. Making the world's roads safer will not be possible unless the needs of these road users are considered in all approaches to road safety – including the way roads are built and the way vehicles are manufactured. Making walking and cycling safer will also have other positive co-benefits if these non-motorized forms of transport become more popular, including more physical exercise, reduced emissions, and the health benefits associated with such changes.
- Making cars safer is a critical component of saving lives on the roads. Vehicle technology has advanced enormously, yet while cars in high-income countries are increasingly safe, this report shows that almost 75% of countries around the world – notably low- and middle-income countries – fail to meet even the most basic international standards on vehicle safety. And these standards are not only important to protecting car occupants involved in a

The Sustainable Development Goals include a target of
50%
reduction in road traffic deaths and injuries by 2020

crash but are also essential to protecting pedestrians, cyclists and motorcyclists. The lack of such standards in middle-income countries that are increasingly becoming major car manufacturers also risks jeopardizing global efforts to make roads safer. Governments must urgently sign up to the minimum international vehicle standards as requirements for manufacturers and assemblers, and limit the importing and sale of sub-standard vehicles in their countries.

The report also highlights a number of other areas that countries need to address in order to improve road safety. These include improving the quality of their data on road traffic injuries, having a lead agency with the authority and resources to develop a national road safety strategy whose implementation they oversee, as well as improving the quality of care available to those who suffer a road traffic injury.

Looking ahead: the SDG target to halve road deaths by 2020

These data represent the road safety situation 3 years into the Decade of Action for Road Safety. Despite a strong evidence base around what works, it shows insufficient attention has been paid to road safety and that a heavy price is being paid in terms of lives lost, long-term injury and pressure on health-care services. The international attention promised to the issue of road safety by the new Sustainable Development Goal target to halve deaths and injuries from road traffic crashes by 2020 presents a golden opportunity for much needed action, and one that must be seized by all countries. Through this, the pace of progress can be accelerated and an actual decline in global road traffic deaths realized.

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EXPLANATORY NOTES

EXPLANATORY NOTE 1

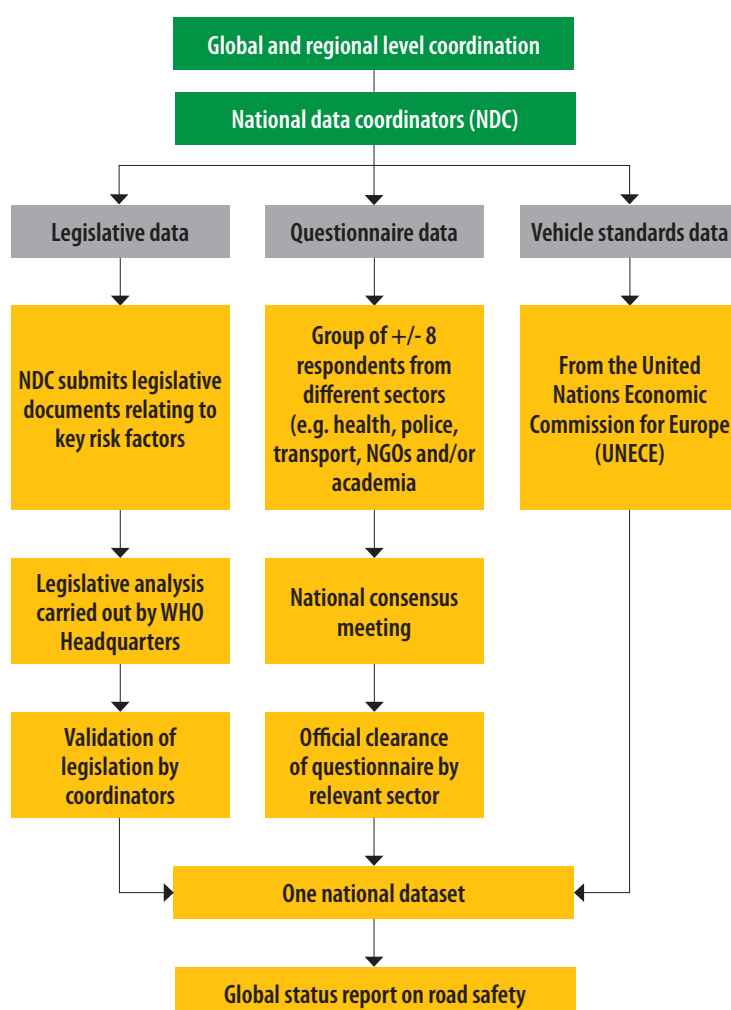
METHODOLOGY, DATA COLLECTION AND VALIDATION

Methodology

The methodology involved collecting data from a number of different sectors and stakeholders in each country according to the following process.

National Data Coordinators (NDCs), who were nominated by their governments, were trained in the project methodology. As representatives of their ministries, they were required to identify up to eight other road safety experts within their country from different sectors (e.g. health, police, transport, nongovernmental organizations and/or academia) and to facilitate a consensus meeting of these respondents. While each expert responded to the questionnaire based on their expertise, the consensus meeting facilitated by NDCs allowed for discussion of all responses, and the group used this discussion to agree on one final set of information that best represented their country's situation at the time (up to 2014, using the most recent data available). This was then submitted to the World Health Organization (WHO), see Figure E1.

FIGURE E1
Methodology



A major new initiative in this report was the comprehensive collection of legislative documents from all participating countries. The WHO team performed an extensive search of online legislative databases and country-level government websites for legislative documents related to key risk factors.¹ In addition, National Data Coordinators were asked to submit laws relating to the key risk factors. All legislative documents were analysed by lawyers at WHO headquarters who extracted the relevant information. The legal analysis was then shared with National Data Coordinators and a validation process resolved any data conflicts through discussion and submission of new legal documents.

The methodology used to collect information on vehicle standards also differed for this report. Whereas in previous reports this information was collected using the questionnaire, for this project these data were based on information from the UN World Forum for Harmonization of Vehicle Regulations² and interpreted with technical support from Global New Car Assessment Programme (Global NCAP).³

The report includes data from 180 countries/areas out of a total of 195, covering 6.97 billion people (97% of the world's population). This includes 52 high-income countries, 98 middle-income countries, and 30 low-income countries (see Table E1). Data on legislation and policies represent the country situation in 2014 while data on fatalities and vehicle registration are for 2013, or the most recent year for which these data were available.

TABLE E1
Participation in the Global status report on road safety 2015

Region	Number of participating countries	Number of countries in region	% population participating
African Region	43	47	97.5
Region of the Americas	31	35	95.8
Eastern Mediterranean Region	21	22	96.5
European Region	52	53	95.0
South-East Asian Region	10	11	98.7
Western Pacific Region	23	27	99.6
WORLD	180	195	97.3

Data collection and validation

Questionnaire data

The questionnaire used for this report was based on the questionnaire used in the previous report. However, some questions were modified to improve the quality of responses and some were added or deleted. The questionnaire can be downloaded with an accompanying instruction booklet on www.who.int/violence_injury_prevention/road_safety_status/2015/en/.

The questionnaire, protocol and accompanying guidelines and training materials were all available in the six WHO languages (Arabic, Chinese, English, French, Russian and Spanish). Where needed, NDCs coordinated the translation of these documents into local languages and then translated back into English for the data entry stage. All data were entered into an on-line database from where data could be extracted for analysis.

Data collection began in May 2014 and was completed by December 2014. Validation involved checking data for logical inconsistencies, and these were checked with National Data Coordinators. Following the validation process, final data sets were sent to respective governments for review and sign-off.

¹ Speed, drink-driving, drug-driving, the use of mobile phones while driving, failure to use motorcycle helmets, seat-belts and child restraints.

² The UN World Forum for Harmonization of Vehicle Regulations (World Forum the global body responsible for the development of passenger car safety standards). <http://www.unece.org/trans/main/wp29/introduction.html>

³ Global NCAP is a British organization that conducts testing programmes that will assess the safety of motor vehicles. <http://www.globalncap.org/>

Fatality data

Estimates on number of road traffic deaths relied in part on data from questionnaires as well as from other sources (see Explanatory Note 3). However, countries/areas were also asked to provide a breakdown of deaths by road user type. These proportions (where available) are reflected in the country profiles (see Explanatory Note 2) and were derived from:

- Country reported data in the current questionnaire;
- If not available from questionnaires, data that countries reported for the previous reports were used;
- If neither of the above were available, countries were assigned regional weighted averages based on countries within the region that had provided data.

These values were then aggregated into regional and global estimates of deaths by road user type.

Legislative data and maps

This report collected information on a number of variables relating to legislation on the five key risk factors (speed, drink-driving, failure to use helmets, seat-belts and child restraints) as well as on two emerging risk factors, drug-driving and the use of mobile phones while driving.

Criteria analysed for each risk factor are detailed in Table E2 while the interpretation methods for each risk factor are detailed in Explanatory Note 2 on country profile.

The information collected was presented in various ways including:

- Country profiles, representing a summary of information for each country;
- Statistical annex, representing the full data set for each country;
- Legislative maps, showing an overview of the situation worldwide for each risk factor.

In order to code the countries for the legislative maps, three categories were used:

- Countries¹ whose national laws meet best practice: shown in green – criteria considered as representing best practices in light of available evidence² are highlighted, for each risk factor, in green in Table E2;
- Countries¹ whose national laws are encouraging but where additional efforts are needed for best practice to be met: shown in yellow;
- Countries¹ whose national laws require strong steps to be taken in order to improve their legislation: shown in red.

Vehicle standard data

Data on vehicle standards were collected using information from the UN World Forum for Harmonization of Vehicle Regulations³, the primary global body responsible for the development of passenger car safety. Technical support on analysing and interpreting this data was provided by Global NCAP⁴. Note that while these data are based on international regulations, in some countries where national regulations are considered to be equivalent to the UN standards (US, Canada, Republic of Korea, China, India, Brazil) these data are used instead. The data collected were based on the following seven variables:

- Frontal impact: UN regulation 94. Note that US regulation 208 is considered equivalent.
- Side impact: UN regulation 95. Note that US regulation 214 is considered equivalent.
- Electronic Stability Control: UN regulation 13H. Note that US regulation FMVSS 126 is considered equivalent.
- Pedestrian protection: UN Regulation 127
- Seat-belts: UN regulation 16. Note that US regulation FMVSS 210 is considered equivalent.

¹ Or, in countries where laws are set at subnational level, where 80% of subnational entities meet selected criteria.

² Peden M et al., editors. World report on road traffic injury prevention. Geneva, World Health Organization, 2004.

³ Hosted by the United Nations Economic Commission for Europe (UNECE), the UN World Forum for Harmonization of Vehicle Regulations (World Forum the global body responsible for the development of passenger car safety standards). <http://www.unece.org/trans/main/wp29/introduction.html>.

⁴ Global New Car Assessment Programme (Global NCAP) is a British organization that conducts testing programmes that will assess the safety of motor vehicles. <http://www.globalncap.org/>

- Seat-belt anchorages: UN regulation 14. Note that US regulation FMVSS 210 is considered equivalent.
- Child restraints: UN regulations 44 and 129. Note that US regulation FMVSS213 is considered equivalent.

More information on each of these regulations is included in Section 3. Data on the three variables considered to be particularly important among these seven (frontal impact, electronic stability control and pedestrian protection) are included in the country profiles (and are the variables represented in Figure 15). The remaining variables are shown in the Table A10 of the statistical annex.

TABLE E2
Legislative criteria assessed relating to 7 risk factors

■ Risk factors ■ Criteria representing best practice ■ Additional criteria presented in the country profiles

Risk factor	Legislative criteria assessed						
Speed	National ¹ speed law in place	Speed limits on urban roads ≤ 50 km/h	Local authorities have the power to modify national speed limits	Speed limit on rural roads	Speed limits on motorways		
Drink-driving	National ¹ drink-driving law in place	Drink-driving law is based on BAC or equivalent BrAC	BAC limit for general population ≤ 0.05 g/dl	BAC limit for young/novice drivers ≤ 0.02 g/dl			
Motorcycle helmets	National ¹ motorcycle helmet law in place	Law applies to motorcycle drivers and adult passengers	Law applies to all road types	Law applies to all engine types	Law requires helmet to be properly fastened	Law requires helmet to meet a national or international standard	Law requires children to wear helmet ²
Seat-belts	National ¹ seat-belt law in place	Law applies to drivers and front seat passengers	Law applies to rear seat passengers				
Child restraints	National ¹ child restraint law in place	Law is based on age-weight-height or a combination of these factors	Law restricts children under a certain age-height from sitting in front seat				
Drug driving	National ¹ drug driving law in place						
Mobile phones	National ¹ law on mobile phone while driving is in place	Law applies to hand-held phones	Law applies to hands-free phones				

¹ Or, in countries where laws are set at subnational level, where 80% of subnational entities meet selected criteria.

² For children who are legally allowed to ride as passengers.

EXPLANATORY NOTE 2

COUNTRY PROFILE EXPLANATIONS

The country profiles shown on pages 77 to 256 present a selection of core information about road safety, as reported by each of the 180 participating countries/areas. The country profiles are presented in alphabetical order. Additional national data can also be found in the Tables of the Statistical Annexes (Tables A2–A10).

Data reported for population were extracted from the United Nations Population Division database (1), while gross national income (GNI) per capita for the year 2013 came from World Bank estimates (2). Where no data were available for 2013, published data for the latest year were used. The World Bank Atlas method was used to categorize GNI into bands thus:

- Low-income = US \$ 1 045 or less
- Middle-income = US \$ 1 046 to US \$ 12 745
- High income = US \$ 12 746 or more

Flags were obtained from the World Flag Database¹. Flags as of 31 December 2014 were used (to correspond with the year of data collection).

The sections below reflect the way information is structured in each of the Country Profiles. They include details on how data on certain variables are presented and should be interpreted. Variables were coded as “—” if the information was unavailable or non-applicable, or if respondents had ticked a “Don’t know” response. Where data were obtained from multiple sources these are listed in alphabetical order.

Dates provided as source documents refer to the year in which these data were published, (rather than the year that the data relate to) unless indicated otherwise.

Data collected by questionnaire were submitted through a consensus meeting (unless otherwise indicated). Each country profile indicates the Ministry that approved this questionnaire data (unless otherwise indicated). Data on legislation were based on WHO’s assessment and extensive validation of this information with National Data Coordinators, although it was not officially cleared by the government Ministry.

Institutional framework

A lead agency is considered to be the institution (either stand alone, or within a Ministry) that coordinates road safety at a national level. Information on the existence of a national road safety strategy is indicated as “Yes” or “No”; countries where national strategy development is underway but has not yet been approved or endorsed by government are indicated as “None”. Where countries have multiple national strategies on road safety this is always represented as “Yes”.

Where countries indicated they have a fatality reduction target, information on this target is included as well as the relevant time period. Specific fatality targets are indicated either as absolute numbers of deaths, or as a rate per 100 000 population.

Safer roads and mobility

- Information on road safety audits of new road infrastructure projects is reported as “Yes” or “No”.
- Information on road safety audits on existing road infrastructure projects is reported as “Yes”, “Parts of road network”, or “No”. For those countries where the response given in the question was “parts of the road network” this is represented as “Yes” in the country profile.

¹ <http://www.flags.net>

Safer vehicles

Total registered vehicles for 2013: Information about the total number of vehicles in the country includes only registered vehicles, and various categories of such vehicles. This is a cumulative number of vehicles in circulation in 2013 (or the most recent year for which data were available) not the number of vehicles brought into circulation in a particular year. In some cases where new data were not available, the figure from the 2013 Global status report has been used and footnoted to indicate this source. In a few countries the number of vehicles in subcategories did not add up to the total number provided. In some countries, respondents noted that a substantial proportion of the vehicle fleet may not be registered.

Vehicle standards applied: Information on vehicle standards presented in this report is derived from UNECE¹.

- Frontal impact standard (UN Regulation 94 or equivalent national standard), the most important minimum standard for crashworthiness;
- Electronic stability control and anti-skid system (Regulation 13H or GTR 8), relevant to crash avoidance;
- Pedestrian protection (Regulation 127 or GTR 9), important for protection of non car occupants involved in a crash.

Post-crash care

- The emergency-room based injury surveillance system variable only indicates whether there was a system in place and not whether it was national or sentinel in nature.
- Emergency access telephone numbers are given only if one national number was provided. If countries reported multiple national numbers then “multiple numbers” is noted in the corresponding field but the actual numbers are not provided.
- The proportion of those transported by ambulance was based on expert opinion.
- The proportion of those disabled as a result of a road traffic crash is only included if a documented source of information was available, however, this was not necessarily national (as indicated in the corresponding footnote).

Data

- Reported numbers of road traffic deaths are included in the Country Profiles, with a footnote to indicate the source of data and the definition of a road traffic death that was used.
- The estimated number of road traffic deaths is included based on the methodology described in Explanatory Note 3. Where this number was based on a negative binomial regression model, a 95% Confidence Interval is also shown.
- The estimated rate per 100 000 population is based on the estimated number of road traffic deaths referred to above.
- Data on the breakdown by sex may be from a different source to the official road traffic data and are converted to proportions. The proportion of deaths where the sex was unknown has not been reported in the profiles. Proportions may not add up to 100% due to rounding or because only partial information was received (indicated in a footnote).
- Reported fatality data from different countries are not necessarily comparable, as different definitions and timeframes have been used (these are noted in the footnotes or in brackets behind the data). However, the WHO estimates (both absolute numbers and rate per 100 000) allow for comparisons between countries. For more information on the fatality data see Explanatory Note 3.
- The standard colour coding of the pie charts used to represent road user deaths in the categories requested in the questionnaire is shown below. Additional categories are represented by non-standard colours as indicated in the specific Country Profiles.

¹ <http://www.unece.org/trans/main/wp29/introduction.html>

- Drivers 4-wheeled cars and light vehicles
- Occupants 4-wheeled cars and light vehicles
- Passengers 4-wheeled cars and light vehicles
- Riders motorized 2- or 3-wheelers
- Drivers motorized 2- or 3-wheelers
- Pillion riders
- Cyclists
- Pedestrians
- Drivers/passengers heavy trucks
- Drivers/passengers buses
- Other/unspecified
- Drivers (all vehicles)
- Passengers (all vehicles)
- Drivers and passengers (all vehicles)

- Some countries classified road traffic fatalities according to the vehicle or road user “at fault” rather than according to who died. In such cases these categories are presented in the pie charts using additional colour coding.
- Graphs on reported road traffic fatality trends are shown either as road traffic death rates per 100 000 population (solid line) or as an absolute number of road traffic deaths (dotted line), depending on which data were supplied by the country. While many countries track decades’ worth of trend data, only a 10-year period is depicted here.
- For countries providing less than 5 years’ road traffic fatality trend data, this information is presented in a tabular format instead of a graph.
- For countries with small populations where the number of deaths are under 50, absolute number of deaths rather than rates are shown. Note that in cases where data were only available for regions within a country, this information is indicated in a footnote.

Safer road users

Legislation provided in this section is extracted from the questionnaire and the legislative analysis undertaken by WHO Headquarters in collaboration with NDCs.

Enforcement: respondents were asked, as individuals, to rate the effectiveness of enforcement of various elements of national road safety legislation based on their professional opinion or perception. These responses – on a scale of 0 to 10, where 0 is “not effective” and 10 is “highly effective” – are presented here. A median of these scores is presented here. Median enforcement figures are rounded up. It should be noted that these scores are subjective and should be seen only as an indication of how enforcement is perceived in the country. Many respondents expressed difficulty in assessing law enforcement at a national level since it often varies from region to region within a country and the intensity of the enforcement may vary at different times. Some countries did not wish to provide enforcement scores.

Speed: Speed limits reported here (and in the statistical tables) are for private passenger cars only and have been converted to kilometres per hour. Countries that reported a range for speed limits relating to particular road types are indicated as such. In cases where the legislation provided a speed limit that could be altered under certain circumstances, the default speed limit is reported and the higher limit referenced in a footnote. Road classifications (in particular the definition of an urban road, a rural road and a highway) varied greatly from country to country. Respondents were asked to report on the speed limits of different kinds of road according to the definitions used in the country concerned. In situations where the legislative analysis showed no reference to a national speed limit on certain types of roads this is indicated as “No”. In the case of motorways, a footnote may be included where National Data Coordinators indicated that motorways did not exist in their country.

Drink-driving: Blood alcohol concentration (BAC) limits (or breath alcohol limits converted to BAC limits) refer to the maximum amount of alcohol legally acceptable in the blood of a driver on the road – i.e. the blood alcohol level above which a driver may be punished by law. This figure is provided for the general population, and for young/novice drivers in grams per decilitre (g/dl). This survey gathered information on drink-driving laws regardless of the legal status of alcohol in the country. Where alcohol consumption was legally prohibited in a country, as reported in the final country questionnaire, this is indicated by a footnote. BAC limits are reported as “—” for countries that have a drink-driving law but do not define drink-driving by BAC, and by a corresponding footnote.

- The use of random breath testing is indicated based on countries’ reports of whether or not such testing is carried out in practice. Those countries where legislation specifically prohibits primary enforcement of drink-driving laws, and thus random breath testing, are indicated as such.
- Deaths attributable to drink-driving were included only when the estimate was based on a published source. In many cases these are not national estimates (as indicated in the source). These estimates are rounded up.

Motorcycle helmets: For information on motorcycle helmet rates (derived from the final country questionnaires), these data were included only when a published source was indicated. Note that “drivers” is taken to mean those driving the motorcycles, while “riders” is understood to include both drivers and passengers. The most disaggregated data are presented here, i.e. separate figures are provided for drivers and passengers where this information was provided. Note that the information provided for drivers and passengers does not necessarily represent the same year, nor come from the same source, as indicated in the corresponding footnotes. The data on passenger rates refer to adult passengers unless otherwise indicated. In many cases these are not national estimates (as indicated in the source). Information on legislation was interpreted strictly: for example, countries where helmet laws apply only to certain types of roads, to certain engine types or certain populations (e.g., minors) were interpreted as not having a national helmet law.

Seat-belts: For information on seat-belt wearing rates (derived from the final country questionnaires), these data were included only when a published source was indicated. The most disaggregated information is presented here, i.e. separate figures are provided for front seat and rear seat occupants where this information was made available. Where respondents provided explanatory information on these data, for example, a source or information on geographical coverage, this information is summarized in the footnotes. Note that the information provided for front seat and rear seat occupants does not necessarily represent the same year, nor come from the same source, as indicated in the corresponding footnotes. Information on legislation was interpreted strictly: for example, countries where seat-belt laws apply only to certain types of roads were interpreted as not having a national seat-belt law.

Child restraints: Information on rates of child restraint use (derived from the final country questionnaires) are presented when a source was provided for the estimate and are included in the most disaggregated form available. Most countries that provided this data, however, had data on children in restraints that was not broken down by age group. Note that where multiple studies are available this information does not necessarily represent the same year, nor come from the same source, as indicated in the corresponding footnotes. The presence of a national child restraint law and its specificities (e.g. based on age, weight, height) was assessed as well as the existence of restriction on children under a certain age sitting in the front seat of passenger cars.

References

1. Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat (June 2013). World population Prospects: The 2012 Revision, Highlights. New York: United Nations.
2. World Development Indicators database, World Bank, March 2015. <http://data.worldbank.org/indicator/NY.GNP.PCAP.CD/countries>.

EXPLANATORY NOTE 3

ESTIMATION OF TOTAL ROAD TRAFFIC DEATHS: WHO DATA AND METHODOLOGY

Background

During the process of preparing the third *Global status report on road safety* WHO generated estimates of road traffic deaths for 2013 for all Member States. Road traffic deaths were estimated by building on the methods used in the second global report by improving and updating the database of vital registration, the data collection instrument (survey) and the database of the covariates for regressions. These estimates were used to generate regional and global estimates, while estimates for individual countries are included in the report only for the 180 countries that participated in the survey.

Death registration information is submitted to WHO regularly by Ministries of Health from around the world, and most is coded using the International Classification of Diseases 9th or 10th revisions (1, 2, 3). Using this classification all deaths that follow from a road traffic death are counted as such, regardless of the time period in which they occur (unlike many official road traffic surveillance data sources, where road traffic death data are based on a 30-day definition following a road traffic crash). WHO applies certain criteria to ascertain the quality of this death registration data and where the death registration data were considered to be of high quality these data were used for this report¹.

For those countries without such good vital registration data, and for which other sources of information on causes of death were unavailable², the estimates were based on covariates (some collected in the survey of Member States, others from available published sources). The regression models were fitted to data for the period 2000–2013, a time series for each covariate was used for this period for each Member States. The improved regression model estimated road traffic deaths (all ages, both sexes) as a function of a set of covariates that include measures of economic development, road transport factors and legislation, road use and safety governance/enforcement and health system access was developed.

Due the availability of new data, and updated time series for many covariates used in the regression, estimates for the full time series have been revised. Hence, the WHO 2015 estimates are not directly comparable to previous WHO estimates published in the first and second global status reports on road safety (4, 5). The 2015 estimation represents the best estimates of WHO for fatalities that occurred during 2013 and earlier years, based on the evidence available up to March 2015. These estimates are not necessarily the official estimates of Member States for that year and are not necessarily endorsed by Member States. However, during the preparation of the report a consultation letter was sent to each Member State that participated in this third *Global status report on road safety* explaining the methodology used during this estimation process and the latest data used for this purpose. In order to allow global and regional comparisons to previous years (2001, 2004, 2007 and 2010), the global and regional estimates for these years were recalculated based on the new data and methods used for 2013.

As in the second report, there are four groups of countries and its estimation methodology is described in detail below.

1. Countries with death registration data

This group includes 85 countries with death registration data meeting the following completeness criteria: completeness for the year estimated at 80% or more, or average completeness for the decade including the country-year was 80% or more. Total road traffic deaths were calculated from the death registration data and population data reported to WHO as follows. Injury deaths classified as “undetermined intent” were redistributed pro-rata across all unintentional and intentional injury categories within age-sex groups. These data were then used to compute age-sex-specific death rates for road traffic deaths. Where completeness was assessed at less than 100%, death rates were adjusted for incompleteness

¹ For details on criteria used to assess quality of vital registration data see reference 3 and Explanatory Note in references 4 and 5.

² However, in some countries other sources of information on deaths were used: where total deaths reported from the national surveillance system were greater than the deaths estimated from the regression or from the death registration data, these were used.

by multiplying by (100/completeness %). These death rates were applied to the UN estimates of population by 5-year age group and sex (6) to estimate total road traffic deaths for each country-year.

These countries fall into three categories:

1. Countries with death registration data for year 2013 where the estimated road traffic deaths for 2013 exceeded number reported from the surveillance system. The death-registration based estimate is used. This category contains 17 countries.
2. Countries where the latest death registration data submitted to WHO is earlier than 2012, but not earlier than 2005. Deaths in year 2013 were estimated based on a projection of the most recent death registration data using the trends in reported surveillance data: this category contains 54 countries.
3. Countries where the reported road traffic deaths for 2013 (i.e. from a source other than death registration) exceeded the estimate based on death registration data. For 14 countries, the reported road traffic deaths were used for year 2013.

2. Countries with other sources of information on causes of death

For India, Islamic Republic of Iran, Thailand and Viet Nam, data on total deaths by cause were available for a single year or very few earlier years. These data sources are documented in Annex B of the *Global Burden of Disease: 2004 update* report (3) as well as some more recent studies submitted to WHO. For these countries, the regression method described below was used to project forward from the most recent year for which an estimate of total road traffic deaths were available.

3. Countries with populations less than 150 000

For 13 small countries with populations less than 150 000 and which did not have eligible death registration data, regression estimates were not used. The reported deaths were used directly without adjustment.

4. Countries without eligible death registration data

For countries without death registration data at least 80% complete and with populations greater than 150 000, a regression model was used to estimate total road traffic deaths. As for the previous reports, we used a negative binomial regression model, appropriate for modelling non-negative integer count data (number of road traffic deaths) (7, 8). A likelihood ratio test was used to assess that the negative binomial model provided a better fit to the data than a Poisson model (where the variance of the data is constrained to equal the mean).

$$\ln N = C + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_n X_n + \ln Pop + \varepsilon \quad (1)$$

where N is the total road traffic deaths (for a country-year), C is a constant term, X_i are a set of explanatory covariates, Pop is the population for the country-year, and ε is the negative binomial error term. Population was used as exposure, making it possible to interpret the coefficients (β_i) for the independent variables as effects on rates rather than a count. In a previous study, this type of model was used to represent “accident proneness” (9). Karlaftis and Tarko have also found a negative binomial regression model to be the appropriate for count data such as road traffic fatalities (10).

The parameters $\beta_1, \beta_2, \beta_3 \dots \beta_n$ (equation 1) were estimated by fitting the negative binomial regression model to estimated total road traffic deaths for all country-years in the range 2000–2013 meeting the completeness criteria (see section 1 above, and reference 5) by using the number of road of traffic deaths from countries from group 1 described above. We

chose three models (Models A, B and C) that had good in-sample- and out-of-sample fit, and for which all the covariates were statistically significant. The final estimates were derived as the average of the predictions from these three models. The table below describes the covariates used for the three models:

TABLE E3
Covariates used in the model

Independent variables	Description	Source of information	Included in models
ln(GDP)	WHO estimates of Gross Domestic Product (GDP) per capita (international dollars or purchasing power parity dollars, 2011 base)	WHO database	Models A, B, C
ln(vehicles per capita)	Total vehicles per 1000 persons	GSRRS surveys and WHO database	Models A, B, C
Road density	Total roads (km) per 1000 hectares	International Futures database (11)	Models A, B, C
National speed limits on rural roads	The maximum national speed limits on rural roads (km/h) from WHO questionnaire	GSRRS survey	Models A, B, C
National speed limits on urban roads	The maximum national speed limits on urban roads (km/h) from WHO questionnaire	GSRRS survey	Models A, B, C
Health system access	Health system access variable (principal component score based on a set of coverage indicators for each country)	Institute for Health Metrics and Evaluation dataset (12)	Models A, B, C
Alcohol apparent consumption	Liters of alcohol (recorded plus unrecorded) per adult aged 15+	WHO database	Models A, B, C
Population working	Proportion of population aged 15–64 years	World Population Prospects 2012 revision (UNDESA)	Models A, B, C
Percentage motorbikes	Per cent of total vehicles that are motorbikes	GSRRS survey	Model B
Corruption index	Control of corruption index (units range from about -2.5 to +2.5 with higher values corresponding to better control of corruption)	World Bank (13), International Futures database (11)	Model B
National policies for walking / cycling	Existence of national policies that encourage walking and / or cycling	GSRRS survey	Model C
Population	Total population (used as offset in negative binomial regression)	World Population Prospects 2012 revision (UNDESA) (6)	Models A, B, C

TABLE E4**Overview of methods used to obtain comparable country estimates**

Estimation method	Country
GROUP 1 Countries/areas with good death registration data	Argentina, Australia, Austria, Azerbaijan, Bahamas, Bahrain, Barbados, Belarus, Belgium, Belize, Brazil, Bulgaria, Canada, Chile, China (14, 15), Colombia, Costa Rica, Croatia, Cuba, Cyprus, Czech Republic, Denmark, Dominican Republic, Ecuador, Egypt, El Salvador, Estonia, Fiji, Finland, France, Georgia, Germany, Greece, Guatemala, Guyana, Hungary, Iceland, Ireland, Israel, Italy, Jamaica, Japan, Kazakhstan, Kuwait, Kyrgyzstan, Latvia, Lithuania, Luxembourg, Maldives, Malta, Mauritius, Mexico, Montenegro, Netherlands, New Zealand, Norway, Oman, Panama, Paraguay, Philippines, Poland, Portugal, Qatar, Republic of Korea, Republic of Moldova, Romania, Russian Federation, Saint Lucia, Serbia, Singapore, Slovakia, Slovenia, South Africa, Spain, Suriname, Sweden, Switzerland, The former Yugoslav Republic of Macedonia, Trinidad and Tobago, Turkey, United Kingdom, United States of America, Uruguay, Uzbekistan, West Bank and Gaza Strip
GROUP 2 Countries with other sources of cause of death information	India (16), Iran (Islamic Republic of), Thailand, Viet Nam
GROUP 3 Countries with populations less than 150 000	Andorra, Antigua and Barbuda, Cook Islands, Dominica, Kiribati, Marshall Islands, Micronesia (Federated States of), Monaco, Palau, Saint Vincent and the Grenadines, San Marino, Seychelles, Tonga
GROUP 4 Countries without eligible death registration data	Afghanistan, Albania, Algeria, Angola, Armenia, Bangladesh, Benin, Bhutan, Bolivia (Plurinational State of), Bosnia and Herzegovina, Botswana, Burkina Faso, Cabo Verde, Cambodia, Cameroon, Central African Republic, Chad, Congo, Côte d'Ivoire, Democratic Republic of the Congo, Djibouti, Eritrea, Ethiopia, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Honduras, Indonesia, Iraq, Jordan, Kenya, Lao People's Democratic Republic, Lebanon, Lesotho, Liberia, Libya, Madagascar, Malawi, Malaysia, Mali, Mauritania, Mongolia, Morocco, Mozambique, Myanmar, Namibia, Nepal, Nicaragua, Niger, Nigeria, Pakistan, Papua New Guinea, Peru, Rwanda, Samoa, Sao Tome and Principe, Saudi Arabia, Senegal, Sierra Leone, Solomon Islands, Somalia, Sri Lanka, Sudan, Swaziland, Tajikistan, Timor-Leste, Togo, Tunisia, Turkmenistan, Uganda, United Arab Emirates, United Republic of Tanzania, Vanuatu, Yemen, Zambia, Zimbabwe

For specific methods used for each country, see web appendix, at http://violence_injury_prevention/road_safety_status/2015/methodology/en/index.html

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