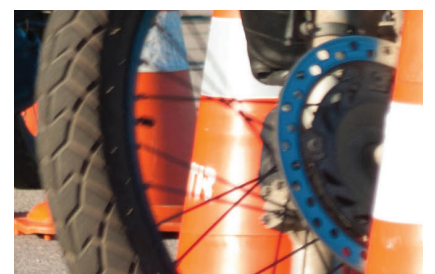




Benchmarking Road Safety in Latin America



Case-Specific Policy Analysis

Benchmarking Road Safety in Latin America



**Análisis de Políticas de Casos
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Executive summary

What we did

This report describes and benchmarks road safety management and performance in ten Latin American countries: Argentina, Brazil, Chile, Colombia, Costa Rica, Cuba, Ecuador, Mexico, Paraguay and Uruguay.

Country benchmarking is a useful tool to compare countries and learn from each other. The comparisons in this study allow identifying similarities and differences between countries in the number of crashes and casualties, but also in the factors that influence the risk of crashes and the severity of their outcomes.

The project was conducted over a two-year period in close co-operation with the Ibero American Road Safety Observatory (OISEVI) and active involvement of experts from the ten countries. It is based on the analysis of a large amount of data and information on the general transport context for each country, their road safety management practices, and trends in road safety performance. Specific aspects that were reviewed in detail were motorcyclist and pedestrian safety, drinking and driving behaviour, seat belt and child restraint use, speed management and post-crash care.

What we found

Road safety is a major issue in Latin America and substantial actions are needed to reduce the road safety toll. There is a high road mortality rate (fatalities per 100 000 population) in all ten countries compared to the European Union average, except in Cuba, where motorisation is much lower. Across the ten countries, more than 78 000 people were killed on the road in 2014. Some countries have seen a significant increase in the number of road deaths in recent years. For others, the number of road deaths has slightly increased or has more or less stabilised, despite a strong increase in motorisation.

In the absence of targeted policy interventions, significant investment and strong leadership, the number of traffic fatalities will grow across Latin America over the next decade. Motorisation has been rising in all countries and significantly increasing the exposure to traffic risks. The deteriorating safety of motorcyclists is a particularly acute problem in Latin America due largely to the dramatic increase in the fleets of powered two-wheelers. In three countries, motorcyclists represent more than 40% of the total number of road deaths. Pedestrians are the largest or second largest group of road deaths in seven countries. While adequate legislations exist in all countries, speeding, drink driving and low levels of seat belt use and wearing motorcycle helmets are common issues in all ten countries. Addressing these issues, and reducing the toll of road deaths and serious injuries, will require substantial efforts.

What we recommend

Create a strong national lead agency for road safety

Where national agencies are charged with co-ordinating road safety efforts, the scope of their mandate, and their coordinating role at national and regional/local level should be evaluated. The

technical and financial resources available to them should be aligned with their mandate. Countries that do not have a national lead agency for road safety should consider creating one.

Set up a road safety observatory and improve road safety data systems for better road safety outcomes

Evidence-based decision making in all countries needs better data regarding crashes and casualties (including serious injuries), as well as risk factors and exposure. Common definitions and methodologies to collect data are needed to facilitate international and inter-regional comparisons. A road safety observatory in charge of monitoring road safety performance and regularly reporting results is a useful complement to a road safety agency.

Develop a national road safety strategy with ambitious targets

A comprehensive road safety strategy that includes ambitious, yet achievable targets will help to set a policy pathway towards fewer road deaths and serious injuries. A national road safety strategy should be complemented with short-term action plans and interim targets for key safety performance indicators. It should build and sustain capacity, and generate investment in road safety data systems and research.

Prioritise safety improvements for motorcycle riders

Improving safety for the growing number of motorcycle riders in Latin America should be a priority. Providing safer and affordable public transport will limit the need for citizens to use a high-risk mode of transport such as motorcycles. National road safety plans and projects should specifically address licensing and training, as well as helmet wearing, setting a target of 100% helmet-wearing rate.

Give priority to pedestrians' safety needs

Walking facilities and management of car speed are particularly recommended for improving the safety of pedestrians. Such interventions should be standard elements in further developing the road network, especially in urban areas, as well as securing access to public transport services.

Address speeding, drink driving and non-seat belt wearing

Implementing a strong speed management policy and seriously addressing the issue of drink driving, still largely underestimated in most Latin American countries, will contribute greatly to reducing traffic risks. Effective enforcement is a cornerstone to achieve better compliance with traffic rules. Likewise, actions to lift the rates of seat belt-wearing will eliminate one of the leading causes of crash injuries and deaths. A target of 95% seat belt wearing for both front and back seats within the next five years is recommended.

Tackle weaknesses in post-crash management

Ensuring effective intervention in the immediate aftermath of a road crash is critical to saving lives and reducing the severity of injuries. To identify any major weaknesses in the current post-crash management, studies should be carried out as the basis for developing improved intervention plans.

Invest in safe road infrastructure and adopt UN regulations on vehicle safety

Little comparable information on the safety performance of the vehicle fleet and the road infrastructure network was available for this study. However, safe vehicles and safe roads are core elements of a good road safety strategy. More systematic data and information should be collected on the vehicle fleet and on the conditions and performance of the road infrastructure to allow for adequate investment in safer roads with safe speed limits. All countries should give significant priority to adopting all seven key UN vehicle safety standards.

Chapter 1. Objectives and working methods of the benchmarking study

Road crashes, serious injuries and their related social and economic consequences are considered to be a major problem throughout the world, and also in Latin America (WHO, 2015). There are around 17.5 people killed in road crashes per 100 000 population (mortality rate) worldwide. The Region of the Americas has a mortality rate of about 16.0, which is lower than the African and Asian regions, and higher than the best performing countries in Europe, such as Sweden, the United Kingdom, and the Netherlands which have a rate of around 3.0. Major differences can be observed between sub-regions and countries in the Americas (PAHO, 2016), with the Andean Sub-region (23.4) and the Southern Cone (21.0) having substantially higher mortality rates than the regional average.

The United Nations adopted the 2030 Agenda for Sustainable Development in September 2016. For the first time, road safety was formally recognised as a development priority. It is estimated that each year more than 1.2 million people are killed in road crashes, and low- and middle-income countries suffer economic losses of around 3% of their GDP as a result of road crashes (WHO, 2015). The UN Sustainable Development Goals (SDGs) include the following road safety targets under:

- Goal 3 (Ensure healthy lives and promote well-being for all at all ages): “By 2020, halve the number of global deaths and injuries from road traffic accidents”.
- Goal 11 (Make cities and human settlements inclusive, safe, resilient, and sustainable): “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.”

These ambitious targets are a real challenge for Latin American countries and must be the focus of all efforts to improve road safety in the region.

Steps have been taken to improve road safety in all countries in Latin America, but much more is needed. One option for determining what needs to be done is to learn from the other countries that are already performing better. “One of the aims of international cooperation in the field of road safety is to make oneself familiar with performances and progress in other countries and to understand if and how these can be of guidance to policymaking, in an adapted form if appropriate. Comparisons can be a starting point to learn from each other” (Wegman et al., 2008).

What is road safety benchmarking?

Benchmarking can be defined as a systematic process of searching for best practices, innovative ideas and highly effective operating procedures that lead to superior performance (Hammer and Stranton, 1995). Country benchmarking is a useful tool, used in many regions and areas, to compare countries and learn from each other. It is a tool to learn from the performances of others “in the same class”.

The first European benchmarking study in road safety was a comparison of the road safety performance of three countries with the lowest crash levels. The three countries (Sweden, the United Kingdom and the Netherlands, described as the SUN countries) studied the underlying elements in their current policies and programmes which make them particularly effective in coping with the traffic safety

problem (Koornstra et al., 2002). This “SUNflower approach” was presented to the OISEVI General Assembly in April 2015 and ten countries expressed interest in participating in the project: Argentina, Brazil, Chile, Colombia, Costa Rica, Cuba, Ecuador, Mexico, Paraguay and Uruguay.

Figure 1.1. **Benchmarking road safety in Latin America: Map of the ten participating countries**



There are different types of benchmarking (Shen et al., 2015). One example is product benchmarking, which compares road safety final outcomes, such as road traffic fatalities and injuries and mortality rates (ITF, 2013). Programme benchmarking, on the other hand, compares activities related to human, vehicle or infrastructure performance (such as drink driving, seat belt wearing, vehicle and road safety ratings) and corresponding policy action. This approach has been frequently used in road safety studies because these activities are causally related to crashes or injuries and can provide a better understanding of the process that leads to crashes (ITF, 2013).

Strategic and organisational benchmarking compares national road safety strategies, resources, management and organisational framework. However, due to the lack of appropriate indicators characterising their features, only some initial attempts have been carried out to date, such as Al-Haji (2007), Wegman et al. (2008) and Eksler et al. (2009).

Countries within the same region, or that have already passed through similar stages of challenges and development, usually have several common problems that can be identified in close co-operation and improvements can be expected by learning lessons from existing best practices in other countries (even if the final solutions or priorities may differ from one country to another, in accordance with their own safety characteristics) (Shen et al., 2015).

Shen et al. (2015) presented a road safety benchmarking cycle, adapted from Wegman et al. (2008), with five core activities (see Figure 1.2):

- determine the key components for road safety benchmarking
- identify the benchmarking partners (or countries)
- develop indicators for meaningful comparisons and data gathering
- examine gaps in performance and their root causes
- set targets (on final and intermediate outcomes) and monitoring progress.

Figure 1.2. **The road safety benchmarking cycle**



Source: Shen et al. (2015), Wegman et al. (2008).

Objective of the research project

The objective of this study was to develop a methodology to assess road safety performances in ten Latin American countries and benchmark their performance against a set of indicators and best practices leading to a set of recommendations for individual countries and for other stakeholders to further improve road safety. Firstly, practices found in Latin America were identified in order for Latin American countries to learn from each other. And, secondly, Latin American performance was compared with elsewhere in the world – for example in Europe, North America and Australia. Of course, performances from the SUN countries, other high-income countries, cannot be easily transferred to Latin American countries, but they can serve as a source of inspiration. For example, it is relevant to compare wearing rates of seat belt in the ten participating, but it is also relevant to know about seat belt wearing rates in passenger cars in other parts of the world (some European countries experience wearing rates as high as 98%) (ITF, 2016a).

The expected outcome of this study was to offer policy makers in Latin America a tool to assess the weaknesses and strengths of each country and to identify areas deserving policy attention, where the experience of other countries may be usefully applied. The results from this benchmarking analysis will also be useful to policy makers and researchers to better understand road safety, and to learn from each other in order to design effective road safety policies.

The explanations for “weaknesses and strengths” are not always provided in this study and further research may be needed to arrive at specific conclusions about where and how to improve, and indeed where further research may be needed. One of the reasons is that the information necessary to arrive at plausible explanations is not always available because we lack relevant data. For example, if we observe a high number of elderly pedestrians being killed in a country, we have to know whether this could be explained by a high number of kilometres walked, or by a risky road environment with fast moving motorised vehicles, or by drink driving during night time hours, etc. Appropriate and focussed countermeasures can be designed once this insight is gained.

This study was split in two main phases:

- Phase 1: Development of the methodology and theoretical framework, about which a working document was published in 2016 (ITF, 2016b)
- Phase 2: Collection of data, refinement of the methodology, benchmarking analysis and reporting on the results.

Methodology

Benchmarking consists of the systematic search and analysis of best practices, innovative ideas and effective operating procedures that lead to superior performance. In this sense, benchmarking is the first step to learn from the results obtained by others “in the same class”.

The comparisons in this study allow similarities and differences between countries to be identified, not only on the number of crashes and casualties, but also on the factors, circumstances and events that influence the risk of crashes and the severity of their outcome.

The purpose of this study is to compare – for the ten countries in Latin America – crash trends and characteristics, road safety strategies, policies, and measures that have been implemented, and to analyse which have been the most effective in reducing traffic casualties, and under which specific conditions. More specifically, the work encompassed the following tasks:

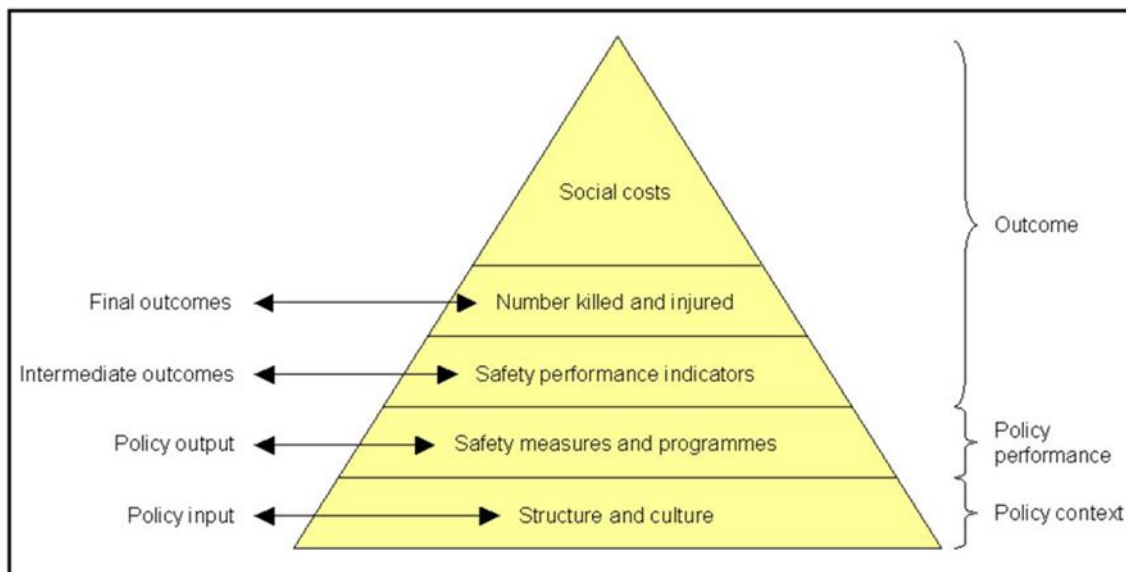
- Define indicators and collect the data required to analyse the specific case studies and overall policy.
- Provide insights concerning the quality of different data sources for comparing road safety policies and actions.
- Identify the strengths and weaknesses of each country or region through comparative benchmarking (data availability and quality).
- Develop a scientifically-based understanding of differences between benchmark values.
- Draw conclusions on effective interventions and measures and success factors in different areas, and propose how these could be applied in other countries participating in this project to improve their road safety performance.

To undertake this analysis, data and information has been collected and analysed in the following areas:

- road safety policy and organisation
- general data on the road transport system
- road crashes and casualty data, and traffic and road safety trends
- case studies on key road safety areas.

The methodological approach is based on the road safety target hierarchy (see Figure 1.3) used in the SUNflower project (Koornstra et al., 2002). In this, it is essential to have a clear understanding of traffic safety processes at different levels in the hierarchy, as well as the causes and consequences that lead to casualties and costs for society (Wegman and Oppe, 2010). The “structure and culture” layer captures country-specific characteristics relevant for road safety. The “structure” is related to the organisation of the policy context (who legislates, who deals with operational issues etc.). The “culture” relates to the societal perception of road safety problems and the respective responsibilities of individuals and the government (different tiers of government). The next layer concerns safety measures and programmes (as road safety policy performance), followed by the layer of safety performance indicators (as intermediate outcomes). Nearing the top of the hierarchy is the layer of numbers of road fatalities and injuries (as final outcomes), with the layer of social costs of accidents.

Figure 1.3. **A target hierarchy for road safety**



Source: Koornstra et al. (2002).

The methodological approach includes the development of a set of indicators, adapted to the road safety situation in Latin America. This includes final outcome indicators (for different road user groups, types of roads) and intermediate outcome indicators or safety performance indicators. The approach also includes the identification of road safety management practices in key road safety areas, as a basis for safety interventions benchmarking.

This project on road safety benchmarking in Latin American countries analyses information from all layers of the pyramid, as well as the relationships between them. This approach is in accordance with the three levels of road safety issues mentioned by Rumar (2000). The first level issues are related to the way crash and injury statistics are analysed, collected and organised, which varies from country to country. Referring to the target hierarchy proposed in the SUNflower project (Figure 1.3), these issues can be seen as final outcome indicators.

The second level issues are revealed by a deeper analysis of the first level issues, for instance unclear road traffic rules, inefficient enforcement of license requirements and traffic rules, insufficient control of road condition from a safety point of view, and risk indicators for crashes and casualties – per inhabitant or vehicle number – amongst others. Referring to the target hierarchy of the SUNflower project (Figure 1.3), they correspond to intermediate outcomes as well as safety measures and programmes.

The third level issues are less visible. They are related to the underlying processes or conditions of the traffic situation, namely the organisation and management of road safety work – such as central or distributed responsibilities – or the values and knowledge of road safety measures that the citizens in a society may have. These issues correspond to the safety measures and programme level and the structure and culture level from the SUNflower project.

The approach as described above could be seen as an “ideal” approach: it basically compares the safety performances of participating countries only (all sitting in one class), and tries to compare the performances of every country with the performances of the “best-in-class”. This comparison will allow countries to learn from the “best-in-class” and by doing so to perform better in the future. But in this research project it turned out to be impossible to identify one country as the “best-in-class”. Some countries are performing better than another, but not in a systematic way. There was also a lack of (comparable) data to support the benchmarking methodology. It was therefore decided to adapt and refine the methodology. Next to comparisons between the ten participating countries, performances in Latin America were compared with (better performing) countries elsewhere in the world. Sometimes European countries are used, or North America, or Australia. This has been done by using best practices as reported in the international road safety literature.

By using this approach, it could be argued that using a benchmark coming from the best performing countries in the world is not a realistic one, and is too ambitious for Latin American conditions. This is a fair observation, because we know that improving road safety is a step-by-step effort, and a lot of (small) steps have to be made to reach substantial progress. But the results of this research (comparing the performances of the ten participating countries plus presenting best practices worldwide) could also be seen as a source of inspiration, and an invitation to design and implement effective road safety strategies and action plans.

Country grouping

The study began by dividing the ten countries into two groups with some unifying similarities among the countries (ITF, 2016b). The idea behind grouping countries is that comparable countries can more easily learn from each other. A “grouping” analysis was undertaken, taking into account the following four indicators: population density, share of the population in urban and rural areas, motorisation rate and mortality rate in relation to motorisation rate.

Table 1.1. Grouping assessment for benchmarking road safety

Criteria	Group 1	Group 2
Population density	Colombia, Costa Rica, Cuba, Ecuador, Mexico	Argentina, Brazil, Chile, Paraguay, Uruguay
Geographical distribution of the population (urban / rural areas)	Colombia, Costa Rica, Ecuador, Mexico, Paraguay	Argentina, Brazil, Chile, Uruguay
Level of motorisation	Chile, Colombia, Costa Rica, Ecuador, Paraguay	Argentina, Brazil, Mexico, Uruguay
Mortality rate in relation to motorisation rate	Paraguay, Ecuador	Argentina, Brazil, Chile, Colombia, Costa Rica, Cuba, Mexico, Uruguay

Countries sharing similar characteristics were identified (see Table 1.1), but there was too little homogeneity in the results to use this as a means of understanding and comparing performance across different countries. That said, in this report some data is presented based on the following country grouping. Group 1 is composed of Colombia, Costa Rica, Cuba, Ecuador and Paraguay, while Group 2 is made up of Argentina, Brazil, Chile, Mexico and Uruguay.

Data collection and analysis

An initial task was to describe and analyse current road safety strategies, including key interventions and main stakeholders. Data and information was collected to describe the road transport system, including: population data, country area, road length, and registered motorised vehicles

Trends in fatal injuries and crashes have been analysed to explain differences identified by the benchmarking. The approach was to relate the outputs with the key measures implemented by each country and to identify the effects (positive or negative) of these measures. However, this turned out to be a weakness in many countries, as it is not well documented what exactly countries did in the past to improve road safety. For example, there is little known about the performance of police and judicial authorities in the field of enforcement and punishment. Monitoring and evaluating the impact of interventions is certainly an area to improve in all countries.

To identify major road safety issues in Latin America, the study focuses on the following subjects: pedestrians, powered two-wheelers, drink driving, seat belts and child-restraint use, speed, and post-crash care. These subjects are treated as cases. A selection of case studies has been made based on country interests and data availability.

Data availability, or more particularly lack of data or comparable data, turned out to be a major issue in this research. For example, the study works with data on fatalities and fatal crashes, although not all countries work with the same definition of a fatality. This lack of harmonisation complicates meaningful comparison. Data on slightly and seriously injured road crash victims are also problematic (unknown, but most probably biased underreporting). As a result, the study limits analysis to fatalities and fatal crashes only.

This research made completely clear that road safety data collection and analysis has to be improved in Latin American countries in order to build a solid basis for policymaking on road safety. This should be done in a harmonised way and it is recommended that OISEVI plays a pivotal role.

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Chapter 2. Road safety management

An analysis of road safety management is a critical window into a country’s overall safety performance and opportunities for improvement. A strong management focused on all aspects of road safety is required to produce road safety outcomes. Some critical elements for success are (SafetyNet, 2009):

- a well-resourced and mandated lead agency with budget and skilled staff
- effective co-ordination among the various stakeholders and clear definition of roles
- a solid regulatory framework
- adequate funding
- a national long-term road safety strategy, backed up by road safety plans with interim targets
- regular reporting.

This corresponds to the “the structure and culture” and the “safety measures and programmes” layers of the pyramid for road safety analysis (see Figure 1.3).

Institutional responsibility for road safety

Good practice road safety management at a country level starts with nominating and funding a lead agency to bring all the necessary functions and arms of government into a cohesive national response to road trauma (Peden et al., 2004; Bliss and Breen, 2009). The role of a lead agency is to:

- vigorously promote road safety within government and wider society
- ensure that sufficient public investment is raised and effectively allocated
- co-ordinate activity between government agencies
- prepare national strategies and lead achievement of associated targets.

A lead agency can take several administrative/institutional forms. Table 2.1 presents the agencies in charge of road safety at the national, regional and local level in the ten countries under review.

Table 2.1. Agencies responsible for road safety at federal/national/regional levels

Country	Agency (ies) responsible for road safety at national / federal level	Lead Agency	Date of creation	Agencies responsible for road safety at regional/local level
Argentina	ANSV (Agencia Nacional de Seguridad Vial)	Yes	2008	Traffic and Transport Directorates (Provincial and Municipal levels); Departments for Safety (Provincial level) Some Provinces have their own lead agency, others don't, and in some provinces there is neither a formal road safety bureau that can be identified in the governmental organisation chart nor a specific budget dedicated to road safety.
Brazil	DENATRAN (Departamento Nacional de Trânsito) and CONTRAN (Consejo Nacional de Trânsito)	Yes	1967	Federal level: Federal Highway Police, National Land Transport Infrastructure Department, National Land Transport Agency State level: DETRAN and 27 State Councils Municipal level: Municipal traffic agencies
Chile	CONASET (Comisión Nacional de Seguridad de Tránsito)	Yes	1993	Traffic Directorate of Municipalities Regional commissions in each region, which reports to CONASET.
Colombia^a	ANSV (Agencia Nacional de Seguridad Vial)	Yes	2013	Local agencies in charge of traffic, police and terminals
Costa Rica	COSEVI (Consejo de Seguridad Vial)	Yes	1979	Cantons and municipalities have responsibility for road safety.
Cuba	CNSV (Comisión Nacional de Seguridad Vial)	No	-	16 Provincial road safety commissions 164 municipal commissions reporting to CNSV
Ecuador	ANT (Agencia Nacional de Transporte)	Yes	-	Decentralized Autonomous Governments (GAD) National Police (in jurisdictions where the GAD does not have competence)
Mexico	CONAPRA (National Council for the Prevention of Accidents) currently chaired by the Ministry of Health with the participation of the Ministry of Communication and Transport	Yes	-	State and municipal governments and 32 States Councils for the Prevention of Accidents (COEPRA)
Paraguay	ANTSV (Agencia Nacional de Tránsito y Seguridad Vial)	Yes	2014	National roads: Road Patrol Urban areas: Traffic Directorate and traffic police of Municipalities (with support of the national police when needed)
Uruguay	UNASEV (Unidad Nacional de Seguridad Vial)	Yes	2007	Departmental governments Municipalities are responsible for road safety in their jurisdiction.

There is not a “best model” for a road safety lead agency. It depends on the governmental structure of each country. The most important criteria of a successful and efficient road safety agency are:

- A dedicated and sustained budget, typically funded from central government budgets, or user charges, like insurance schemes, income from traffic violations, or fees from vehicle or driver regulation.
- Skilled and permanent staff, which is a critical issue for most countries in this study – interviews with national experts revealed that in several countries capacity building in road safety agencies is a priority.
- A clear mandate in drafting road safety strategies, action plans and co-ordinating the different activities of stakeholders. Other tasks of the agency can include motor vehicle and driver regulation, road safety and information campaigns, data analysis and research, etc.

Lead agencies are already well established in Costa Rica and Chile, where they have been in existence since 1979 and 1993 respectively. In other countries, they are more recent. In Colombia, the agency was officially created in 2013, but it became operational only in December 2016 due to the difficulty of providing the administrative, legal and fiscal procedures required for the full operation of the Agency.

In Mexico, road safety responsibility is partly co-ordinated by CONAPRA (the National Council for the Prevention of Accidents), the State Councils for the Prevention of Accidents and the State agencies in charge of crash prevention for both urban and federal roads. The actions carried out on federal roads are co-ordinated by the Ministry of Communications and Transport. Road safety management is very fragmented in Brazil and there is not even a co-ordinating organisation. There are several agencies/organisations involving various stakeholders and different levels of government.

When the creation of a lead agency is not immediately feasible, a co-ordinating body could be formed to oversee the road safety agenda on an interim basis. This would likely need a professional secretariat to succeed, and could provide the basis for the necessary leadership function.

Responsibilities for road safety at the local level

Local road safety initiatives are key components of every effective road safety strategy and need to be empowered from a national/federal level. Some countries have centralised institutions at the local level, as in Argentina, Cuba, Mexico and Uruguay, while others rely on municipalities, as in Chile, Colombia and Paraguay. In the case of Argentina, municipalities are also responsible for road safety intervention according to the provincial and local constitutions. Brazil and Ecuador have higher level institutions co-ordinating road safety at the local level.

Challenges faced by federal countries

Federal systems of government can result in a diversity of legal frameworks for road safety within a given country, and create difficulties in implementing a national road safety policy. A degree of uniformity/homogenisation among the various regional legal frameworks and policies is important, particularly in vehicle safety, driving licensing and traffic rules and signs.

Co-ordinating road safety across Federal structures is a key challenge in Argentina, Brazil and Mexico where regional authorities like States and Provinces have a leading role in road safety. There are several options to ensure effective management of road safety at the federal level. Box 2.1 describes the grant programme in the United States of America to encourage States to do more for road safety. There

are several OECD member countries with a Federal government including Australia, Belgium, Canada, Germany, Switzerland and the United States. There would be value in setting up a group of federal countries to discuss and exchange experiences with road safety management.

Box 2.1. States grant programmes in the United States

Annually, the US Department of Transport has different types of grant programs administered through the Governors of States via Highway Safety Offices. Grant programmes are intended to influence States to do more and improved work in safety.

The US best practice experience relies on having grant requirements based on (either individually or in combination): achievement of a state safety law; achievement of certain program objectives; and meeting or exceeding a specific data threshold (for example, States that have pedestrian fatalities that represent 15% or more of the total motor vehicle-related fatalities automatically qualify for the new pedestrian/bicycle grant program).

The success has centred on raising the bar for safety in some programs (e.g. if the State achieves a high occupant protection rate then it has fewer specific grant requirements to meet as incentive). Traditionally, if new laws are involved (e.g. distracted driving), first-year grant requirements are easier in subsequent years requiring States to do more and/or better. For more information: <https://www.nhtsa.gov/highway-safety-grants-program>.

National road safety strategies, plans and targets

A national road safety strategy with a long-term vision backed up by road safety plans is an important policy tool. Strategy management processes should include setting, monitoring and reporting on road safety targets, as this has been proven to be effective in raising awareness of road safety, mobilising the various stakeholders and, in turn, achieving better performance (ITF, 2002; 2008; 2015). The experience of best performing countries suggests that targets should be based on a thorough analysis of road safety data and empirical evidence of effectiveness of selected measures. This helps countries to adopt achievable and ambitious targets, secure community support and strengthen political support (ITF, 2008). Table 2.2 summarises the status regarding the adoption of a national road safety strategy, safety plans and targets.

All countries have either a national road safety plan or road safety strategy with the exception of Argentina and Brazil. Argentina is currently in a transition period and a new road safety strategy is being elaborated. In Brazil, although there are several thematic plans, there is not a national road safety strategy. There is scope in all countries for a more systematic development of a national strategy, supported by ambitious and achievable targets (including safety performance indicators), detailed national safety plans, and institutional settings with clear accountabilities and effective implementation systems.

Cuba, Mexico and Uruguay have long-term strategies supplemented by time-bound action plans which provide greater opportunity to encourage long-term analysis and short-term results. In addition, Argentina, Chile, Colombia and Uruguay have specific plans in place for motorcycle safety, which is important given the scale of this problem.

Most countries work with a quantitative target. These targets, however, are usually based on poor insight into “business-as-usual” combined with information of effectiveness of proposed interventions (as is the case in a few European countries). This means that it is not known if these targets are achievable. It is known that countries with ambitious targets perform better than countries without quantitative targets, or with unambitious targets.

Safety performance indicators (e.g. seat belt use, speed, number of alcohol related crashes) are essential tools to monitor the progress of a road safety strategy, and adjust it when needed. Based on available information, most countries do not have a systematic process to monitor continuously key indicators and assess the success of their road safety strategies.

Generally, current performance is not improving, and experiences in many countries suggest that significant efforts are required to set road trauma on a downward path.

Table 2.2. **National road safety strategies, plans and targets**

Country	National Road Safety Strategy/Plan	Main targets
Argentina	New strategy under development	Under development
Brazil	No	No
Chile	Strategy under development	
Colombia	Road Safety Strategy 2013-21 (adopted as a Resolution of the Ministry of Transport)	-26% road fatalities by 2021 ≤ 8.3 deaths per 100 000 population
Costa Rica	National Road Safety plan 2015-20	-20% in the mortality rate per 100 000 population
Cuba	National Road Safety Strategy 2009-24 Several short-term action plans. Current plan covers 2013-16	≤ 5.0 deaths per 100 000 population
Ecuador	National Road Safety Strategy 2015-20	-40% road deaths by 2020 < 13.2 road deaths / 100 000 population
Mexico	National Road Safety Strategy 2011-20 Strategic Action Plan 2013-18	-50% road deaths
Paraguay	National Road Safety Plan 2013-18	-20% deaths by 2018 -20% serious injuries
Uruguay	National Road Safety Strategy 2011-20 Annual national actions plans	-50% deaths by 2020

Box 2.2. What is a road safety strategy? What is a road safety plan? How to set targets?

A **road safety strategy** typically has a 5- to 10-year time frame. It describes the main lines of thinking, sets priorities and identifies the main stakeholders. It is a political commitment, ideally endorsed by the government. It is based on a long-term vision (e.g. “zero road deaths or serious injuries”) and includes interim targets.

A **road safety plan** is a technical document derived from the road safety strategy. It typically covers one to three years and presents in details the measures that will be implemented during this period and their expected effect. It describes the conditions for implementing the measures, including in terms of resources and budget.

There are two ways to set **road safety targets**: The first “top-down” method is to formulate a target without being exactly clear beforehand what measures need to be taken to achieve that target. An example is the targets set by the European Union: a halving in ten years.

The second “bottom-up” method derives a “business-as-usual” target, typically based on extrapolation of trends from the past, to which the safety effects of the policy interventions under consideration are added, and an estimated result is identified. If this future result is considered satisfactory, it becomes a target. If it is not satisfactory, an adjusted package of measures is developed and a new result is estimated.

Targets should be set at different levels. Final outcome: for example the number of road deaths and serious injuries. It is recommended that targets are based on the absolute number (e.g., less than 2 000 road deaths or reduction of 50% in the number of casualties) rather than on rates (e.g., less than eight deaths per 100 000 population). Safety performance indicators: for example, seat belt wearing rates, helmet use, average speed, number of alcohol related crashes.

Regular monitoring and evaluation of performance against road safety targets is essential to assess performance and to make adjustments as required.

Status regarding key legislative measures to influence behaviour

Table 2.3 presents the status of important behavioural measures in each of the participant countries and the year of introduction. The measures have largely proven their effectiveness and are “common practices” in most OECD member countries. They include legislation on seat belt and helmet wearing, maximum speed in urban areas, drink driving, compulsory third party insurance and the use of mobile phones while driving.

In several countries the adoption of important safety measures has been very recent. In Ecuador, for example, most safety measures were adopted in 2014, while in Costa Rica they were introduced in 2012. Countries with the “longest” experience with road safety measures are Argentina (many measures were adopted in 1995) and Colombia (2002). In many European countries, most of the key road safety measures were adopted in the 1970s and have produced important safety benefits. These measures could bring important safety benefits in the coming years, providing they are backed up by regular campaigns and continuous enforcement.

Table 2.3. Implementation status of important road safety measures and years of introduction

	Argentina	Brazil	Chile	Colombia	Costa Rica	Cuba	Ecuador	Mexico ^b	Paraguay	Uruguay
Compulsory vehicle insurance (cars and motorcycles)	Yes	Yes	Yes not for mopeds	Yes, not for mopeds	Yes	No	Yes, together with vehicle registration tax	Yes at federal level. At State level: in 14 states only	No	Yes
Default speed limit in urban areas	60 km/h	30-80 km/h	60 km/h	60km/h	50 km/h	50 km/h	50 km/h	60 km/h	50 km/h	45 km/h
Compulsory use of front seat safety belts in passenger cars	1995	1997	1985	2002	2012	2010	2014	2003	2008	1992
Compulsory use of rear seat safety belts in passenger cars	1995	1997	2005	2002	2012	No	2014	2003	2014	2007
National child restraint law	1995	2008	2006	2002	2012	2010. Not implemented in practice ^a	2012	2003	2014	2013
National drink driving law. Maximum authorised blood alcohol concentration (BAC) for car drivers	1995	2012	1997	2012	2012	2010	2014	0.8 g/l (may vary by states)	2008	2008
National motorcycle helmet law (motorcycles and mopeds)	1995	1997	1985	2002	2012	2010	2014	2003	2008	2009
Pedestrian priority on zebra crossing	1995	1997	1986	2002	No	2010	2014	2015 only in the highway code of Mexico city	2008	1984
National law on mobile phone use while driving (prohibition on hand-held mobile phone use – hands free permitted)	1995	1997	2005	2002	2012	2010	2014	2003	2008, poor compliance	2013

Notes: a) Cuba: Although the use of child restraint systems is mandatory by law, in practice as these devices are not sold in Cuba, it is only required that children below 2 are seated in the back of the car accompanied by an adult.

b) Mexico: Measures introduced in 2003 were part of a package of measures to reduce the occurrence and impact of road crashes (General Health Council).

c) Mexico: According to the Highway Code for federal roads and bridges only.

d) Paraguay: The use of child restraint system is compulsory, but in practice it is only used by high income families.

There was little information available for this study on the enforcement of these laws. In most countries, there is an important distinction between the fact that a measure has been legislated and its actual implementation, due to economic or other reasons. In Paraguay and Cuba, for example, the use of safety child seats is in theory compulsory, but the price of this safety equipment is considered prohibitive for most low-income families in Paraguay, and these devices are not sold in Cuba. Additionally, while some equipment (e.g. helmet, seat belt, active safety equipment) may be compulsory, there is not always information or regulation on equipment standards. Adopting UN regulations and standards could be an efficient regulatory framework for all countries.

Organisation of traffic enforcement

There is an important distinction between a measure being legislated, and actually enforced. In all countries, for most measures, quite severe penalties are already in place, and improved compliance with traffic safety law now relies on significantly increasing the perceived likelihood of being detected through increased enforcement.

The potential effectiveness of traffic enforcement is well documented (see for example Hakkert et al., 2005; Cliff, 2016), and derives from two approaches:

- General deterrence is the process whereby drivers are deterred from offending by the perceived risk of detection without the actual experience of that detection. When general deterrence is sufficiently visible and regular – to create a perception that a driver will be detected – it is highly effective in deterring “simple” offending behaviour types such as alcohol impaired driving.
- Specific deterrence is the actual experience of being sanctioned for a traffic violation (e.g. speeding). This may be an immediate sanction in the form of being stopped by a police officer and issued an infringement notice, or receiving an infringement later if detected by a speed camera.

Research indicates that general deterrence is the main driver for change of human behaviour because the safety impacts are far higher than specific deterrence (Goldenberg, 1995). The effectiveness of general deterrence is not only determined by police activities but also by (mass media) campaigns. Enforcement and campaign activities should always go together. An organisation (such as the lead agency) can be in charge of delivering and co-ordinating the campaigns.

Enforcement is an essential component of a comprehensive road safety policy and can significantly improve road safety outcomes, providing it is well organised, funded, managed and co-ordinated. The dominant aim of police enforcement is changing road user behaviour, specifically by deterring road users from violating traffic laws and regulations. An effective enforcement system is based on:

- a fair sanction regime, which applies to all equally and with sanctions proportional to the safety risk of the violations
- a high perception by the population that there is an effective enforcement system
- a sufficient number of well-trained police officers who are trusted by the population and free of bribery and corruption
- a solid system for the management and monitoring of sanctions to make it impossible to escape the payment of the fine.

Box 2.3 illustrates the automated traffic offence system in France, which makes it nearly impossible to escape the payment of the fine. Most countries could do more to strengthen the fine collection system, by increasing the perception that fines will be collected.

Box 2.3. Automated traffic offence processing in France

In 2011, the French National Agency for the Automated Processing of Offences (*Agence nationale de traitement automatisé des infractions* [ANTAI]) was created to contribute to the State modernisation, save costs, and increase the reliability of the process and equity among offenders. The ANTAI ensures the automated processing of the correspondence with the offenders after a traffic offence is detected by an automated system (speed cameras or red lights) or registered by electronic equipment within the framework of the “electronic ticketing” programme (PVe). ANTAI also aims to facilitate the payment of fines and the appeal process.

There are three types of fines: fixed, reduced and increased fines, depending on compliance with deadlines for payment. Several payment channels (internet, phone, mail, Public Revenue Office, tobacconist) and methods (credit card, e-stamp, cheque, cash, fine-stamp) are available. A traffic violation ticket or an increased fine may be appealed in three cases:

- Case 1: theft, destruction, usurpation, donated or sold vehicle
- Case 2: designation of the actual driver of the loaned or rented vehicle
- Case 3: contestation of the reality of the offence.

In the latter case, it is compulsory to make a deposit (consignation) using the same procedure, in an amount equal to the fine, but without deduction of points from the driving license. This deposit will be reimbursed if the appeal is closed without further action or if the judge declares the case dismissed.

ANTAI is also the national contact point for European countries to exchange information (according to the EU Directive 2015/413 facilitating cross-border exchange of information on road-safety-related traffic offences). This exchange of information is currently working between ten countries in Europe.

As of 2017, offenders who do not pay their fine despite notifications are registered in a “Register of bad payers”. When stopped (during a control or following an offence) by French police forces, payment of the fine will be requested and their vehicle will be retained as long as the fine remains unpaid. Also as of 2017, foreign offenders will be monitored with a virtual driving license, functioning like a French driving license with the same amount of points (12), with the prospect of being banned from driving in France in the case where all points have been removed.

Sources: DSCR (Delegation to Road Safety and Road Traffic), <http://www.securite-routiere.gouv.fr/>
 NTAI, <http://www.antai.gouv.fr/en/publiques/accueilstranger>

Box 2.4. Speed enforcement in Spain

Spain’s speed enforcement policy has developed in four major stages:

1. 1980s: The first annual road safety plan was adopted. Enforcement was done exclusively on the use of mobile speed cameras. Low intensity of surveillance.
2. 2004-05: National plan of fixed speed cameras, with a significant increase of speed control points. By 2017, there were approximately 650 control points, in which 375 speed cameras operate. In

addition, there are 25 section (average speed) cameras and 13 cameras operating in helicopters.

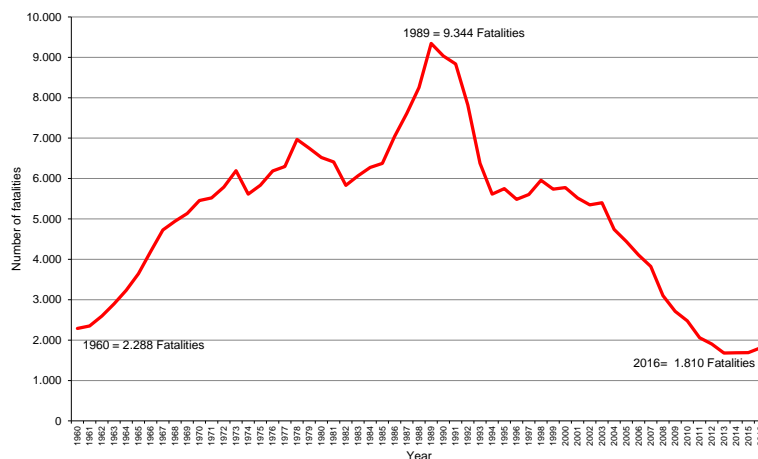
3. 2006: Introduction of the demerit point system, reform of the criminal code and of the sanctioning procedure; creation of the National Center for Camera-Assisted Fine Enforcement (CTDA). In 2009, the sanctioning procedure was reformed. The management of administrative procedures is simplified and the owner of a vehicle is obliged to identify the driver who was driving the vehicle when photographed by a speed camera. In 2016, excessive speed accounted for 34% of all points withdrawn from Spanish drivers' licenses.
4. Refinement of the speed camera system; the emphasis is on conventional roads and high-risk sections. The operational margins of cameras are made homogenous and disseminated.

One policy component that has been present throughout all these stages has been the implementation of periodic campaigns of awareness and surveillance, consisting of the dissemination of messages through the media and the increase of the intensity of surveillance during a period of 1-2 weeks.

Overall, the creation of the CTDA and the reform of the sanctioning procedure have significantly increased the system's effectiveness and credibility. However, although an important part of the speed enforcement policy has been based on the growth of the network of fixed speed cameras, the surveillance by mobile cameras has not lost its importance. In 2016, the Traffic Group of the Guardia Civil (Traffic Police) checked the speeds of 23.4 million vehicles on non-urban roads. A majority of these checks were carried out on rural (1+1) roads, where mobile speed cameras are particularly well suited to the typical low traffic flow of this type of roads. Since 2015, the Directorate General for Traffic has been using an index called INVIVE, which uses data on observed speeds and crash records to identify high-risk road sections where enforcement through mobile speed cameras must be reinforced. These sections are published on the website www.dgt.es.

The available indicators show that these policies have been effective in reducing average speeds in the Spanish road network. The percentage of light vehicles exceeding the speed limit (120 km/h) on motorways has decreased from 28% in 2003 to 16% in 2015; and on rural roads, the percentage of light vehicles exceeding the speed limit (100 km/h) has decreased in the same period from 17% to 13%. Although there are no scientific studies isolating the impact of speed reductions on casualties on the Spanish network, it is clear that speed reduction has contributed to an important part of the decrease in the number of fatalities in Spain.

Figure 2.1. **Evolution of the number of fatalities within 30 days in Spain, 1960-2016**



Source: DGT.

Table 2.4. Overview of traffic police organisation

Organisation of traffic police	
Argentina	National roads exclusively: Gendarmería Nacional and Policía Federal, which depend of the Ministry of National security (Ministerio de Seguridad de la Nación). Provincial roads, national roads and other roads: provincial police of the 24 provinces. Urban areas: Traffic agents if the State government created a special force; provincial police if there is an agreement between the State and the provincial governments to work together.
Brazil	Federal Highway Police, State Military Police, Municipal Guard (civil) and Municipal Traffic Agents
Chile	Carabineros de Chile (National police)
Colombia	National roads: National Police Traffic and Transport Directorate (DITRA), which includes 7 000 police officers. Urban roads and rural roads under municipal jurisdiction: Municipal traffic inspectors. Cities have to sign an annual contract with DITRA. Some areas are neither covered by DITRA or the municipal traffic police (Source: World Bank capacity review)
Costa Rica	Policia de Transito
Cuba	Policia Nacional Revolucionaria
Ecuador	National Police
Mexico	Federal roads: Federal police State and municipal roads: state and municipal traffic police
Paraguay	Patrulla Caminera on national roads Municipal police in urban areas National police on the whole network
Uruguay	National roads: National Traffic Police Cities: Municipal traffic Traffic police includes around 1 200 police officers

Achieving effective enforcement relies on well-organised and co-ordinated police forces, with adequate budget. A prerequisite is to have enough police officers dedicated and trained to road safety. Table 2.4 summarises how traffic police is organised in the ten countries under analysis.

Sustained traffic enforcement should be publicly and demonstrably supported by Government Ministers and Police Commanders. Low levels of police enforcement can reflect a lack of political leadership in road safety, as well as a wider set of institutional issues. Institutionally, it can be difficult for a police force to break away from a focus on personal security and safety, and instead focus on the prevention of injury on the road. Road safety management capacity is particularly critical in these environments, starting with the top leadership of the organisation.

The most senior levels of command need to have a clear understanding of the principles behind good quality road traffic enforcement, to commit resources to the problem. They need to develop partnerships with other agencies to set and monitor indicators to measure progress in the delivery of critical enforcement services and user behaviour. Demonstration enforcement projects in cities, regions or states would help identify and promote good practice for road traffic enforcement within the Latin American context.

Further research could be undertaken to assess the effectiveness of traffic policing at a country level, since there is currently almost no available information. It could for example be useful to report on the number of violations or the number of hours dedicated to traffic enforcement by the police. With the

participation of all member countries, OISEVI could undertake a study on enforcement practices in Latin America, including a detailed description of police agencies in charge of enforcement, enforcement methods and sanction regimes.

Driving license systems

The driving licence system is an important component of any road safety strategy. This requires a person learning to drive in a controlled environment, with a competent driver sitting in the passenger seat, and being tested ahead of being granted a licence. (Information on motorcycle driving licenses is presented in Chapter 7. In all countries there is distinct system to get a professional driving licence, but this is not covered in this study.)

There is good evidence that controlled conditions should continue after the initial licensing process so that skills and experience are safely developed. This is called graduated licensing and positive safety effects are measured in a large number of countries worldwide (Foss et al., 1999; Shope, 2007). Based on information collected, none of the ten countries currently has such a graduated licensing system. Table 2.5 presents the conditions to obtain a car driving license for the countries under analysis.

Table 2.5. **Criteria for obtaining a car driving license**

Country	Minimum driving age	Theoretical exam	Practical exam	Demerit point system
Argentina	17 with parental agreement	Yes	Yes	Yes (it is in the traffic law) but not yet in application
Brazil	18	Yes	Yes	Yes (it is an additive system not a demerit system)
Chile	18 17 with parental agreement	Yes	Yes	No
Colombia*	18 16 with parental agreement	No*	No*	No
Costa Rica	18	Yes	Yes	No
Cuba	18	Yes	Yes	Yes
Ecuador	18 16 with parental agreement	Yes	Yes in principle	Yes
México	18	Yes in most states	Yes in most states	In some states
Paraguay	18	Yes in some localities	Yes in some localities	Yes but not yet in application
Uruguay	18	Yes	Yes	No

Note:* In Colombia, a new licensing system should enter into force in 2017 which will include a theoretical and a practical exam.

The minimum age to get a car driving license is 18 in almost all countries, which is encouraging. The exception is Argentina where the minimum licensing age is 17; it is also possible to get a licence at 17 in Chile, and 16 in Colombia and Ecuador, subject to a formal parental or tutoral consent.

In 2016, practical and theoretical exams were required in all countries, except in Colombia, which is also encouraging. The full licensing system is currently being reviewed in Colombia and a new licensing

system should enter into force in 2017 which will include theoretical and practical tests. There are wide variations among the ten countries regarding the content of the practical tests (and the practical tests may vary from one state/region to another in Argentina and Uruguay). Both theoretical and practical tests should be set at a level where the regulator can assure itself of the safety knowledge and practical capability of the person applying for a licence. Safety knowledge can be demonstrated through multiple choice questions and relatively simple electronic tests for recognising traffic hazards. Practical capability requires demonstration under real traffic conditions. Finally, all regulators should have audit systems in place to counter corrupt practices.

Argentina and Colombia have a compulsory pre-licensing training system. This goes beyond what is required in Europe or Australasia for example. In these countries, there are a number of different models for delivery of testing services (some delivered by government, others delivered by accredited organisations), and there is typically a driver training market. In this situation, the regulator may prepare a curriculum which, if followed, will assist an applicant to pass the theory and practical tests. There are many sources to assist in the development of such curriculum. As an example, the International Commission for Driver Testing (CIECA) provides useful guidance regarding training and testing.

In some countries, the driving licensing system is managed at the state/regional level. This may mean there are no common licensing standards, or a unique driver licence register. National driver licensing systems (with integrated components in a Federal environment) are essential for traffic enforcement purposes, including for example an effective demerit point system. In the case of Argentina, there is a Unique National License (since the creation of the National Agency) together with different provincial and municipal licensing systems. At the beginning of 2017, around 85% of drivers hold a National License. The licenses of the 15% remaining drivers are issued by hundreds of local authorities. A demerit point system is in application in Cuba and Ecuador. In Argentina, Paraguay and Mexico, it exists in theory, but it is either not implemented, or unevenly implemented between the various jurisdictions.

Finally, for this study, there was no information available concerning the number of unlicensed drivers. Countries should also assess the situation regarding unlicensed and especially never licensed drivers and riders. While there are some problems in high-income countries of drivers and riders who have had their licence suspended, the more fundamental problem in many countries is that a licence has never been issued – if this is the case, it needs to be fully addressed.

Safety quality of roads

The design characteristics of a road network and of roads and streets are undoubtedly related to their safety performance. The assessment of the safety quality of roads is therefore of major importance for safety policies.

Several methodologies are available to assess the safety quality of existing road infrastructure (see for example ITF, 2015). Some use the crash history of road infrastructure (for example to identify high risk sites or to come up with crash modification functions/factors). Others use surrogates for road related risks (for example SPIs for roads based on inspection of roads). It is also possible to use the star rating procedure as developed by the iRAP organisation (www.irap.org). Nevertheless, IRAP's readily available data are not meant to compare the performances of countries by way of cross checking, but rather compare the individual performance of roads and streets with an “international knowledge benchmark”, that is to say the iRAP reference.

Within this project it was foreseen to compare the safety quality or performance of road infrastructure in the ten participating countries, to identify differences and similarities and based on that to benchmark countries. Unfortunately, no comparable information on the safety quality of a representative sample of roads with a relevant level of disaggregation per road type was available.

The concept of the iRAP methodology is to make an assessment of the safety quality of roads by identifying infrastructure-related risk scores (star ratings). The protocol involves an inspection of road infrastructure attributes that are known to have an impact on the likelihood of a crash occurrence and its severity. Between 1 and 5 stars are awarded depending on the level of risk which is attributed to a specific road. Following this approach, the lowest risk roads (4- and 5-star) have road safety attributes that are appropriate for the prevailing traffic speeds. According to iRAP standards the highest risk roads (1- and 2-stars) do not have road safety attributes that are appropriate for the prevailing traffic speeds.

Information about road attributes is collected by conducting video surveys of roads and subsequently recording data for more than 40 different road attributes at 100-metre intervals along the road. The road attributes include speed limit, curvature, intersections and sidewalks. Additional supporting information on motorised traffic, pedestrian and bicyclist flows and traffic operating speeds is also compiled.

Following the data collection phase, road attribute risk factors are combined with the road attribute data (see also iRAP, 2014). The factors imply that, for example, the likelihood of a vehicle run-off road crash occurring on a very sharp curve is six times higher than on a straight or gently curving segment of road. The road attribute risk factors are then brought together in multiplicative equations to produce star rating scores (SRS), which are produced for vehicle occupants, motorcyclists, pedestrians and bicyclists for each 100-metre segment of road. These scores are then assigned range bands to produce Star Ratings, as shown in Table 2.6.

Table 2.6. Star Rating bands and colours

Star Rating	Star Rating Score				
	Vehicle occupants and motorcyclists	Bicyclists	Pedestrians Total	Along roadside	Crossing
5	0 to < 2.5	0 to < 5	0 to < 5	0 to < 0.2	0 to < 4.8
4	2.5 to < 5	5 to < 10	5 to < 15	0.2 to < 1	4.8 to < 14
3	5 to < 12.5	10 to < 30	15 to < 40	1 to < 7.5	14 to < 32.5
2	12.5 to < 22.5	30 to < 60	40 to < 90	7.5 to < 15	32.5 to < 75
1	22.5 +	60+	90 +	15 +	75 +

iRAP data for eight countries were made available to this study; however these data do not constitute a representative, nor comparable, measurement of the safety quality of their roads, as iRAP ratings are not conducted on comparable road samples - preventing direct interpretation for benchmarking purposes. Nevertheless they illustrate of the usefulness of the iRAP methodology to assess the quality of roads and its potential to benchmark countries, assuming sampling issues and representativeness issues are carefully addressed.

In this study, iRAP results were categorised and summarised according to type of roads (urban and rural) and carriageway type road attributes (divided carriageway [D] and undivided carriageway road [U]). Figures 2.2 and 2.3, for example, show the percentage of roads rated 3-stars or better for vehicle occupants and motorcycles, disaggregated by area and carriageway type. The analysis of these figures

allows to identify, for instance, that there is a relatively high percentage of rural roads in Chile with a divided carriageway that were rated 3-stars or better for vehicle occupants, but not for motorcyclists. The same country receives a poor rating in rural undivided roads for vehicle occupants.

Figure 2.2. Roads rated 3-stars or better for vehicle occupants

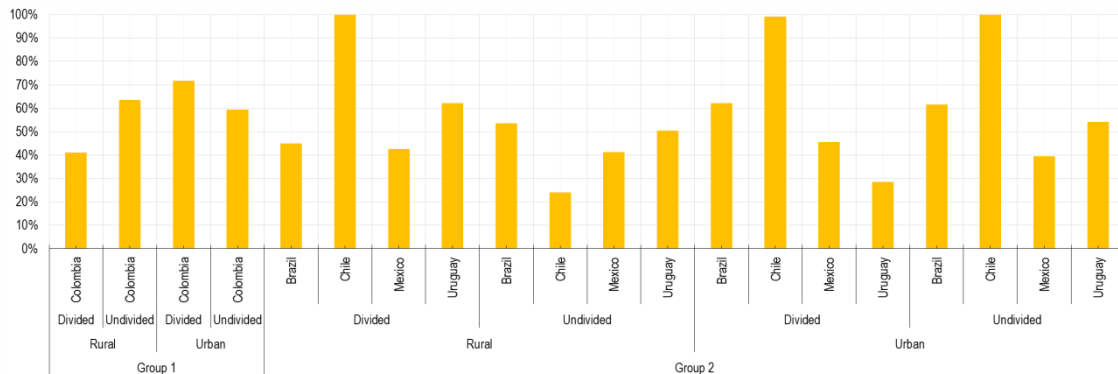
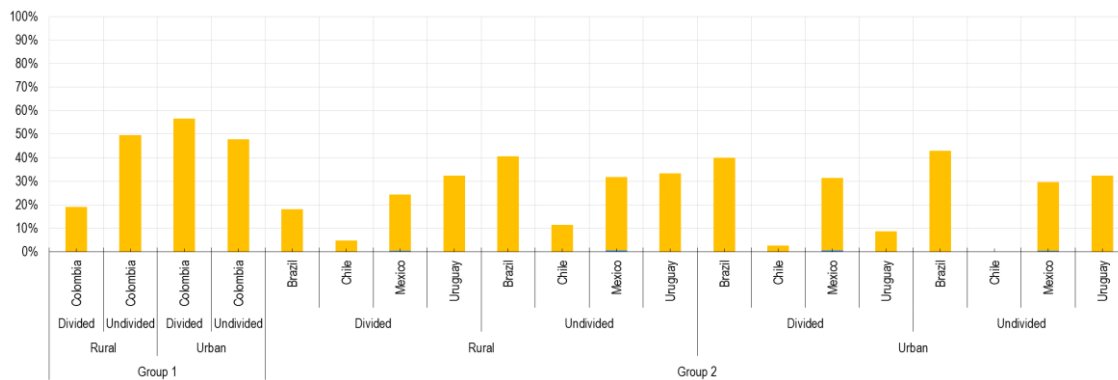


Figure 2.3. Roads rated 3-stars or better for motorcyclists



United Nations Conventions on vehicle safety

The United Nations Economic Commission for Europe (UNECE) manages a number of United Nations road safety legal instruments. UNECE legal instruments are negotiated by governments and become legally binding for states that accede to them. These legal instruments cover: traffic rules; road signs and signals; construction and technical inspection of vehicles; road infrastructure; driving times and rest periods for professional drivers; and safe transport of dangerous goods and hazardous materials. The conventions serve as a foundation for states to build national legal frameworks which prevent death and disability from road traffic crashes.

All countries should consider ratifying each of these UN safety conventions, but particular attention is required to those relating to vehicle safety regulations.

Table 2.7. Status of ratification of the six main UN road safety conventions

Country	1968 Convention on Road Traffic	1968 Convention on Road Signs and Signals	1958 Agreement concerning the Adoption of Uniform Technical Prescriptions for Wheeled Vehicles, Equipment and Parts	1997 Agreement on Technical Inspections of Vehicles	1957 Agreement on Dangerous Goods by Road (ADR)	1998 Agreement (Global Technical Regulations)
Argentina	NO	NO	NO	NO	NO	NO
Brazil	YES	NO ²	NO	NO	NO	NO
Chile	NO ¹	YES	NO	NO	NO	NO
Colombia	NO	NO	NO	NO	NO	NO
Costa Rica	NO ¹	NO ²	NO	NO	NO	NO
Cuba	YES	YES	NO	NO	NO	NO
Ecuador	NO ¹	NO ²	NO	NO	NO	NO
Mexico	NO ¹	NO ²	NO	NO	NO	NO
Paraguay	NO	NO	NO	NO	NO	NO
Uruguay	YES	NO	NO	NO	NO	NO

1. Chile, Costa Rica, Ecuador and Mexico have signed but not ratified the 1968 Convention on Road Traffic.

2. Brazil, Costa Rica, Ecuador and Mexico have signed but not ratified the 1968 Convention on Road Signs and Signals.

Vehicle safety regulations

On 15 April 2016 the UN General Assembly adopted resolution A/RES/70/260 on “Improving global road safety” which includes strong commitments on vehicle safety. The resolution “invites Member States that have not already done so to consider adopting policies and measures to implement United Nations vehicle safety regulations or equivalent national standards to ensure that all new motor vehicles, meet applicable minimum regulations for occupant and other road users protection, with seat belts, air bags and active safety systems fitted as standard.”

The resolution is an unprecedented call for standard fitment of vehicle safety technologies. Effort is now urgently required on vehicle safety legislation where there is considerable scope for improvement.

The Global Status on road safety (WHO, 2015) identifies seven priority United Nations vehicle safety regulations that apply to passenger vehicles. All countries should adopt these seven standards. A recent study commissioned by Global NCAP and the Inter-American Development Bank shows that 40 000 lives could be saved in Latin America and 400 000 serious injuries prevented by 2030, if UN vehicle passive safety regulations were applied by Argentina, Chile, Mexico and Brazil following the certification processes of the UN (Working Party 29) 1958 Agreement.

While, as of January 2017, no country had adopted all seven priority standards, there has been some progress. Argentina, Brazil, Chile, Colombia, Ecuador and Uruguay have applied the two seat belt regulations. With the exception of Colombia, they have also applied the frontal impact regulation. All seven regulations have either been applied, are scheduled to be applied, or are under discussion in Brazil and Argentina. Table 2.8 below illustrates Governments’ stated compliance with UN regulations.

Table 2.8. Implementation status of important UN vehicle safety legislation

	Seat belt (UN Reg N°14)	Safety belts anchorage (UN Reg N°16)	Frontal impact standard (UN Reg N°94)	Lateral collision standard (UN Reg N°95)	Electronic Stability Control (UN Reg N°13H / GTR8)	Pedestrian Protection (UN Reg N°127 / GTR9)	Child seats
Argentina	Yes	Yes	Yes ^a	Yes ^a	Yes ^b	No, under discussion	Yes ^c
Brazil	Yes	Yes	Yes	No	Yes ^d	No	Yes
Chile ^e	Yes	Yes	Yes	Yes	No, under discussion	No	Yes
Colombia	Yes	Yes	No	No	No	No	No
Costa Rica	No	No	No	No	No	No	No
Cuba	No	No	No	No	No	No	No
Ecuador	Yes	Yes	Yes	Yes	Yes	No	No
Mexico	Yes	No	No	No	No	No	No
Paraguay	No	No	No	No	No	No	No
Uruguay	Yes	Yes	Yes	No	No	No	Yes

a) Argentina: the regulation will be implemented in 2018 for new models, and 2022 for every new vehicle.

b) Argentina: the regulation will be implemented in 2018 for new models.

c) Argentina: The regulation has been implemented in 2016 for new models, and will be implemented in 2018 for every new vehicle (ISOFIX and LATCH System).

d) Brazil: Will be required for new vehicles sold as of 1 January 2022 and for all vehicles as of 1 January 2024.

e) Chile use Japanese, Korean and Brazilian regulations.

Particular mention is required of the approach taken by Ecuador which has applied five of the seven regulations, and established the United Nations (1958 Agreement) regulations as the exclusive channel for local homologation. Rather than establishing the full list of regulations which have been set in high-income countries, Ecuador simply requires manufacturers to apply for a type approval under the UN 1958 Agreement against the most important safety-relevant UN regulations. This includes regulations for ongoing administrative and production compliance which provide the necessary safety assurance.

Latin American countries should become a contracting party of the 1958 Agreement (UNECE Vehicle Regulations) and the 1998 Agreement (Global Technical Regulations). The UN WP 29 1958 agreement imposes a number of conditions (such as the tests of the models being performed in independent laboratories) that aim at a transparent process and manufacturers building vehicles that consistently meet the required standards.

Table 2.9 presents the Global New Car Assessment Programme's recommended road map for improved vehicle safety by 2020.

Another critical UN standard to be adopted urgently by all countries concerns the provision of high-quality helmets meeting the UNECE 22 (or equivalent) standard requirements.

Table 2.9. **Global NCAP recommended vehicle regulatory road map 2020**

Road map for safe vehicles 2020 UN regulations* for:	All new vehicles produced or imported	All vehicles produced or imported
Frontal impact (No. 94)	2016	2018
Side impact (No. 95)		
Seat belt and anchorages (No. 14 and 16)	2016	2018
Electronic stability control (No. 13H/GTR. 8)	2018	2020
Pedestrian protection (No. 127/GTR. 9)	2018	2020
Motorcycle anti-lock brakes (No. 78/GTR. 3)	2016	2018
Autonomous Emergency Braking systems	Highly recommended	Highly recommended

*or equivalent national standards such as US Federal Motor Vehicle Safety Standards (FMVSSs).

Conclusions and recommendations

Both a road safety lead agency and road safety observatory are needed. The road safety agency is the decision-making body. The observatory monitors performance. There are lead agencies in Argentina, Chile, Colombia, Costa Rica, Ecuador, Paraguay and Uruguay, but it seems that these agencies are not all yet staffed and empowered to take a formal leadership role. It is not enough, however, to establish a lead agency or mandate an existing agency to lead. Whatever the form of the lead agency, it needs a clear mandate, adequate budget and resources, and stability within the staff. Keeping skilled and technical staff in road safety positions is a challenge in several countries, and efforts should be made to ensure continuity of the staff working on road safety.

In several countries, local authorities have an important role in the implementation and enforcement of measures. And they shall be able to initiate the required changes. The national/federal level can provide incentives.

All countries, except Brazil and Argentina, have either a road safety plan or road safety strategy (a new strategy is under development in Argentina but not yet adopted). There is scope in all countries for a more systematic development of a national strategy, with ambitious and achievable targets, detailed national safety action plans, and parallel safety plans at local level when needed. While several countries have established targets, these targets are rarely set up following an analysis of the planned interventions and their possible effects.

There is a reasonable legal framework for many important legislative measures relating to driver behaviour across the ten countries, with widespread adoption of mandatory requirements relating to the compulsory use of seat belts and of motorcycle helmets, maximum blood alcohol concentration, and more recently the use of mobile phones. However, in federal countries, and Mexico in particular, the application of federal legislation varies across the country. Furthermore, the maximum speed limit in urban areas is above 50 km/h in Argentina, Brazil, Chile, and some localities in Mexico. Legislative priority should be given to the application of the key UNECE vehicle safety and helmet regulations.

Visible, regular enforcement targeted at the whole driving population focusing in particular on well-understood traffic rules – such as speeding, drink driving, non-use of seat belts or helmets – is essential, along with penalties and legal processes which reinforce the seriousness of the offending.

These operations should be data-driven, and be supported by good quality technologies and mass media education campaigns.

In nearly all countries, the enforcement system should be strengthened. The focus should not be to raise the amount of the fines but to increase the population's perception that unsafe behaviours will be detected, and the payment of the fine will be required when they commit a traffic offense. This will require capacity building among the police forces. An OISEVI study on the organisation and effectiveness of enforcement in Latin America could be highly valuable.

Driver licensing systems are the point of entry for drivers into the road traffic system, and can almost always be strengthened to improve road safety results. Based on the findings of the study, all countries are likely to benefit from review and reform of their licensing system, focusing on:

- pre-license curriculum and training standards
- the licensing standards such as age, and graduated exposure to risk
- audit and compliance systems to monitor testing and on-going driver compliance
- systems to enforce suspension or disqualification of the driver licence.

As in many low- and middle-income countries, it seems that the driving license is easy to get in some countries (either through lax standards or lax systems), and hard to lose (despite regular offences). Particular attention should be given to reducing unlicensed driving.

The safety quality of road infrastructure plays an important role in benchmarking road safety performance. Unfortunately, good data for benchmarking the safety quality of road network and for individual roads and streets were not readily available for the ten participating countries. The safety of road infrastructure varies with the function of a road, driving speeds, traffic volumes, the mix of users, and also with the safety quality of the road as it is designed, maintained and managed. To become meaningful, benchmark data should be collected from a representative sample of different road types (urban, rural, motorways), and if possible, serving different functions (through, collector/distributor and access roads); and of course data collection methods should be harmonised. By way of illustration, data from road surveys conducted by the iRAP in eight out of ten countries (data from Cuba and Ecuador are missing) were analysed; but cannot be considered as a representative situation of the whole network. It could be useful for countries to develop a safer roads indicator, particularly focused on urban settings and villages.

Effort is urgently required on vehicle safety legislation where there is considerable scope for improvement. There are seven priority United Nations vehicle safety regulations that apply to passenger vehicles, which should be adopted by all countries.

Recommendations for all countries

1. Assess existing lead agencies regarding the scope of their mandate, their co-ordinating role at national and local levels, and the technical and financial resources available to be effective in tackling road safety.
2. Ensure that a national lead agency is nominated in countries where they do not yet exist, strengthened (in terms of road safety leadership mandate, as well as human and financial resources) where they do exist, and complemented by the establishment of national road safety observatory.
3. Develop a national road safety strategy, with ambitious and achievable targets, backed up by short-term action plans and interim targets for key safety performance indicators.

4. Assess the effectiveness of their traffic enforcement system with the following objectives:
 - better co-ordination of police agencies, including municipal, provincial or state police, highway police, and national police forces, which may all be responsible for traffic enforcement
 - development and implementation of demonstration enforcement projects in cities, regions or states to help identify and promote good practice road traffic enforcement
 - intensification of the level of enforcement to create a higher probability of being caught, and not necessarily higher level of penalties
 - ensuring a sufficient number of well-trained police officers trusted by the population and free of bribery and corruption
5. Give significant priority to the adoption of all seven key UN vehicle safety and helmet standards, as well as administrative and production compliance, and regulations relating to child restraint systems, motorcycle helmets and motorcycle anti-lock braking systems.
6. Review current licensing system, focusing on pre-license curriculum and training standards, licensing standards such as age, and graduated exposure to risk, audit and compliance systems to monitor testing and on-going driver compliance, and systems to enforce suspension or disqualification of the driver licence.
7. Improve knowledge on infrastructure safety performance by developing a road infrastructure safety indicator for networks as well as roads and streets.

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Chapter 3. Road transport background

Comparing road safety levels between countries requires normalising safety data based on common exposure data. The objective of this chapter is to review the main characteristics of existing road transport systems. In the analysed countries, common exposure data (such as population, fleet and road length) are used to normalise crash and injury frequencies data. This chapter also reviews characteristics of public transport, as it has a strong impact on mobility patterns and in turn on exposure to road crashes.

This chapter is based on available data in existing national and international databases for the ten countries: population, area, density of roads, road length and number of registered motorised vehicles. It would have been extremely useful to include data on traffic volumes and distances travelled, but these data are rarely collected in the analysed countries. Most data analysed in this chapter is from 2013; it is summarised in Table 3.1 and Table 3.2 for Group 1 and Group 2 countries respectively.

Table 3.1. **Population, area, road network and vehicle data**
Group 1, 2013

	Colombia	Costa Rica	Cuba	Ecuador ^a	Paraguay
Population (million)	47,121	4,713	11,238	16,027	6,559
Area (km²)	1 141 748	51 100	109 884	283 560	406 752
Road network					
Total road length (km)	203 392	42 868	71 139	43 670	30 401
Urban roads length (km)	48 653	1 820 ^d	16 193	n.a.	13 817
Rural roads length (km)	154 739	5 961 ^d	19 902	n.a.	16 584
Motorways length (km)	n.a. ^e	0	656	n.a.	0
Other roads length (km)	n.a.	35 087	0	43 670	0
Paved roads (km)	137 980	11 827	36 752	n.a.	5 185
Unpaved roads (km)	65 412	31 04	34 387	n.a.	25 216
Vehicle fleet					
Motorised vehicles	10 172 876	1 759 341	628 155	1 752 712 ^b	1 362 471
Passenger cars	2 893 166	1 240 932	231 254	529 521	378 950
Lorries (3.5 tonnes and above)	372 267	15 001	66 492	98 022	5 377
Van/station-wagon (< 3.5 tonnes)	1 441 530	43 498	n.a.	368 890	63 223
Motorcycles	5 188 933	380 369	211 395	405 173	387 707
Mopeds/mofas (below 50 cm³)	n.a.	5 800	n.a.	n.a.	n.a.
Coaches/buses	221 670	26 933	18 356	84 916	16 838
Other motor vehicles^c	55 310	46 808	100 658	266 190	510 376
Rates					
Road length per 1 000 inhabitants (km)	4.316	9.090	6.330	2.725	4.635
Population per km²	41.271	92.231	102.271	56.521	16.125
Road length per km²	0.18	0.84	0.65	0.15	0.07
Motorised vehicles per 1 000 inhabitants	216	373	56	109	208

Notes: n.a. – not available.

a) 2014 data for Ecuador.

b) For Ecuador, it is estimated by local experts that approximately 1 000 000 motorised vehicles are not registered, but participate in traffic.

c) The category “other motor vehicles” varies according to the country:

Cuba: Jeep, van, trailer and semitrailer, tricycle, minibus

Paraguay: includes non-standard versions of some vehicles, since the database only allows a single version. This is a software error that the Automotive Registry is planning to correct in 2017.

d) Road network for urban and rural roads for Costa Rica only concerns national roads.

e) There are motorways, but it is not possible to distinguish their length.

There is great diversity among the analysed countries regarding all the indicators included in Tables 3.1 and 3.2. Firstly, countries under review vary greatly in area: Brazil for example is 167 times larger than Costa Rica. There are also marked differences in their population, road network and vehicle fleet patterns. For example, Cuba, which is one of the smallest countries under analysis, presents the highest population density, versus Argentina which is the second largest country and has the lowest density. However, a high proportion of Argentina’s population lives in urban settings, which converts the road safety problem to an urban problem as well.

The road density is linked to the size of the countries and also to the motorisation rate. Costa Rica and Cuba have the highest road densities. Detailed discussions of these aspects are provided in the following sections.

Table 3.2. **Population, area, road network and vehicle data**
Group 2, 2013

	Argentina	Brazil	Chile	Mexico	Uruguay
Population (million)	42.203	201.033	17.632	118.395	3.440
Area (km²)	2 780 400	8 515 767	756 096	1 964 375	176 215
Road network					
Total road length (km)	638 627 ^d	1 563 447	77 571	378 923 ^a	77 732
Urban roads length (km)	40 000 ^d	n. a.	n. a.	n. a.	n. a.
Rural roads length (km)	596 390 ^d	n. a.	n. a.	139 155 ^a	8 776
Motorways length (km)	2 237	10 000	n. a.	9 174 ^a	n. a.
Other roads length (km)	0	1 553 447	77 571	230 594 ^a	68 956 ^b
Paved roads (km)	121 419 ^d	211 468	18 642	148 329 ^a	n. a.
Unpaved roads (km)	517 208 ^d	1 351 979	58 929	230 594 ^a	n. a.
Vehicles					
Motor vehicles	22 371 465	81 600 729	4 263 084	36 743 331	1 991 836
Passenger cars	16 834 231	45 444 387	2 954 498	24 819 922	841 333 ^c
Lorries (3.5 tonnes and above)	n.a.	2 488 680	181 305	9 704 131	61 667
Van/station-wagon (< 3.5 tonnes)	n.a.	5 731 997	747 371		n.a.
Motorcycles	5 499 148	21 454 404	148 455	1 873 093	1 080 017
Mopeds/mofas (below 50 cm³)	n.a.	142 857	n.a.	n.a.	n.a.
Coaches/buses	38 086	547 465	111 352	346 185	8 819
Other motor vehicles	n.a.	5 790 939	120 103	n.a.	n.a. ^e
Rates					
Road length per 1 000 inhabitants (km)	15.13	7.77	4.40	3.20	22.60
Population per km²	15.18	23.61	23.32	60.27	19.52
Road length per km²	0.23	0.18	0.10	0.19	0.44
Motor vehicles per 1 000 inhabitant	530	406	242	210	579

Notes: n.a. – not available

a Does not include urban roads

b Roads under the Departmental Jurisdiction (urban and rural).

c Includes passenger cars and vans.

d Estimated value.

e In Uruguay, the category “other vehicles” includes vehicles that do not require registration, insurance or traffic permits, for example: animal traction vehicles, quadricycles, bicycles, tractors, etc. No available data.

Population

General information

Figure 3.1 illustrates the size of the population for the ten countries under review.

Figure 3.1. **Population in the ten countries (millions of inhabitants), 2013**



Amongst the Group 1 countries, Colombia has the highest population with more than 47 million inhabitants. The other Group 1 countries have a much smaller population (between 4.7 million in Costa Rica and 16 million in Ecuador). Colombia is also the largest country, being more than 20 times larger than Costa Rica, ten times larger than Cuba, four times larger than Ecuador and three times larger than Paraguay.

Cuba and Costa Rica have the highest population densities (respectively 102 and 92 inhabitants per km²). The least densely populated country is Paraguay with 16 inhabitants per km². Colombia and Ecuador have intermediate population densities (41 and 56 inhabitants/km² respectively).

Amongst the Group 2 countries, Brazil has by far the largest population (more than 200 million), followed by Mexico (118 million), Argentina (42 million), Chile (17.6 million) and Uruguay (3.4 million). Brazil is also the largest country, three times larger than Argentina, four times larger than Mexico, eleven times larger than Chile and 48 times more than Uruguay.

With 60 inhabitants per square kilometre, Mexico has the highest population density. Overall, the remaining Group 2 countries have relatively similar low population densities, varying between 15 and 24 inhabitants per square kilometre.

Figure 3.2 illustrates the spread of the population between urban and rural areas. All countries present a higher percentage of urban population than rural population. It is possible to distinguish three groups of countries:

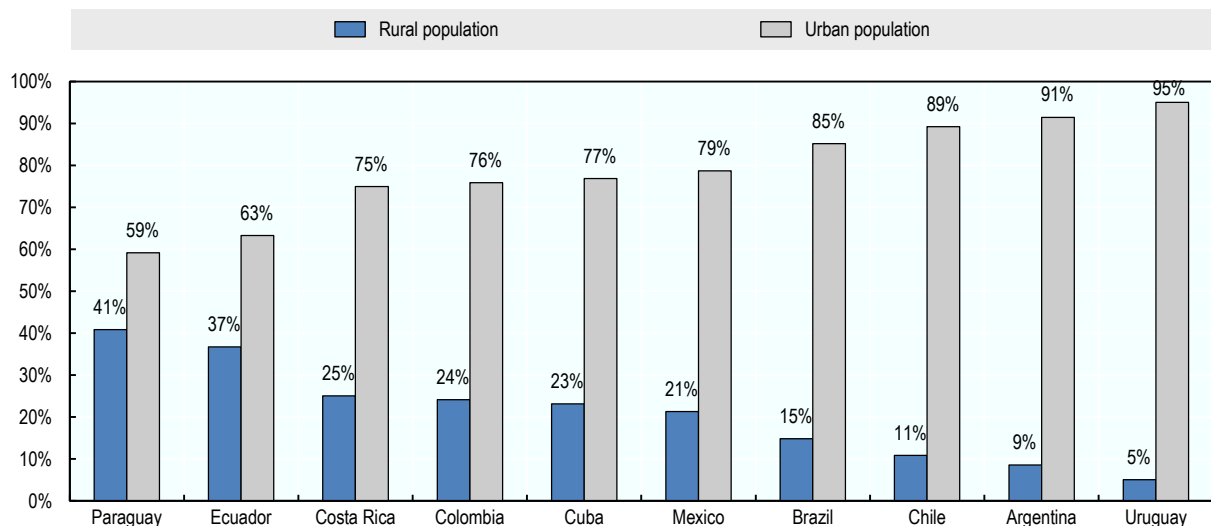
- 90% or more of urban population: Chile, Argentina and Uruguay
- Between 75% and 85% of urban population: Costa Rica, Colombia, Cuba, Mexico and Brazil
- Between 60% and 65% of urban population: Paraguay and Ecuador.

This disaggregation is relevant due to the fact that road safety problems in urban areas are very different in nature from those in rural areas. Usually, it is common to observe lower fatality rates in urbanised areas than in rural areas. Consistent with this relationship, urbanised countries usually have lower mortality rates than less urbanised countries. However, not all fatality rates in the analysed countries reflect this type of relationship, and in this case additional research is needed in order to understand the underlying reasons.

Uruguay falls into the urbanised country category, because more than 90% of the inhabitants live in urban areas and it's a rather small country, although it has a low population density. Under these conditions, Uruguay should present lower mortality rates, but, as shown in Chapter 5, they are above average. Argentina is presenting a relatively lower mortality rate (also shown in Chapter 5) which may be related to the fact that, although it has a low population density, inhabitants are concentrated in urban areas.

Ecuador and Paraguay are at the other end of the scale, with the lowest share of urban population. These countries have higher fatality rates (as stated in the following chapters), as would be expected in countries with lower percentages of population in urban areas.

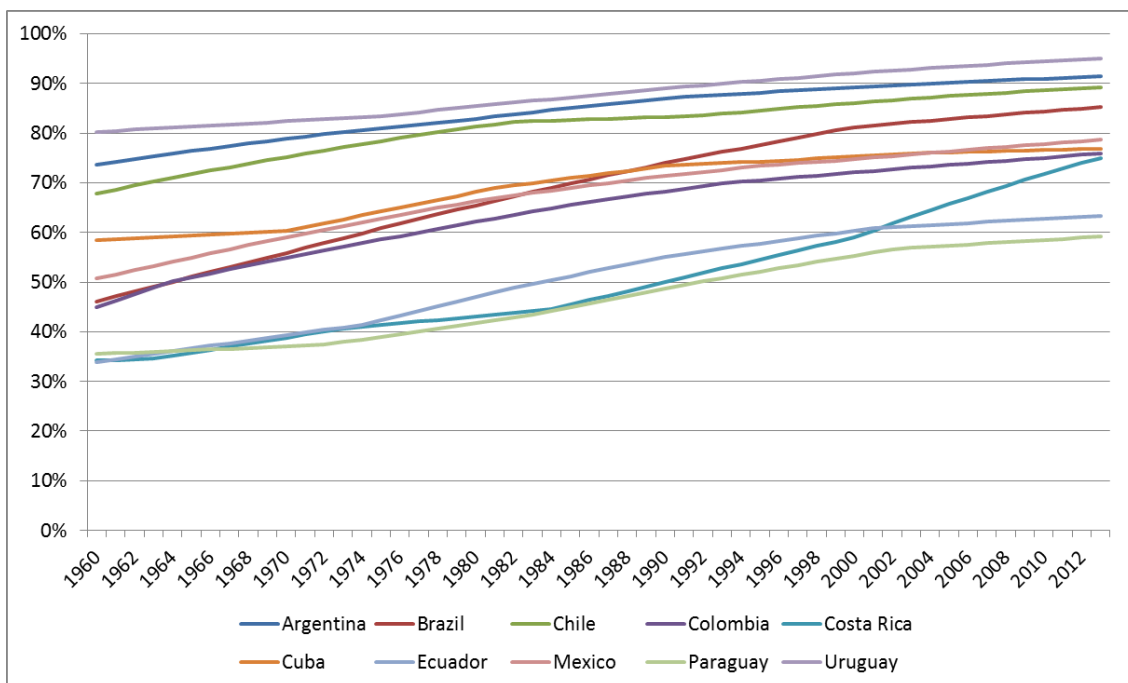
Figure 3.2. Proportion of urban and rural population, 2013



Source: World Bank; <http://data.worldbank.org/indicator/SP.URB.TOTL.IN.ZS>.

Figure 3.3 presents the share of the population living in urban areas from 1960 to 2013 and shows a common trend towards urbanisation, with the population in urban areas increasing in all countries, at a similar pace. The only major difference was identified for Costa Rica, with a higher increase since 2000.

Figure 3.3. Trend in the share of population living in urban areas trend, 1960-2013



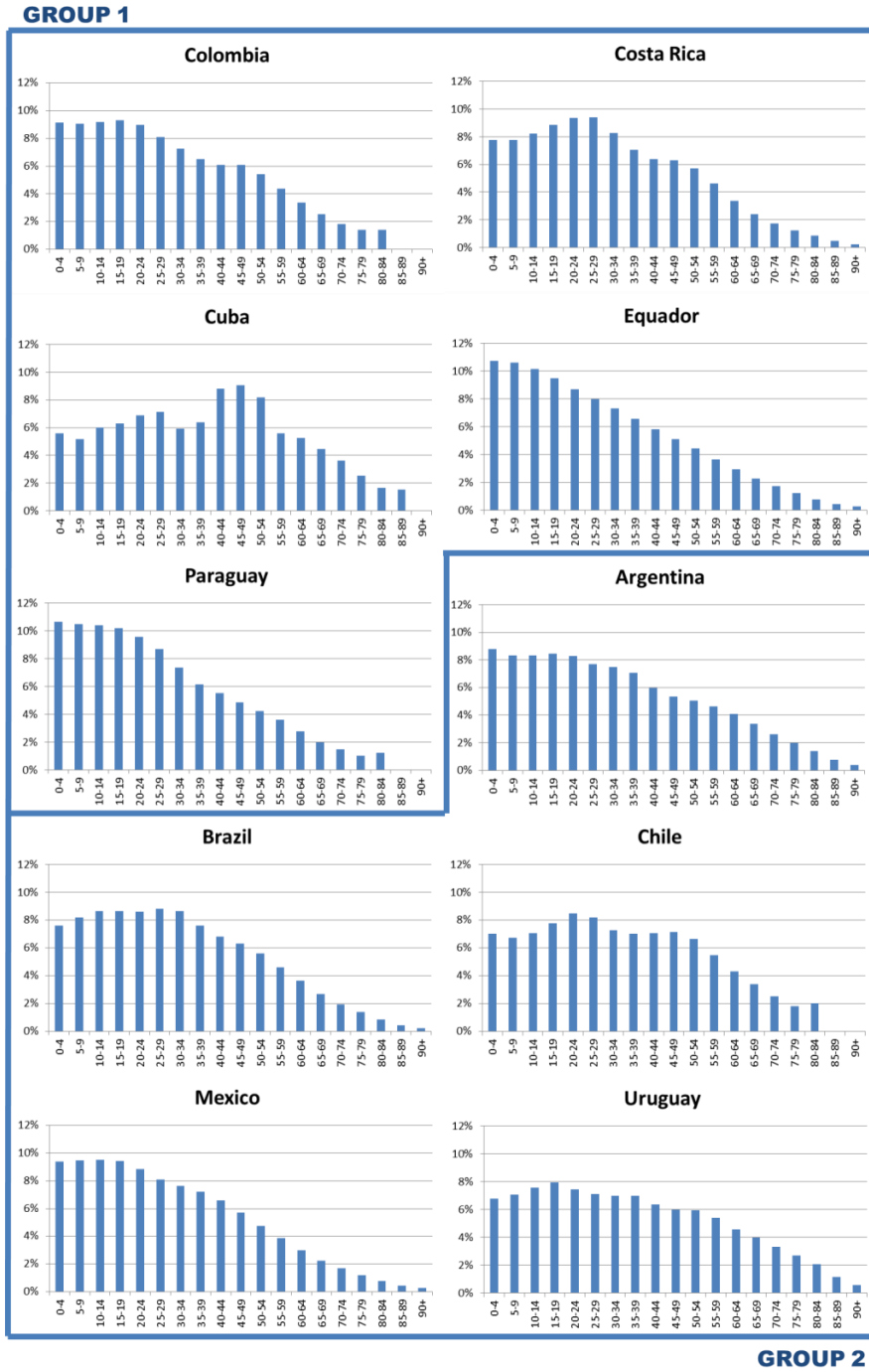
Source: World Bank; <http://data.worldbank.org/indicator/SP.URB.TOTL.IN.ZS>

Distribution of population by age group

The distribution of the population by age group can be useful to interpret traffic safety data, as young drivers and the elderly population often present specific road safety challenges. The age group distribution in 2013 is illustrated in Figure 3.4.

All countries, with the exception of Cuba, have a relatively high proportion of the younger population and a relatively small proportion of the older population (when compared to European countries for example). This is important to take into consideration, as young driver safety is a priority in many countries. It is also notable that Ecuador and Paraguay have a very high percentage of children, with the 0-14 population representing nearly a third of the population. Cuba also stands out, with a relative low proportion of population in the younger age groups, and a peak for the 40 to 54 age group. This may be an impact of some social policies applied in the 1960s, which were associated with the increase in life expectancy.

Figure 3.4. Percentage of the population by age group



Ecuador: data for 2014.

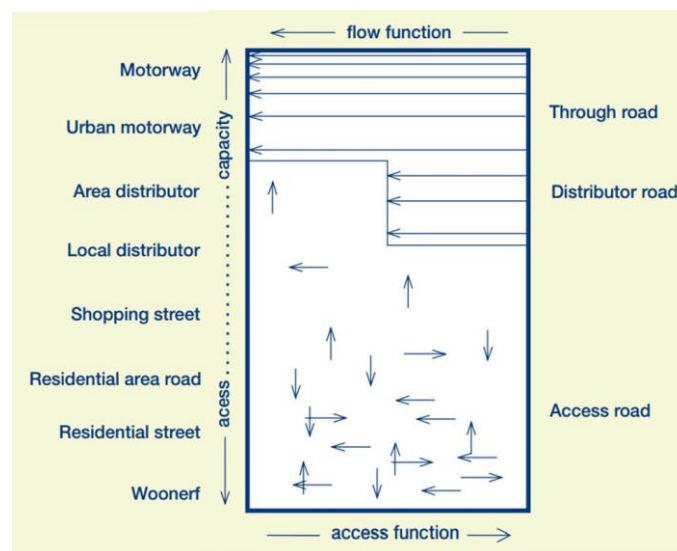
Road network

Road classification

There are several ways to classify the road network elements. In terms of traffic and safety management, a useful approach is to categorise roads based on their function (e.g. access roads, distributor roads, flow roads).

The Sustainable Safety vision, developed in the Netherlands, includes among its five principles, a criteria for classifying roads according to their functionality: “each road should serve one unique function as a through road, a distributor road, or an access road, in a hierarchically structured road network” (Wegman et al., 2006). This is illustrated in Figure 3.5.

Figure 3.5. Categorisation of roads used in Sustainable Safety



Source: Wegman et al. (2006).

These functions can be found in the urban and rural setting. The main reason for making such a distinction between flow, distributor and access is that roads have different functions, which has consequences on road traffic safety. For the purpose of this report, due to an absence of relevant information, a simpler classification is used:

- urban roads: roads inside built up areas
- rural roads: roads outside built up areas, which are not motorways
- motorways: usually a two- to four-lane road, with a median barrier, grade separated interchanges, full access control and a ban on non-motorized traffic.

In addition, for each road type, a distinction can be made between paved roads (with a surface layer in concrete or asphalt) and unpaved roads (also called gravel roads).

It is useful to analyse crash data separately for each of these road types, as crash risks and scenarios differ considerably (e.g. a high share of vulnerable road users in urban areas; high-speed and high-risk collision in rural roads, amongst others).

While preparing this report, it was not possible to adopt a common classification suitable to all countries. Some countries do not have a motorway network, namely Ecuador, Paraguay and Uruguay. In countries such as Chile and Ecuador, roads are classified administratively. That is, the classification is based on the jurisdiction they belong to (e.g. national roads, provincial roads, municipal roads) and not on their function or road environment. Table 3.3 highlights some of the classification issues in the ten countries.

Table 3.3. **Road classification aspects**

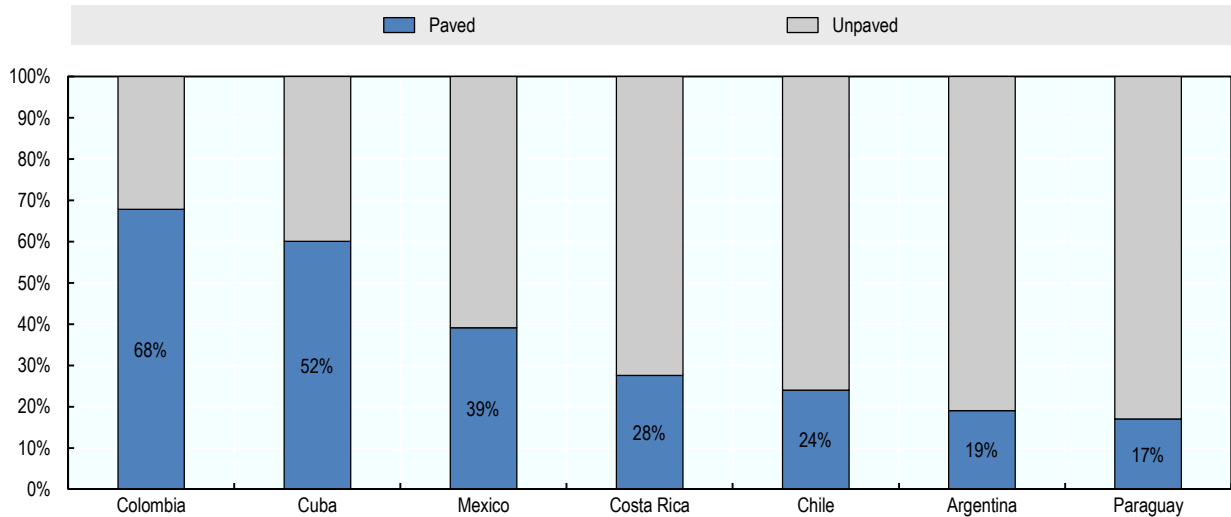
Country	Classification issues
Argentina	Roads are managed at three different government levels: National, Provincial and Municipal, which means that information on roads is provided by more than 2 000 agencies. Due to the fact that the urban road length is not accurate, estimations were made in order to present the available figures in the way defined in this project.
Brazil	Although the Brazilian traffic code includes an urban/rural classification, these data were not available.
Chile	Only a jurisdictional classification of roads (stat /regional/municipal roads), without information on urban/rural environment.
Costa Rica	High percentage of roads not classified as urban, rural or motorways category. This disaggregation is only possible for national roads.
Ecuador	No information on motorway's length. Only jurisdictional classification of the roads (state roads/provincial roads/others).
Mexico	No information on urban road length.
Uruguay	No distinction between urban and rural roads for roads under the Departmental Jurisdiction Information on paved/unpaved not available.

Paved/unpaved roads

Figure 3.6 illustrates the relative share of paved and unpaved roads in the seven countries with available data. This information is important since interventions to address unpaved roads safety issues may differ from the ones suitable to paved roads.

Apart from Colombia and Cuba, which have 60-70% of paved roads, more than half of the road networks in other countries are unpaved. This has important implications in terms of road safety and infrastructure management – for example in the selection of adequate speed limits, treatment of intersections, faster vehicle wear and tear (tyres in particular), potentially higher risk for motorcyclists, and specific challenges to implement road marking to help drivers adapting the right behaviour.

Figure 3.6. Relative share of paved and unpaved roads, 2013

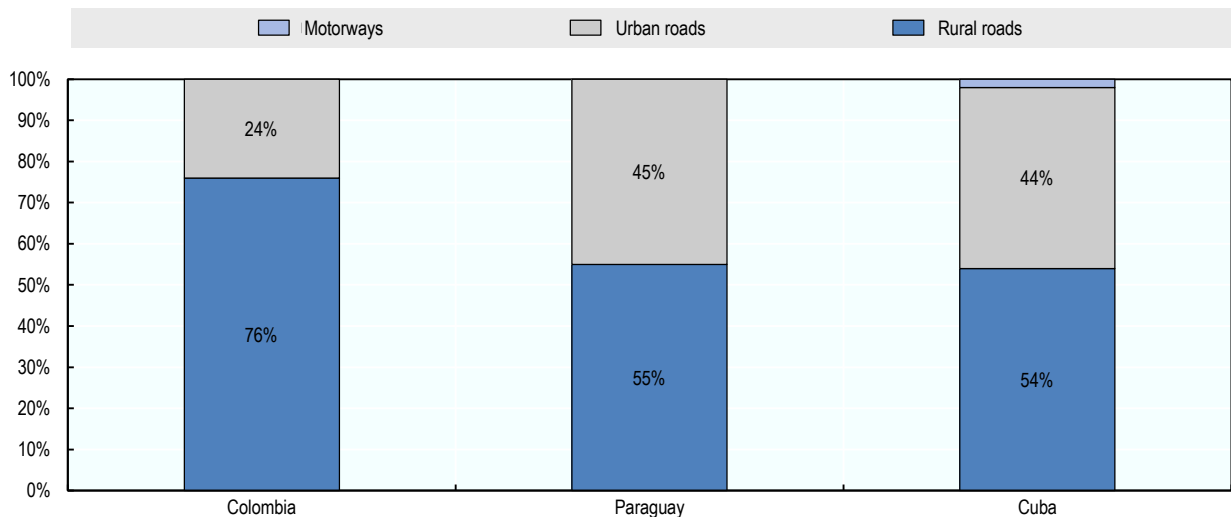


Note: Data for Mexico only concerns rural roads.

Road environment (urban roads/rural roads)

Figure 3.7 illustrates the road length distribution by road environment category, in countries where data are available. This is an important piece of information as there are specific road safety issues in urban and rural areas. The road safety problem in urban areas is very different from the one observed in rural roads, not only due to the road environment itself, but due to the diversity of users, driver workload, amount of visual noise and the high frequency of driving decisions under multiple competing stimuli that is necessary to process each time. Rural road crashes are generally more severe than crashes on urban roads due to higher operating speeds, road geometry, functionality, enforcement levels, and other factors (OECD, 1999).

Figure 3.7. Road length distribution by road environment category



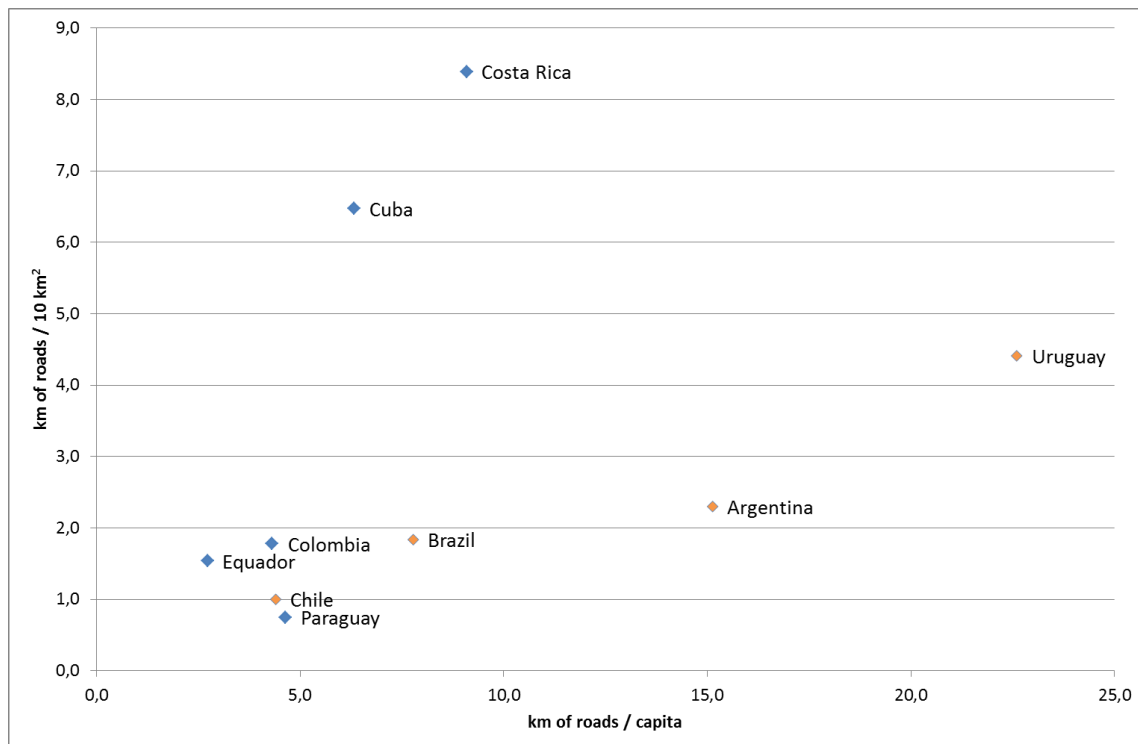
Network density

The degree of accessibility of a road network influences the mobility patterns of citizens, and in turn their exposure to risk.

Figure 3.8 illustrates the density of the network per capita and per square kilometre. Among Group 1 countries (in blue), Colombia has the largest road network with more than 200 000 kilometres of road; Paraguay is the smallest with around 30 000 km. Nevertheless, when normalising this indicator by area and inhabitants, they are positioned very close. This figure also shows that the smallest countries (in area) - Costa Rica and Cuba - have relatively dense road networks.

When considering this along with the population data in Figure 3.3, it is possible to notice that countries with a higher percentage of urban population (Argentina and Uruguay) are also the ones that present a higher road length per capita and per area. Conversely, Paraguay and Ecuador have the lowest percentage of urban population and very low values of road densities per capita and per area.

Figure 3.8. Density of the road network per capita and per area, 2013



Note: Mexico not included, because road length is incomplete since it does not include urban roads.

Regarding Group 2 countries (in orange), Uruguay has the highest densities for km of roads per capita and area. Argentina stands out with three times more roads per capita than Chile (it has around 2.5 times more inhabitants than Chile).

As an overall analysis, Cuba, Costa Rica, Argentina and Uruguay have patterns clearly different from the other countries. Cuba and Costa Rica have the highest road length per area; Argentina and Uruguay have the highest road length per inhabitants. These data will be further explored in Chapter 5,

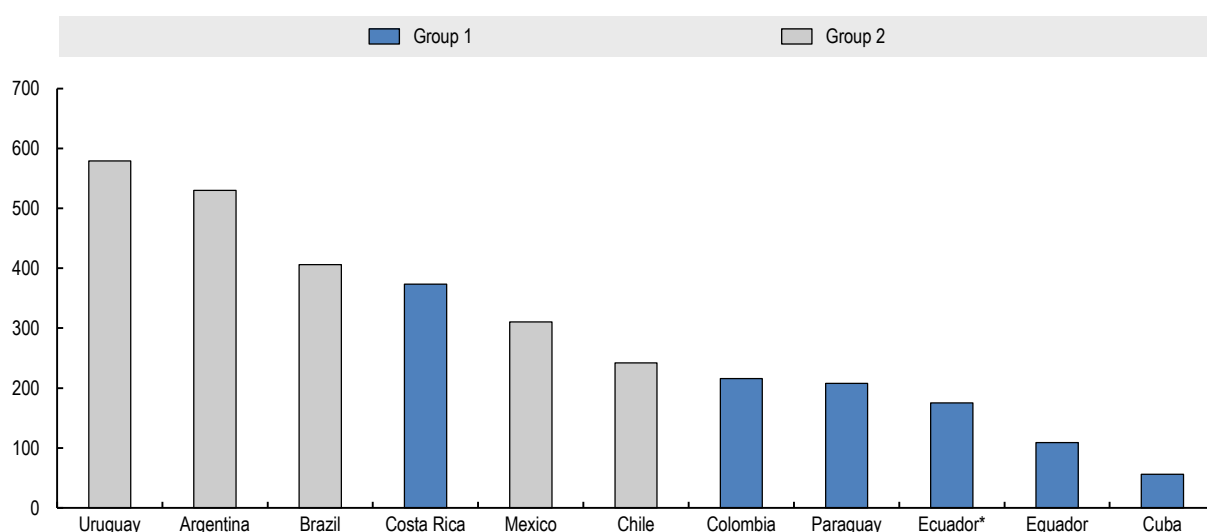
when analysing the relationship between accident frequencies, road density, accessibility, urbanisation and mobility patterns, and exposure to risk.

Vehicle fleet and motorisation

Motorisation

The level of motorisation of a country can be considered as a surrogate measure of exposure to risk. Figure 3.9 illustrates the ten countries' motorisation in 2013, calculated as the number of all registered motor vehicles (including motorcycles and mopeds) per population.

Figure 3.9. **Motorisation rate, 2013**
Number of registered motorised vehicles per 1 000 inhabitants



*Ecuador: two rates were calculated. One based on the official vehicle fleets statistics, the other based on an estimation of the *real* number of motorised vehicles, with includes an additional 1 000 000 vehicles. Both values are from 2014.

Among Group 1 countries, motorisation ranges from 56 vehicles per 1 000 inhabitants in Cuba to 373 in Costa Rica. Among Group 2 countries, motorisation ranges from 242 in Chile to 580 in Uruguay. For Ecuador, two motorisation rates were calculated. According to local experts, it is estimated that there are approximately 1 million unregistered vehicles. The motorisation rate changes from 109.4 to 171.8 motorised vehicles/1 000 inhabitants but it does not affect the comparative position of Ecuador in relation to the other countries.

Figures 3.10 and 3.11 illustrate the development in time of the motorisation rate, respectively for Group 1 and Group 2 countries. Different time series are presented due to data availability. Overall, motorisation rates have been increasing in all countries at an annual average rate of between 4% and 7%.

The outliers of this average growth are Paraguay and Colombia, where motorisation is growing extremely fast (+30% and +18% respectively), and Cuba at the other end, where the motorisation is still relatively low and has been rather stable in the past years.

It is likely that motorisation will continue to increase at a sustained pace in the years to come. This puts additional pressure on road safety and calls for immediate measures to address related problems.

Figure 3.10. Developments in motorisation, Group 1 countries

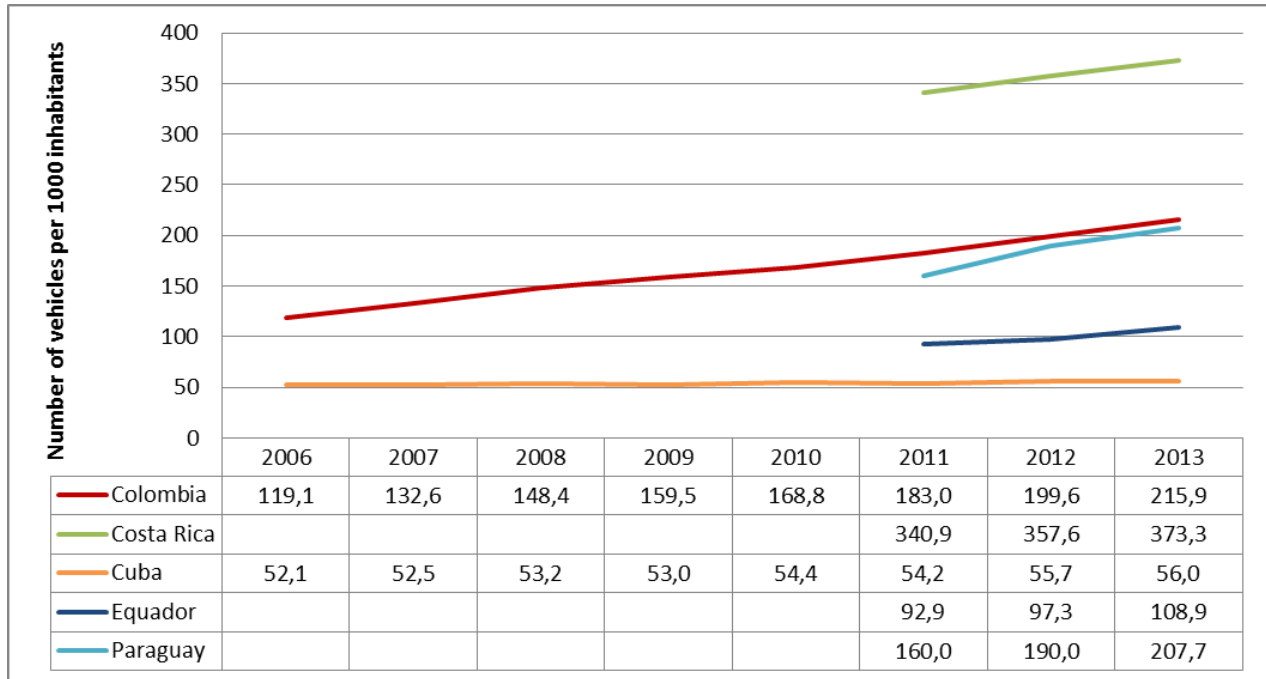
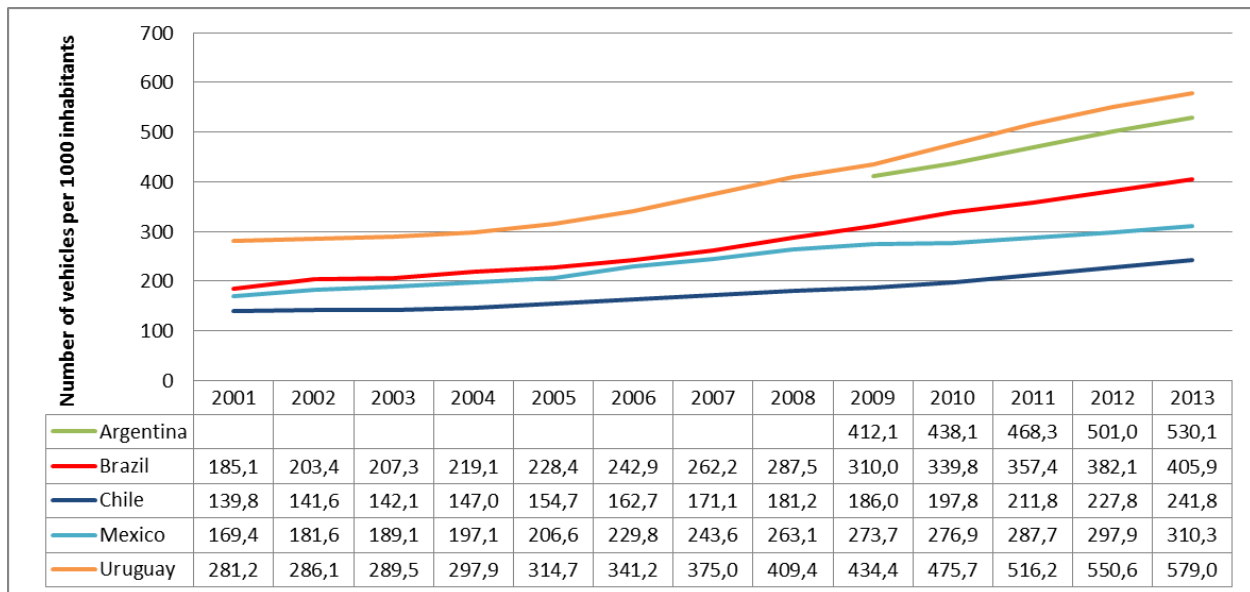


Figure 3.11. Developments in motorisation, Group 2 countries



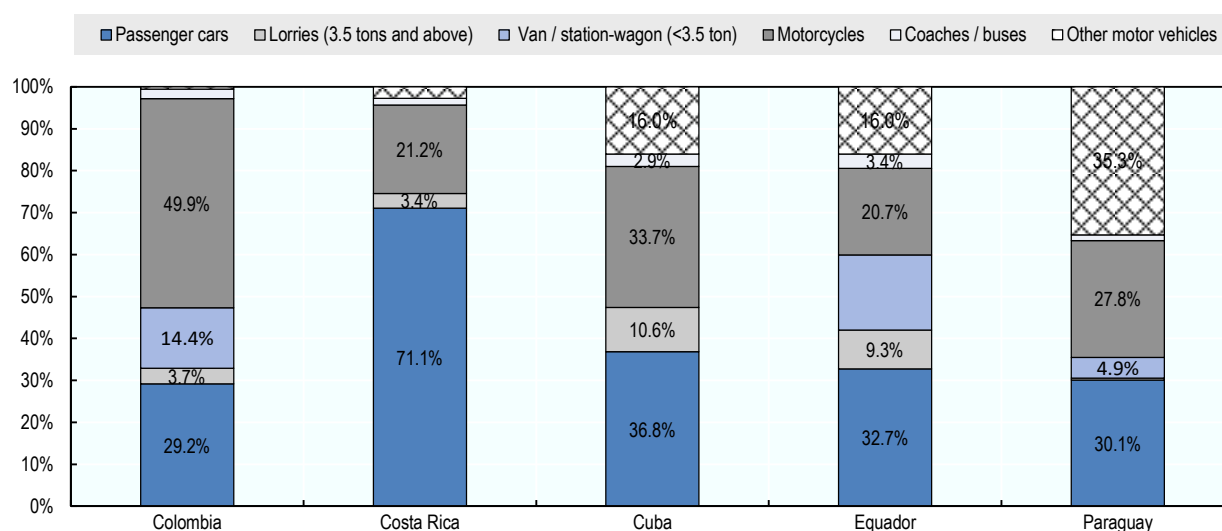
Vehicle fleet by vehicle type

Figures 3.12 and 3.13 present the distribution of motor vehicle fleet by types of vehicle. The vehicle types considered were as disaggregated as possible. They also include moped, but since most countries do not register this type of vehicle, or include them in the motorcycle class, they were not represented separately. In Group 1, Costa Rica has a far bigger share of passenger cars in the fleet than the other countries. Colombia is the country with the highest percentage of motorcycles: around 50% of the fleet.

As already stated before, Ecuador has around 1 million unregistered motor vehicles. The percentage of unregistered vehicles by type is unknown, but it is estimated that the share of motorcycles in this condition is rather low. Due to the rather intensive control operations performed by the police on motorcycles that have been carried out for a couple of years in Ecuador, a filter for identifying motorcycles without registration has been created.

Paraguay presents a high percentage of vehicles that fall into the “Other motor vehicles” category. The reason for this relies on a limitation in the current database, which prevents the inclusion of non-standard versions of some vehicle models, and is scheduled for correction.

Figure 3.12. **Distribution of motor vehicles by type, Group 1 countries (average 2011-13)**



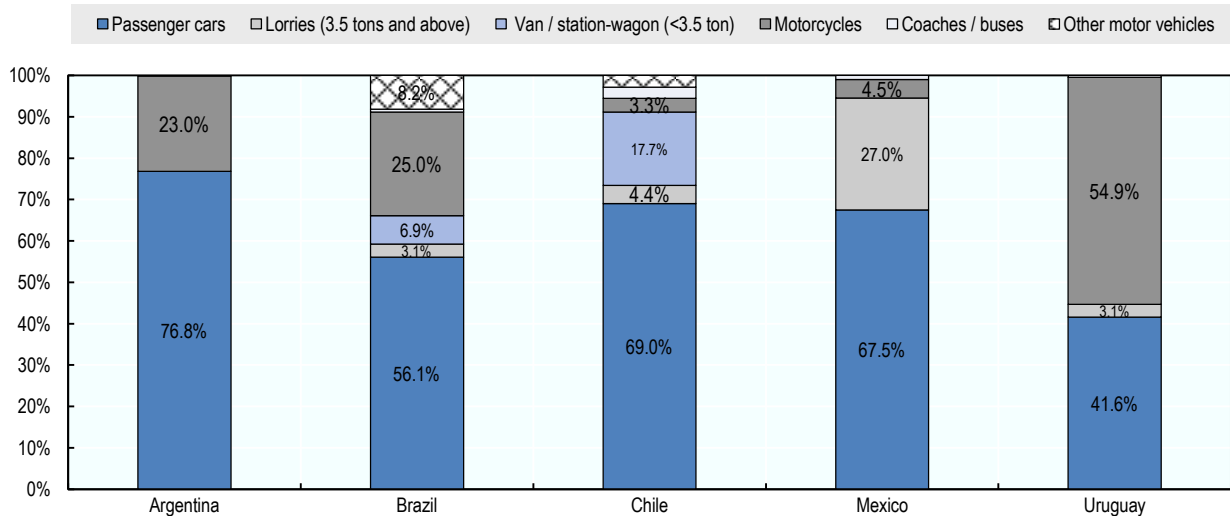
In Group 2 countries, Argentina has the highest percentage of passenger cars, followed by Chile and Mexico. Uruguay is the country with the lowest share of passenger cars (this value already includes vans) and the highest percentage of motorcycles. Chile and Mexico are the countries presenting the lowest share of motorcycles.

According to Figure 3.13, Uruguay presents the highest percentage of motorcycles. This may be associated with the increase in the purchasing power of the inhabitants in the last decade (especially for the middle-low class), the credit facilities offered by motorcycle dealers granting extensive financing plans, and in some cases, the excessive cost of mass transit (Sector Automotor y Autopartista, 2015). In addition, the low quality of the public transport service encouraged a modal shift to private transport modes, like motorcycles, acquired with affordable pre-financing and with low monthly costs (fuel consumption per kilometre, compulsory insurance and other annual rates). Since 2007, the number of registered motorcycles exceeds the number of passenger cars.

Although not represented in the previous figures, one important aspect of the vehicle fleet concerns the quality and share of vehicles used in transit systems. This problem is further increased in some cases by a weak public transport service, as is the case in Cuba. Informal public transport developed as a solution to overcome the mobility problems of this country, with passengers being transported by trucks which accounts for serious road safety concerns.

Paraguay also has concerns about the quality of its public transport system, especially regarding its efficiency and safety, as well as the quality of servicing vehicles. In order to overcome this problem, many Paraguayan inhabitants shifted to the use of motorcycles as a practical and effective alternative.

Figure 3.13. **Distribution of motor vehicles by type, Group 2 countries (average 2011-13)**



Note: Uruguay's percentage of passenger cars also takes into account vans/station-wagon <3.5tonnes. Mexico's percentage of lorries includes vans/station-wagon <3.5tonnes. Argentina's percentage of passenger cars also includes trucks.

Public transport

Mobility patterns around the world have been changing depending on increased wealth and urbanisation. Particularly in Latin America, it is common for individuals to only use public transport until it is possible for them to buy a motorcycle or car. This raises concerns about the increasing use of cars and motorcycles and the implications in terms of congestion, pollution and safety.

Public transport is a key feature in all high-income countries and low- and middle-income countries, especially for urban areas. It's a relatively safe transport mode (per kilometre travelled), but it is important to provide safe pedestrian access to and from public transport and safe transport operations. In order to increase public transport use, it is important to improve its quality and attractiveness, and insure that it is fully adapted to the travel behaviour and consumer needs and expectations.

The Development Bank of Latin America (CAF) conducted an in-depth survey on mobility patterns in 29 cities in Latin America which showed that the provision of affordable, safe and accessible public transport services had an important impact on the decision to use public transport rather than a private mode of transport (CAF, 2016). Eight of the participating countries are represented by one or more cities in CAF's work: Argentina, Brazil, Chile, Colombia, Costa Rica, Ecuador, Mexico and Uruguay. In several cities, the price of public transport is considered high when compared to the price of purchasing and using a motorcycle. This factor influences the modal share, with important negative impacts on road safety, as the crash risk is much higher when traveling by motorcycle than when traveling by public transport and walking on convenient sidewalks to its stations.

Decision makers need to understand these mobility challenges and trade-offs when addressing road safety. The planning and provision of safe and affordable transit services with proper walking facilities to access public transport are an efficient starting point for road safety interventions.

Conclusions and recommendations

This chapter presents an overview of the main characteristics of the road transport systems which are useful to understand and compare the road safety performance of the analysed countries.

All countries, with the exception of Cuba, present a relatively high proportion of young population and a relatively small proportion of the older citizens. All countries are experiencing a marked urbanisation, with the share of population living in urban areas at least 50% and growing rapidly.

There are no homogeneous criteria to classify the road network, and incomplete information on road length. The fact that the road network is being managed by different road administrators may be hindering the acquisition of proper knowledge on an important exposure indicator, which is relevant for both road safety assessments and infrastructure road safety management.

Wide differences were found in motorisation, with some countries being highly motorised compared to others (for instance Uruguay and Argentina, when compared with Ecuador and Cuba), and the vehicle registration system is also in need of improvement for some countries.

Motorcycles represent almost half of the motorised fleet in Uruguay and Colombia which has strong, negative impacts on road safety. The increase in motorcycle users may also result from problems in the public transport system, as it was detected for Cuba and Paraguay. In these cases, a broader analysis must be made, in order to identify solutions that can promote a modal shift to transit.

Road safety will benefit from synergies with other public policies and road safety policies should be interactively defined and pursued with, for instance, mobility management policies and land use planning. In particular, the provision of a safe and affordable transit service can mitigate the modal transfer towards more risky modes of travel such as powered two-wheeled vehicles.

Only two countries presented some exposure data, mostly aggregated (Colombia: total vehicle-kilometres, for all vehicles; Ecuador: annual distance travelled by passenger cars and passenger-kilometres), which prevented the use of this information as an indicator for the safety statistics.

It is recommended that all countries improve understanding of roads and crash locations by classifying road networks at least by type of road (urban roads, rural roads and motorways); improve vehicle registration systems by including at least the age and type of the vehicle and allowing better analysis of safety issues; and collect traffic and travel data to help assess exposure to risk.

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Chapter 4. Road crash data reporting

Overview of road crash data

To analyse road safety, a wide range of data are needed. To understand the magnitude of the safety problems, “outcome” indicators are needed (see also Figure 1.1), which include:

- the number of road deaths (by user group, by age group, by location)
- the number of serious injuries (by user group, by age group, by location)
- the number of crashes
- the costs of road crashes.

To conduct a benchmarking analysis, it is also important to have common definitions.

One issue common to several countries (for example Paraguay and Mexico) is that there are different information systems regarding information on the crash (location, circumstances) and the casualty (age, gender etc.).

There are very little data on injuries. Some countries do not make a distinction between slight and serious injury; and underreporting of injury data is also a recurrent problem. In other countries, such as Paraguay and Cuba, there are different data systems regarding the casualties and the crash, making it difficult to perform comparisons.

It was therefore decided to limit the benchmarking analysis of safety data to fatalities and fatal crashes. This does not mean that serious injuries are not an issue – quite the opposite. Reducing the number of serious injuries is also a key challenge that does not necessarily call for the same actions than targeting fatalities, and countries should not neglect the data collection on injury crashes (ITF, 2016).

Chapter 5, 6 and 7 review trends of recent crash data. Other types of data (safety performance indicators) are also needed to understand the road safety performance of a country. They are analysed in Chapters 8, 9 and 10, on issues related to drink driving, seat belts and speed.

Definitions of a road fatality

For international comparisons of road crash fatal victims, the international thirty-day fatality definition, as proposed in the Eurostat/ITF/UNECE Glossary for Transport Statistics (Eurostat/ITF/UNECE, 2009), is commonly used (fatal victims from road crashes who died within thirty days). Nevertheless not all countries use this definition. Table 4.1 presents the definition for a road fatality used by each country.

In Colombia, Cuba, Paraguay and Uruguay and in 18 provinces of Argentina, road deaths are registered within 30 days, through follow-up with hospitals or health institutions (except for Colombia, which uses a verification procedure through the difference between the date of the accident and the date of death or necropsy). In Chile, Ecuador and eight provinces of Argentina, fatal casualties are only

registered on the spot or within 24 hours after the crash. A correction factor is therefore applied to convert the data to the 30-days definition.

In Brazil, road deaths are registered up to twelve months after the crash. After twelve months, Brazil continues monitoring the consequences of a road crash. In Costa Rica and Mexico it is not possible to combine information on the victims with information on the causes and circumstances of crashes from police reports. This concerns, in particular, the date of the crash and the date of the victim's death, preventing the registration of the victims who died within 30 days. Nevertheless, all road crash victims are registered in a database, no matter the number of days after the occurrence of the crash. The conversion for the 30-days definition might require the use of a conversion factor lower than one.

Table 4.1. **Definition of a road fatality in the participating countries**

Country	Official definition of a road fatality	30-days definition	Conversion factor to match the 30-days definition
Argentina	Person killed immediately or dying within 30 days as a result of a road crash.	✓	1.3 ^a
Brazil	Person injured in a terrestrial transport crash that had the underlying cause of death the traffic accident, regardless of the elapsed time of the accident.	x	-
Chile	Person killed within 24 hours as a result of a road crash.	x	1.3
Colombia	Person killed as a result of a road crash (including sequelae) on the national territory and registered by the Colombian medical forensic system between 1 January and 31 December of the year of analysis.	✓	-
Costa Rica	Person killed as a result of road crash during the year of its occurrence.	x	-
Cuba	Person killed immediately or dying within 30 days as a result of a road crash.	✓	-
Ecuador	Person killed immediately or dying within 30 days as a result of a road crash.	✓	1.3 ^b
Mexico	Person who dies as a result of the injuries caused by a traffic accident, within an unlimited time after the crash.	x	-
Paraguay	Person killed immediately or dying within 30 days as a result of a road crash.	✓	-
Uruguay	Person killed immediately or dying within 30 days as a result of a road crash.	✓	-

Notes: a) Correction factor applied in six of the 24 provinces.

b) Correction factor applied provisionally until the official numbers are presented by the end of the year.

c) The data presented in this report concerns a person killed as a result of crashes during the year of its occurrence.

As an overall recommendation, the adoption of a procedure that calculates the number of fatalities within 30 days after the crash occurrence should be adopted in all countries. If this is not possible in the short term, the application of an appropriate conversion factor should be considered to convert data to the 30-days definition. The exact value of the correction factor should be set based on a thorough study on the proportion of fatal victims who die in the first 30 days after accident occurrence.

Data reporting procedures

The procedures in each country to collect road crash and casualties data are rather heterogeneous. Police forms are diverse. Even within the same country, different police forms may be used, as is the case in Argentina, Brazil and Mexico (although in Mexico, a set of similar variables is collected as part of the National Institute of Statistics and Geography's [INEGI] initiatives).

The lack of uniformity of the data collection procedure is often a challenge in the federal countries, since individual states (or provinces) can have their own crash data collection system, without the obligation to use a single national procedure. This is the case in Argentina (see Box 4.1), Brazil and Mexico. Other countries with a similar federal structure have managed to come up with solutions to overcome this problem. Box 4.2 describes practice in the United States.

The adoption of similar procedures for collecting road crash and casualty data improves the data quality and reduces the under-reporting effect. It is therefore highly recommended that countries adopt a single procedure of data collection, with a uniform police form.

Box 4.1. Crash data collection in Argentina

Before 2010, the 23 Provinces and the City of Buenos Aires used a different form to collect information and data on crashes. Since 2010, huge efforts have been made to implement a Single Statistical Form (FEU) with the federal government inviting provinces to voluntarily sign an agreement. As of January 2017, 14 provinces have signed the agreement. The provincial police are in charge of using the form when a crash occurs on its jurisdiction.

As the information collected via the form by these provinces represents a small proportion of the total number of fatal and serious injury crashes, official statistics are still constructed using a monthly aggregated form (called Planilla A). In order to give further impetus to the FEU, new software called SIGISVI was developed and has been implemented since January 2017.

Box 4.2. Data collection procedure in federal countries: Case study of the United States

The United States does not have a single police crash report form; each State and even some cities within States use different forms. Therefore, the National Highway Traffic Safety Administration (NHTSA) and other federal agencies encourage States to adopt Model Minimum Uniform Crash Criteria (MMUCC) so that a minimum of data elements are comparable across States. NHTSA collects crash data in a number of ways: from collecting police-reported motor vehicle crash data reports from the States to direct investigation of crashes. Below is a short description of NHTSA's current crash data collection systems.

The Fatality Analysis Reporting System (FARS) provides standardised information on a national census of police-reported motor vehicle traffic crashes with at least one fatality within 30 days of the crash. More than 100 data elements are coded into a common format from eight different data sources within each State, including the police crash report, medical examiner's information, vehicle registrations and driver records. NHTSA creates an annual file from the State-provided information and conducts rigorous quality control before the file is made available to the public (with no personally identifiable information)1.

The Crash Report Sampling System (CRSS) provides standardised information from a national sample of police-reported motor vehicle crashes of all severities, involving all types of motor vehicles. NHTSA samples approximately 50 000 police crash reports from more than 50 sites across the U.S. using a complex sample design. The sample design allows users to make nationally-representative estimates of crash characteristics when the data

are weighted. The only data source for CRSS are State police crash reports and about 100 data elements are uniformly coded from these reports. The annual file will be made available to the public (with no personally identifiable information). The CRSS is the sole source of trends on the number and severity of crash-related non-fatal injuries in the United States.

The **Crash Investigation Sampling System (CISS)** provides nationally representative information from in-depth crash investigations conducted by NHTSA. The scope for CISS is traffic crashes resulting in at least one towed, passenger car or light truck. NHTSA uses highly trained crash investigators to collect documentation of the scene evidence, vehicle damage, crash avoidance technologies, and experts to thoroughly code all crash-related injuries from medical records. The number of sampled crashes is currently targeted at 2 400 per year and more than 600 data elements are coded for each crash. After thorough quality control, the CISS annual file of standardised, crash report information will be released to the public (with no personally identifiable information).

NHTSA also collects complete crash data files from 34 States and processes the information into standard formats (**State Data Systems**). These files are not generally available publicly, unless States allows NHTSA to release them. NHTSA is piloting near real-time transfer of the entire State crash data files from six States. The electronic transfer allows NHTSA to populate some of the police crash report data in FARs and CRSS in an effort to increase efficiency, timeliness and quality of the data systems.

The **Special Crash Investigations** program provides in-depth information on about 100 motor vehicle crashes of interest each year. NHTSA uses highly trained crash re-constructionists to perform in-depth investigations collecting hundreds of data elements. NHTSA uses this convenience sample of crashes to understand emerging safety issues that require quick responses. SCI has three rapid response teams across the U.S. that provide immediate research support on topics including potential recalls and other agency enforcement and safety efforts.

Source: NHTSA, for more information: <http://www.nhtsa.gov/Data>

Data quality and underreporting

Underreporting of road crashes is a common problem in many, if not all, countries (including European countries) (ITF, 2011). Fatal casualties are usually better reported than non-fatal casualties. For these cases, the degree of underreporting can be quite large, and it can be variable according to the injury severity and road user type. Nevertheless, even in the case of fatal injuries, underreporting can happen, for instance when the police are not informed of the crash, when the patient dies in the hospital and there is no database update, or when there is a wrong codification of the death cause (being related to something other than a road crash).

Underreporting is a more acute issue for casualties involved in crashes without a third party or for some road users (motorcyclists and cyclists) leading to distortion in road safety data (ITF, 2011).

Underreporting is problematic as it leads to a biased description of the road safety issue and an underreported assessment of consequences in terms of health care, disabilities and associated costs which may appear not as dramatic as they are in reality. Additionally, underreporting of particular road crashes (e.g. vulnerable road users) may lead to setting the wrong targets in prevention campaigns (Amoros, 2006).

To get a better picture on the number of road casualties, it is necessary to cross police and health data; it is common in some countries that police are unaware of road traffic casualties admitted to hospitals (ITF, 2011). On their own, hospital data are not a substitute for police data, as they are likely to include only minimal information on the circumstances of a crash. However, using hospital data in addition to police data can provide valuable information, including:

- some basic information on casualties not reported to the police, such as age, gender and vehicle type
- better understanding of the total number of casualties
- better understanding of injury severity
- in-depth understanding of the medical consequences of particular types of crash, if police and hospital records are linked.

Police data should therefore remain the main source for road crash statistics but be complemented by hospital data, which are the next most useful source.

There are some procedures that might help to reduce the number of underreporting crashes. Box 4.3 presents the example of the Netherlands on crash data collection procedure. Box 4.4 presents the particular case of Sweden, which has developed a method to eliminate suicides from the road crash database.

Box 4.3. Crash data collection procedure in the Netherlands

Before 1996, all road death statistics in the Netherlands were based on police reports. Since 1996, the number of deaths is determined by Statistics Netherlands (CBS), in close consultation with the Ministry of Infrastructure and the Environment. CBS uses three different data sources to determine the number of road deaths in the Netherlands:

- data from the cause of death forms filled out by a coroner
- the district courts dossiers on deaths of unnatural causes
- the police crash reports (Database of Registered Crashes in the Netherlands - BRON). This database is published by the Ministry of Infrastructure and the Environment.

By linking and comparing these data sources CBS composes the overview of the number of road deaths. It assumes that all road deaths are registered in at least one of the three sources and that there are therefore no traffic deaths that are not registered in any of these sources. Double entries are removed, and the file is cleaned of casualties that should not be included in the road deaths in the Netherlands (crashes abroad, not on the public road, suicide, natural causes). In the last five years the number of road deaths in BRON is about 15% lower than the number determined by CBS.

Source: SWOV, <https://www.swov.nl/en/facts-figures/factsheet/road-deaths-netherlands>

Box 4.4. Suicide and accident classification methodology in Sweden

In Sweden not all fatalities in road traffic are accidents. Some are suicides. Since 2010 Sweden has been presenting suicides in road traffic separately from fatalities caused by accidents. To undertake this, a method has been developed for classification of road traffic fatalities in order to determine if the fatality was caused by accident or by suicide.

The basis for the assessment is to inquire and examine all available data regarding the accident and the psychosocial status of the deceased and then make the classification. Three criteria are considered for the identification of the suicide cases: the existence of a farewell message; a traffic event that supports a suicidal act in combination with the knowledge of previous known suicide attempts or intention in the past, ongoing prolonged

depression or severe emotional stressful life event; and a traffic event that strongly supports a suicidal act. This assessment is performed through contact with the police, relatives, health care institutions and others.

A five level classification scale is then applied, which relates to the certainty of the cause being attributed to suicide or not. Fatalities in level one and two are classified as suicides. The analyses show that 10% of the road traffic fatalities occurred in Sweden are suicides.

Source: Andersson and Svensson (2015).

In order to assess the level of underreporting, it is possible to link police and hospital data on fatalities. Table 4.2 presents a summary of current practices in each country.

Table 4.2. **Practices linking police and hospital data and estimation of underreporting**

Country	Does data on fatalities link police and hospitals registries?	Do the results influence official statistics?	Underreporting estimation
Argentina	Yes, for 16 provinces however it is not really a linking process, but more a thorough monitoring of injured people	Yes, for 16 provinces	n.a.
Brazil	No	No	n.a.
Chile	No	No, both databases remain separated	n.a.
Colombia	Yes ^a	No	6 - 9% ^d
Costa Rica	No	No	n.a.
Cuba	Yes ^b	Yes	n.a.
Ecuador	No	No	n.a.
Mexico	No ^c	No	18.85% ^e
Paraguay	Yes	Yes	0%
Uruguay	Yes	Yes	n.a.

Notes: n.a. – not available.

a) Police statistics are merged with the forensic medical statistics. The police are obliged to inform the INMLCF (Instituto Nacional de Medicina Legal y Ciencias Forenses).

b) The information is updated after with the Legal Medicine statistics, for victims who died within 30 days after the crash occurred.

c) Some federal states are starting to link data on fatalities between police and hospitals registries. It is carried out through the State Injury Observatories in co-ordination with the National Injury Observatory.

d) These values were obtained through the analysis of the differences between the report from the Forensic Medical System and the one from the Vital Statistics (reported 18 months later).

e) Based on death certificates (Pérez-Núñez et al., 2015). This does not only concern underreporting, but also underestimation of road deaths due to wrong classification in the cause of death.

Table 4.3 compares the number of road deaths reported by the police with the number of road deaths reported in health statistics. For Chile, Colombia and Mexico, it was only possible to access underreporting percentages.

The link between the police and hospital data is not yet implemented in Chile, Costa Rica, Ecuador and Mexico (no available information for Brazil). Therefore most of countries do not have a procedure to

assess the level of underreporting and to correct for it. In Mexico, however, the information collected by INEGI to report on the number of road deaths comes from two sources (death certificates as well as information from the public prosecutor).

Table 4.3. Comparison of the number of road deaths in police and health databases, 2013

	Registered by the hospitals or health institutions	Registered by the police ^f	Are the official statistics updated?	Number of unreported deaths
Argentina	5 535	5 209	No	n.a.
Brazil	17 876	n.a.	Yes	n.a.
Chile	2 119	1 623	No	496 (23.4%)
Colombia	6 389 ^c	5 996	No ^b	393 (6%)
Costa Rica	n.a.	288	Yes	n.a.
Cuba	n.a.	687	Yes	n.a.
Ecuador	3 072	2 277	Yes	n.a.
Mexico	15 856	8 957 ^a	Yes	(18.85%) ^d
Paraguay	1 191	1 093 ^e	Yes	n.a.
Uruguay	n.a.	567	n.a.	n.a.

Notes: n.a. – information not available

a) Police records at the accident site.

b) The final report of the statistics of each year is made 18 months after the end of each period and only includes the information from the Civil Registry of Death, which is very limited.

c) For 2013, the DANE - Departamento Administrativo Nacional de Estadísticas - certified the occurrence of 6 524 deaths due to transportation accidents, of which 6 389 correspond to land traffic accidents. Compared to the official value presented by INMLCF for 2013 (5 996), an underreporting of 6% is estimated.

d) This does not only concern underreporting, but also underestimation of road deaths due to wrong classification in the cause of death in the death certificates (Pérez-Núñez et al., 2015).

e) The police do not register deaths within the hospital.

f) In the case of Colombia, the registry is made by the Forensic Medical System through the National Institute of Forensic Medicine and Forensic Sciences. It is not up to the Police to carry out this registration.

The World Health Organization (WHO) publishes, on a regular basis, reports on the global status of road safety which describes the road safety situation worldwide. The latest edition was published in 2015, based on 2013 data (WHO, 2015).

Road traffic deaths information is submitted to WHO by each Member State, and most is coded using the International Classification of Diseases, which considers that all deaths that follow from a road traffic crash 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).

For the countries without a good registration data, WHO uses regression models to estimate road traffic deaths 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.

For many countries the estimates presented in the 2015 report represent the best estimates for fatalities that occurred during 2013 and earlier years, based on the evidence available up to March 2015. According to this document “These estimates are not necessarily the official estimates of Member States for that year and are not necessarily endorsed by Member States”.

Table 4.4 presents a comparison between the reported number of road deaths included in the WHO report, the estimates made by WHO and the number of road deaths provided by the countries for this project.

Table 4.4. Comparison between the reported number of road traffic deaths and estimates by WHO, 2013

Country	Reported number of road deaths ^a in the WHO report	WHO estimates ^b	Difference	Figures provided by the countries for this project
Argentina	5 209	5 619	7%	5 209 ^g
Brazil	42 291 ^e	46 935	10%	42 266 ^g
Chile	1 623 ^d	2 179	26%	1 623 ^d
Colombia	6 219 ^e	8 107	23%	5 996 ^g
Costa Rica	644 ^f	676	5%	644 ^f
Cuba	918 ^{c, f}	840	-6%	708 ^{c, g}
Ecuador	3 072 ^e	3 164	3%	3 072 ^g
Mexico	17 653 ^{c, e}	15 062	-14%	17 102 ^{c, f}
Paraguay	1 114	1 408	21%	1 212 ^g
Uruguay	567	567	0%	567 ^g

Notes: a) Adjusted for 30-day definition of a road traffic death.

b) Modelled using negative binomial regression.

c) 2012 data.

d) Defined as died within 24 hours of crash.

e) Defined as unlimited time period following crash.

f) Defined as died within a year of crash.

g) Fatal victims according to the 30-days definition.

Only the data for Uruguay match the three categories, suggesting that the data procedure in Uruguay is rather well organised, with very little underreporting.

Reported data for Argentina, Brazil, Chile, Costa Rica and Ecuador in the WHO report and this report are the same (or nearly the same in the case of Brazil). However, WHO estimates are between 5% and 26% higher, due in some cases to the application of a correction factor to match the 30-days definition and to underreporting. For Cuba and Mexico, the WHO estimates are lower than the reported data, but it was not possible to assess the justification for this.

Countries have stated several reasons that may be appointed in order to justify these differences, but mainly they rely on different fatal victim's definitions (with different time period being considered) or different data sources. It is recommended that countries reduce their level of underreporting and get a closer connection to WHO estimates, in order to solve any data-related problems.

Conclusions and recommendations

A consistent theme throughout this study was the need for much better (collection, analysis and use of) data to improve road safety results.

Five countries apply the standard 30-days definition of a fatality: Colombia, Cuba, Ecuador, Paraguay and Uruguay. Chile uses the 30-days definition after applying a correction factor to convert a 24-hour to a 30-day figure. Argentina has adopted the 30-days definition at federal level, however, in practice, not all provinces are yet capable of following road casualties within the 30 days that follow the crash; therefore a correction factor may be applied in some provinces. Costa Rica and Brazil register all

victims who die from a road crash within 12 months. In Brazil, the consequences of a road crash continue to be monitored even after the 12 month period, as recommended by the International Classification of Diseases and related Health Problems. In Mexico, it is possible to register a road death even after one year, when it can be proven that the cause of the death is related to the road crash.

Underreporting is an issue in all countries, meaning that not all road crashes are reported to/by the police and are not included in official national crash statistics. Police data should remain the main source for road crash statistics, but other data systems such as hospital data and death certificates are a useful complement to adjust for underreporting and procedures to link police and hospital data should be initiated in Costa Rica and Ecuador. Non-fatal injury data is very important, and all countries would benefit from improving the capacity of their crash data system to collect and analyse this type of data.

Crash data should be collated and analysed within a single consolidated national crash data system. This is made very difficult in Argentina, Brazil and Mexico where there are different police forms in different jurisdictions throughout the country. Harmonised police traffic crash reporting is important across the police forces in each country.

Other critical data needs relate to monitoring and evaluating progress on safety performance indicators through, for example, observational studies on driving speeds on different roads, drink driving, and use of helmets and seat belts. There is a critical need in all countries to build and sustain capacity and investment in data systems, academic and applied research, and practical studies of how to significantly improve results.

It is recommended that all countries build and sustain capacity and investment into road safety data systems and research, and in particular:

- Adopt a 30-day definition and apply a correction factor when this is not yet feasible.
- Develop and/or strengthen a single consolidated national crash data system with harmonised police crash report forms.
- Take measures to get information on seriously injured person by a more systematic linking between health and police data system.

It is recommended that **OISEVI**:

- Play a role in ensuring data quality by regularly conducting data audits.
- Continue to provide data to the IRTAD LAC database, which allows data to be collected in a standardised way.
- Develop guidelines on how to establish a crash data collection system and how to audit safety data.

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Notes

¹ For more information: [http://www.nhtsa.gov/Data/Fatality-Analysis-Reporting-System-\(FARS\)](http://www.nhtsa.gov/Data/Fatality-Analysis-Reporting-System-(FARS))

Chapter 5. Road safety trends

Trends in the number of road deaths

This section analyses trend in road deaths, with a distinct analysis for Group 1 and Group 2 countries whenever possible. Data were collected and analysed, based on data availability, for the period 2001 to 2013. Regarding Ecuador, it is important to note that it recently undertook a major transformation in its data collection process, resulting in improved data for 2014, with a higher disaggregation. When possible, data for 2014 are presented, however they cannot be compared with previous years.

Table 5.1 presents the evolution in the number of reported road deaths between 2001 and 2015, or when data are not available for this time frame, for the longest period with data. For Group 1 countries, the number of reported road deaths decreased in Cuba (-26%), Costa Rica (-8%), but increased in Colombia (4%), Ecuador (+64%) and Paraguay (+123% for the period 2004-15). For Group 2 countries, the number of road deaths only decreased in Argentina (-8% for 2008-14). It increased in Brazil (+27%), Mexico (+15%) and Chile (+5%). Uruguay presented a very small variation (+1%).

Although the number of road deaths decreased in Costa Rica and Chile, the Poisson Means Test showed that this reduction was not statistically significant at the 95% confidence level. The same happened with the small increase revealed by Uruguay.

Table 5.1. Change in the number of road deaths (2001-15)

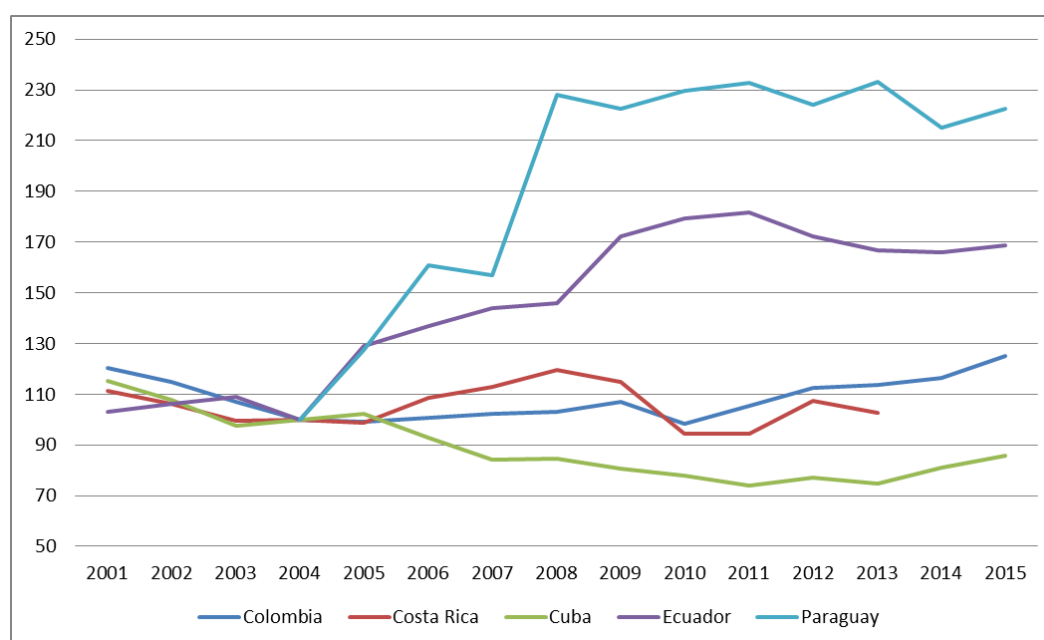
	GROUP 1					GROUP 2				
	Colombia	Costa Rica	Cuba	Ecuador	Paraguay	Argentina	Brazil	Chile	Mexico	Uruguay
2001	6 346	700	1 061	1 899	-	-	30 524	2 031	14 005	502
2002	6 063	667	990	1 959	-	-	32 753	2 014	14 613	398
2003	5 630	625	896	2 010	-	-	33 139	2 214	14 900	394
2004	5 271	628	920	1 843	520	-	35 105	2 284	15 016	448
2005	5 227	620	940	2 379	663	-	35 994	2 114	15 970	411
2006	5 298	681	855	2 520	837	-	36 367	2 148	16 767	467
2007	5 387	709	776	2 655	816	-	37 407	2 139	15 346	465
2008	5 431	751	778	2 691	1 186	5 759	38 273	2 317	17 058	515
2009	5 639	721	742	3 176	1 158	5 219	37 594	1 960	17 814	535
2010	5 177	592	716	3 304	1 195	5 094	42 844	2 074	16 546	556
2011	5 550	594	682	3 351	1 211	5 040	43 256	2 045	16 596	572
2012	5 934	675	708	3 176	1 166	5 074	44 812	1 980	17 086	510
2013	5 996	644	687	3 072	1 212	5 209	42 266	2 110	15 846	567
2014	6 127	-	746	3 059	1 118	5 279	43 780	2 119	15 886	538
2015	6 590	-	788	3 109	1 157	-	38 651	2 140	16 039	506
Geometric average annual change	0.3%	-0.7%	-2.1%	3.6%	7.5%	-1.4%	1.7%	0.4%	1.0%	0.1%
% Change	4%	-8%	-2.6%	64%	123% (2004-15)	-8% (2008-14)	27%	5%	15%	1%
Poisson	0.0326	0.1335	0.0000	0.0000	0.0000	0.0000	0.0000	0.0902	0.0000	0.9247
Means Test (95% conf.)	significant	non significant	significant	significant	significant	significant	significant	non significant	significant	non significant

Notes: All data converted to 30 days. Argentina: Percentage calculated for the period 2008-13. Paraguay: Percentage calculated for the period 2004-13. Ecuador: An improved data collection system was introduced in 2014. Data for the period 2001-13 are probably not comprehensive.

Figures 5.1 and 5.2 present the trends in the number of road deaths between 2001 and 2013 for Group 1 and Group 2 countries (indexed on the earliest year for which data are available for the larger number of countries). In Group 1, three groups of countries can be distinguished:

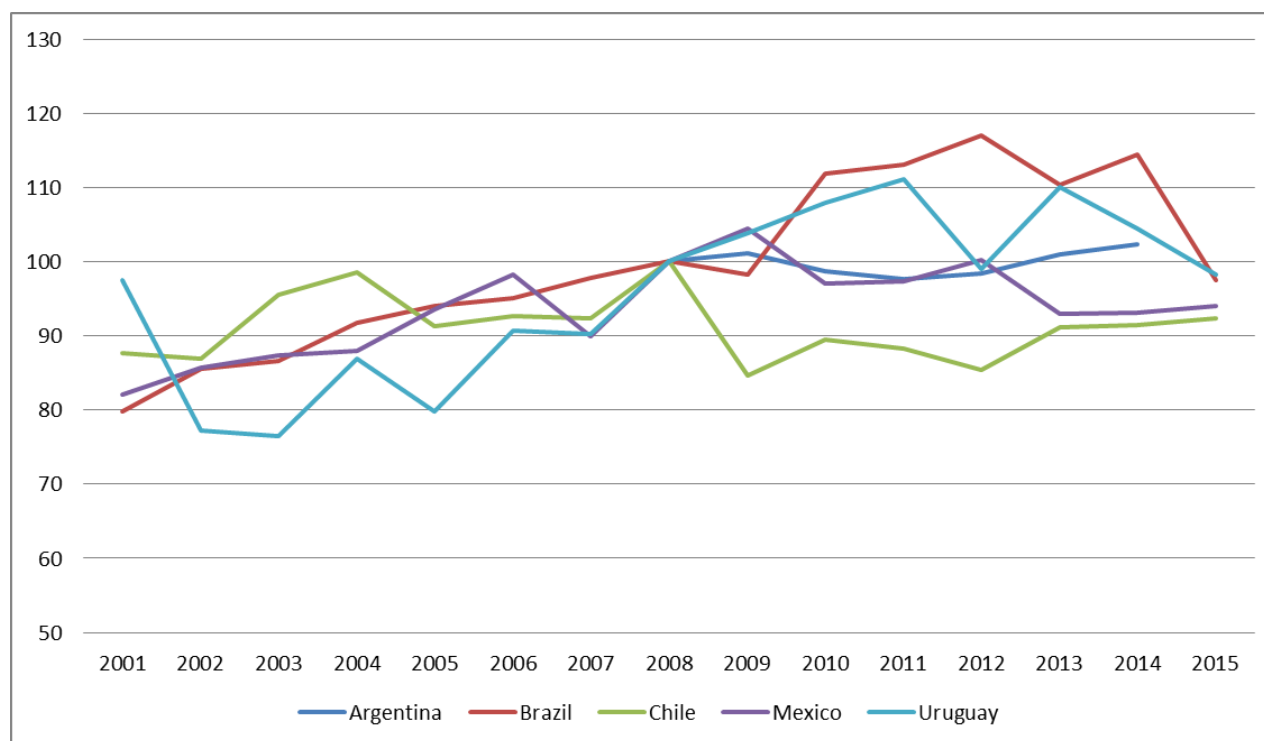
- Paraguay and Ecuador: a marked increase in the number of road deaths was observed, with some stabilisation since 2009. In Paraguay, the number of road deaths more than doubled between 2004 and 2008, and increased by more than 45% just in one year between 2007 and 2008. This strong increase should be further analysed in order to assess the underlying reasons. Some hypothesis to consider could be improved recording of fatalities and increased motorcycle use.
- Cuba: a steady decrease in the number of road deaths was observed since 2002, with a slight increase since 2013.
- Costa Rica and Colombia: there is relatively little variation, although Colombia is presenting an increasing trend since 2010.

Figure 5.1. Trend in the number of road deaths, Group 1 (index 100=2004)



For Group 2 countries, trends are very irregular, but it is possible to identify for Mexico a relative stabilisation in the number of road deaths in the most recent years. The reason for this may rely on the recent legislation changes, on the progress made in safer vehicles and on the investment in infrastructure improvement and on the fight against drink driving. In Brazil, the number of road deaths increased until 2012; however, a decreasing trend has been observed since. There is a rather stabilised trend or a low variation in Argentina and Chile. For Uruguay, although an overall growing trend is observed, it is possible to identify a downwards trend with a reduction of around 11% in the most recent three years of analysis.

Figure 5.2. Trend in the number of road deaths, Group 2 (index 100=2008)



Mortality rates

To interpret road deaths data and assess the relative risk in each country, it is useful to normalise them by population, road length, and the number of vehicles or annual distances travelled by vehicles and passengers, or fuel sales for motorised vehicles.

Box 5.1 explains the strengths and weaknesses of the most commonly used indicators and highlights the care needed when interpreting rates and comparing countries.

Box 5.1. Measuring rates and comparing countries

To measure road safety performance and compare safety level across countries, three indicators are commonly used (ITF, 2016): the number of fatalities per head of population (mortality rate); the number of fatalities per distance travelled by motorised vehicles (vehicle-kilometres) (fatality risk); the number of fatalities per registered motorised vehicles (fatality rate), as a proxy for fatality risk. Each indicator has its advantages and disadvantages and in all cases, country comparisons should be interpreted with greatest care, especially between countries with different levels of motorisation.

Fatalities per 100 000 inhabitants: Mortality rates

The number of inhabitants is the denominator most often used and the figure is readily available in most countries. This rate expresses the mortality rate, or an overall risk of being killed in traffic, for the average citizen. It can be compared with other causes of death, like heart disease, HIV/Aids, etc. It is useful to compare risk in countries with comparable levels of motorisation. It is, however, not very meaningful to compare safety levels between high-motorised countries and countries where the level of motorisation is low.

Fatalities per billion vehicle–kilometres (distance travelled): Fatality risks

This indicator describes the safety quality of road traffic and theoretically is the best indicator to assess the level of risk of the road network. This indicator does not take into account non-motorised vehicles (such as bicycles), which can in some countries represent a large part of the vehicle fleet and of the fatality figures. Only a limited number of countries collect data on distance travelled.

Fatalities per 10 000 registered (motorised) vehicles: Fatality rates

This rate can be seen as an alternative to the indicator number of fatalities per distance travelled (exposure to risk). It requires reliable statistics on the number of vehicles. In some countries, scrapped vehicles are not systematically removed from the registration database; others do not include new types of vehicles, such as electric motorcycles or motorised bicycles, thereby undermining accuracy. This indicator does not take into account non-motorised vehicles (such as bicycles), which can in some countries represent a large part of the vehicle fleet and of the fatality figures.

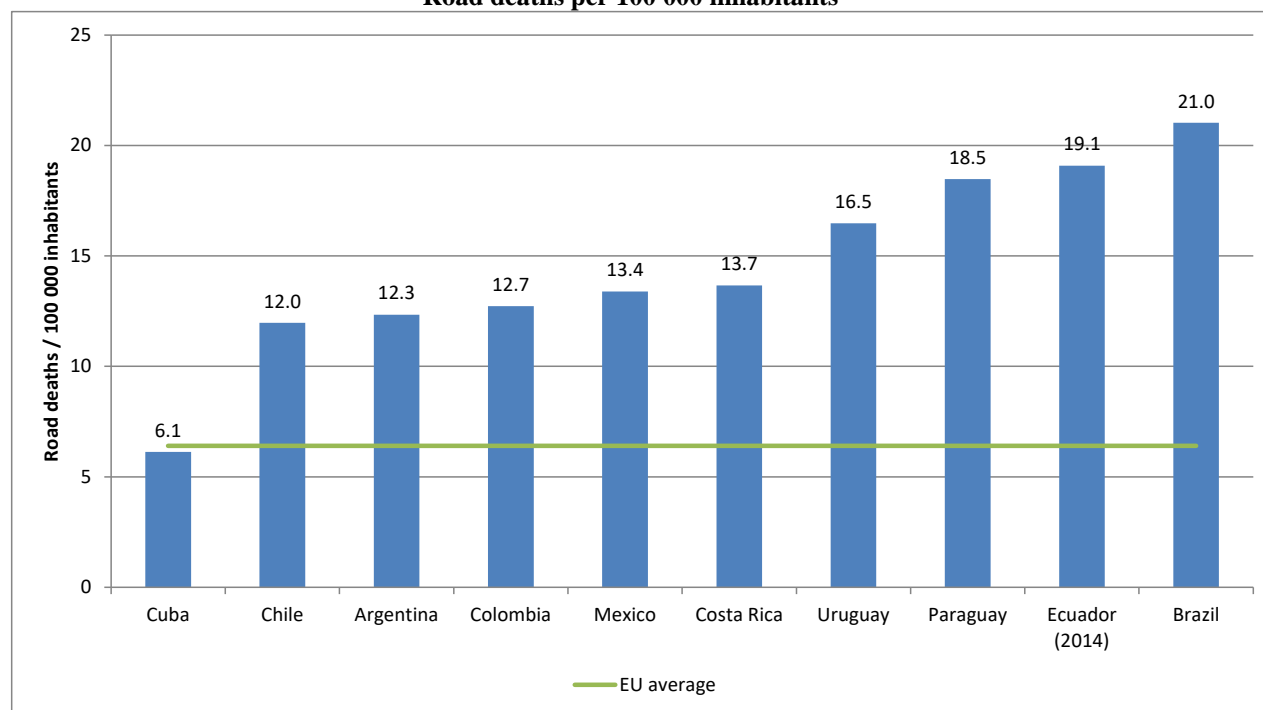
Source: ITF (2016).

Mortality rates*Total population*

Figure 5.3 illustrates the mortality rate in terms of road deaths per population in 2013 (2014 for Ecuador, since an improved data system was introduced). For comparison purposes, this figure also presents the average mortality rate for the European Union.

Brazil has the highest mortality rate (20.5 road deaths per 100 000 inhabitants in 2013, which decreased to 18.3 in 2015). Paraguay and Ecuador have similar mortality rates of a little bit lower than 20. Between 2004 and 2013, the mortality rate more than doubled. Cuba has a relatively low mortality rate of 6.1 road deaths per 100 000 population. Mortality rates for Chile, Argentina, Mexico and Costa Rica are similar and considerably lower (by one-third) than countries like Brazil. A careful analysis is needed to understand differences in mortality rates between countries. Differences in motorisation levels, demographics and urbanisation can explain a part of differences. One can also think about the impact of safety interventions which could explain (partly) differences between countries.

Figure 5.3. Mortality rates, 2013
Road deaths per 100 000 inhabitants



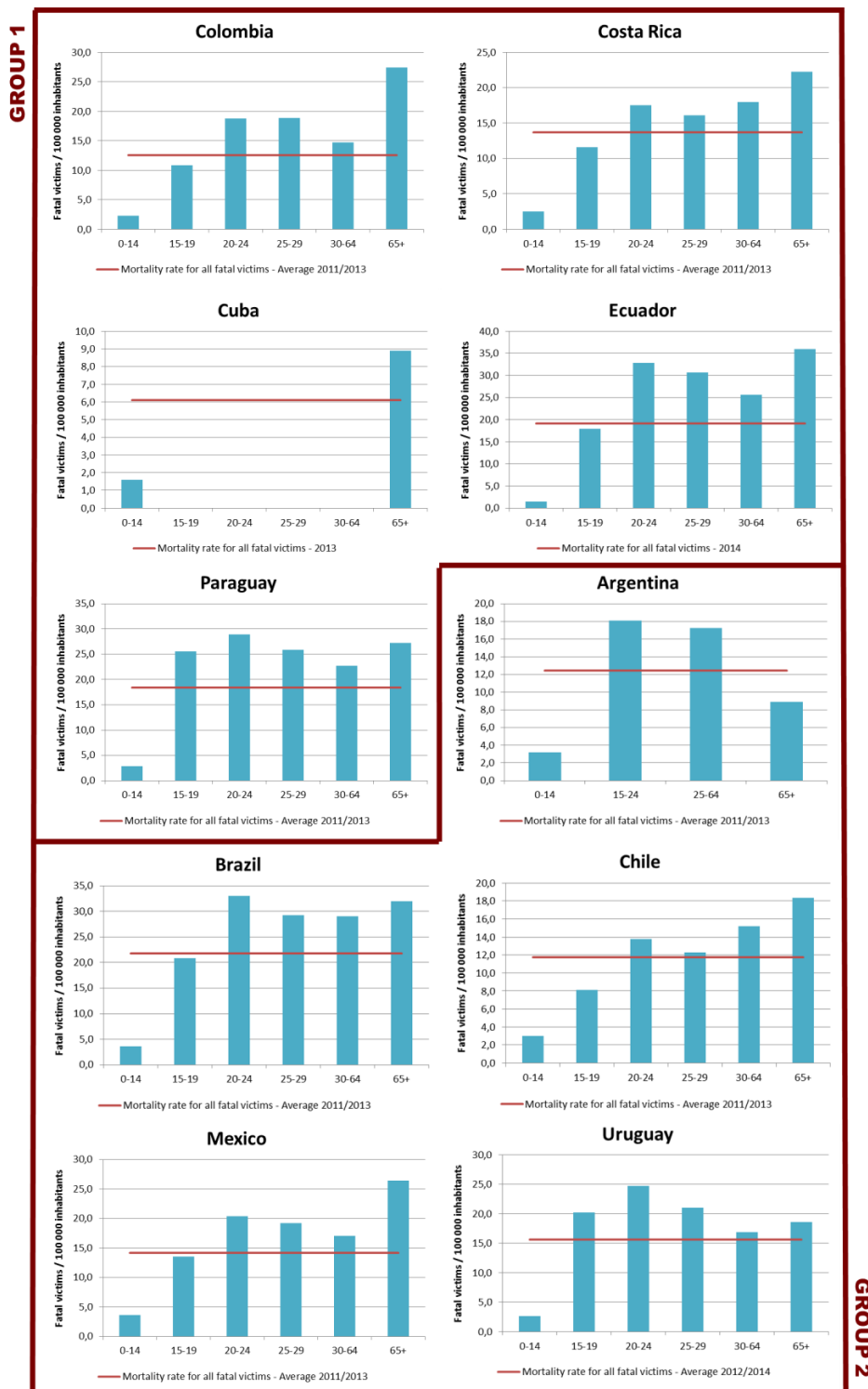
Notes: For Costa Rica and Mexico, the mortality rate was calculated with the number of persons killed as a result of road crash during the year of its occurrence; For Chile a correction factor of 1.3 has been applied to the raw data to match the 30-days definition.

Source: EU countries, CARE; Americas and Caraibes, WHO.

Per age group

Figure 5.4 illustrates the average mortality rate for the period 2011-13 disaggregated by age group in order to identify age groups. In almost all countries, the groups with the higher mortality rates are the young people 20-24 and the senior citizens above 65.

Figure 5.4. Mortality rates disaggregated by age groups



Note: For Cuba it was not possible to present data for the intermediate age groups. For Argentina it was not possible to present the same age group disaggregation. For Costa Rica and Mexico, the mortality rate was calculated with the number of persons killed as a result of road crash during the year of its occurrence. For Chile a correction factor of 1.3 has been applied to the raw data to match the 30-days definition. For Ecuador the data is only for 2014.

Senior population

The mortality rate of the senior population is much higher than average in all countries, except in Argentina and Uruguay. In Costa Rica, Colombia and Mexico the safety of the older population is particularly acute, as their mortality rate is nearly twice the risk of the average population.

The elderly population is particularly vulnerable as pedestrians, and interventions should focus particularly on providing a safe walking environment, especially around public transport stations (see also Chapter 6). Older people are also much more fragile, and the quality of the post-crash treatment has an important impact on their chance of surviving a crash. Improving post-crash treatment is also an important component of increasing safety for older people (see also Chapter 12). The information we gathered did not allow conclusions on the specific risk of older drivers; however based on experience from other countries, older drivers do not present a higher risk in road crashes for other road users.

In Argentina, the mortality rate of the senior population is much lower than average. In Uruguay it is slightly above average. Further information and data on mobility patterns of the senior citizens are needed to understand this pattern.

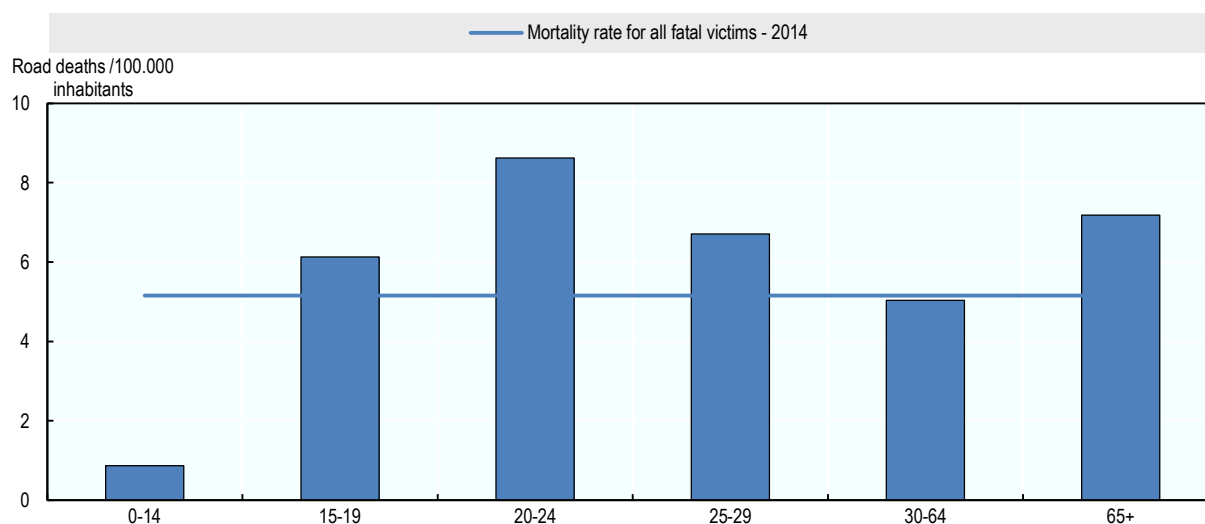
Young people: 15-19 and 20-24 year olds

Unlike EU countries, the 15-19 age group has in all countries studied (except Paraguay and Uruguay) a lower than average mortality rate. Further information on the mobility patterns of this age group is needed to understand this difference, possibly due to the fact that for economic and cultural reasons, young people start driving a car at an older age. The young population in Latin America is much larger compared with EU countries. This has a negative effect on mortality rates of countries because this age group has a relatively high mortality rate. This partly explains the differences between EU countries and countries in Latin America.

In most countries, the 20-24 age group is the first or second group most at risk in traffic; EU countries reflect a similar pattern. The greater risk of young people is particularly acute in Argentina, Brazil, Ecuador Paraguay and Uruguay. All countries should carefully review their young driver strategies, including the licensing process, as discussed in Chapter 2.

In Chile, the pattern is quite different as the two groups most at risk are the seniors followed by the 30-64 year olds. The young population seems to be less effected than other countries by traffic crashes, in part explained by the fact that the motorcycle fleet is rather small in Chile which reduces the highest risk exposure for young people.

Figure 5.5. Mortality rates disaggregated by age groups for EU countries, 2014



Source: CARE database.

Fatality rates per 10 000 registered motor vehicles

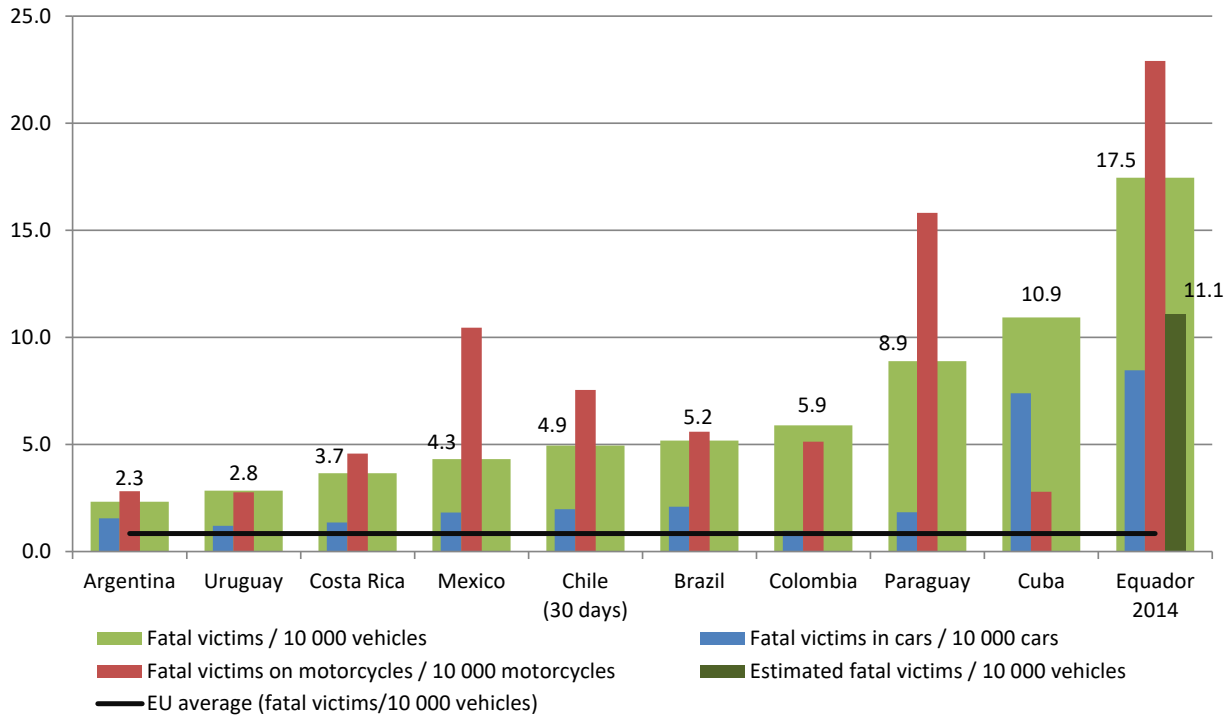
Figure 5.6 presents the number of road deaths per 10 000 registered motor vehicles for the year 2013 disaggregated by the type of vehicles (total number of motorised vehicles, passenger cars and motorcycles).

In general, the mortality risk of Group 1 countries (Colombia, Costa Rica, Cuba, Ecuador and Paraguay) is much higher than the one for Group 2 countries (Argentina, Brazil, Chile, Mexico and Uruguay). Ecuador presents by far the highest number of road deaths per 10 000 registered motor vehicles (17.5), followed by Cuba and Paraguay. This remains the case even when the Ecuador data is corrected for the “true” number of vehicles (see Chapter 3) and the rate drops to 11.1.

In all countries, the mortality risk of motorcyclists is much higher than the mortality risk of car occupants.

For group 2 countries, Brazil has the highest number of road deaths per 10 000 registered motor vehicles. The remaining countries from this group have a rate ranging from 2.3 (Argentina) to 4.3 (Mexico). The biggest differences between rates for cars and motorcycles are in Chile and Mexico.

Figure 5.6. Number of road deaths per 10 000 registered motor vehicles, 2013



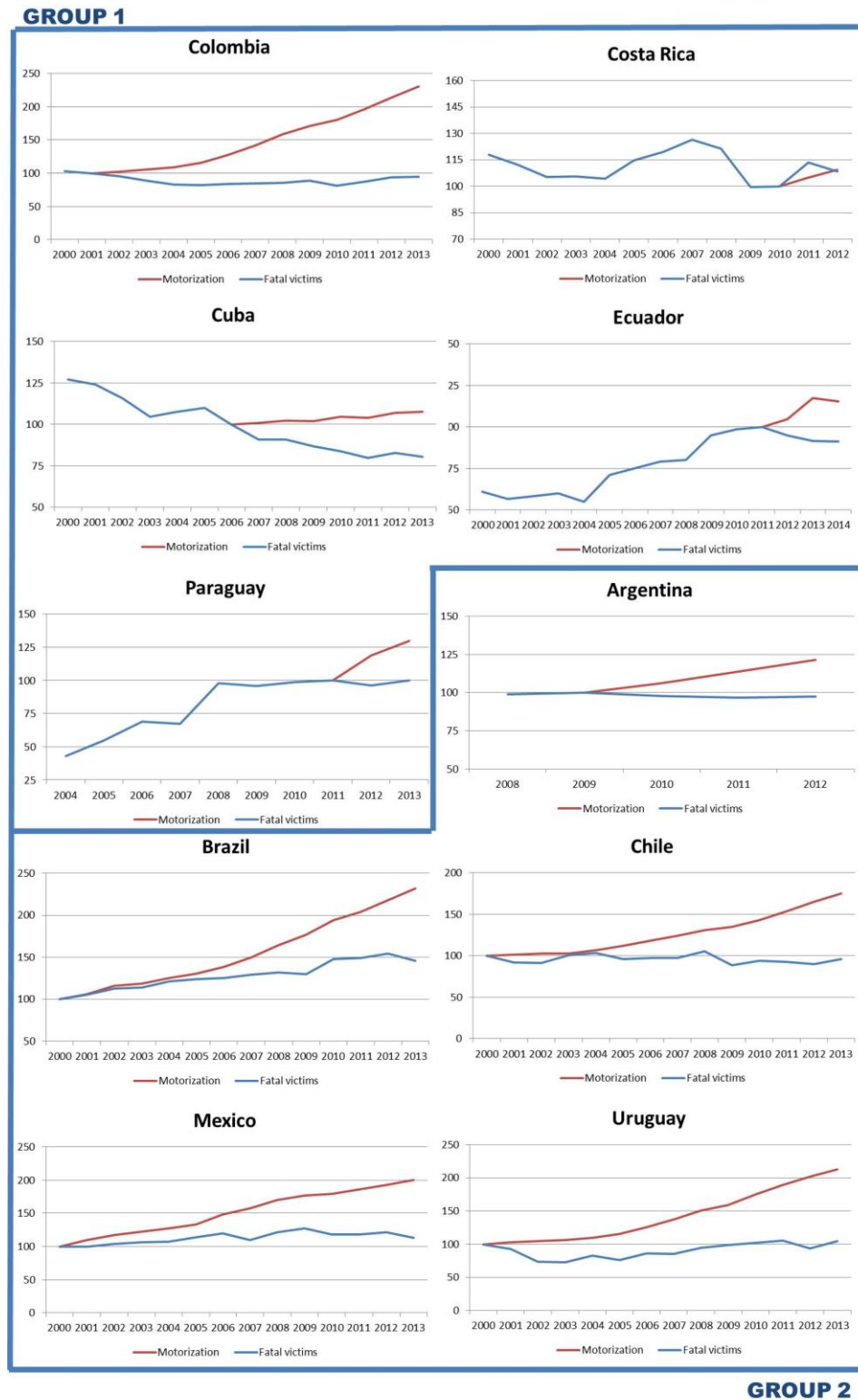
Note: For Costa Rica and Mexico, the mortality rate was calculated with the number of persons killed as a result of road crash during the year of its occurrence. For Chile a correction factor of 1.3 has been applied to the raw data to match the 30-days definition. Regarding the number of road deaths/10 000 vehicles, two figures are presented for Ecuador: one based on the official number of registered vehicles, and one based on the real number of vehicles (i.e. with 1 million additional vehicles).

Figure 5.7 presents the trend for the motorisation and the number of road deaths registered motor vehicles normalised with an index=100 for the first available value of each series. All countries have experienced fast growing motorisation, however in Cuba the increase is modest.

When comparing the trend in the number of road deaths with the trend in motorisation, it seems that countries have managed to avoid a fatality trend that would be naturally associated with a motorisation increase.

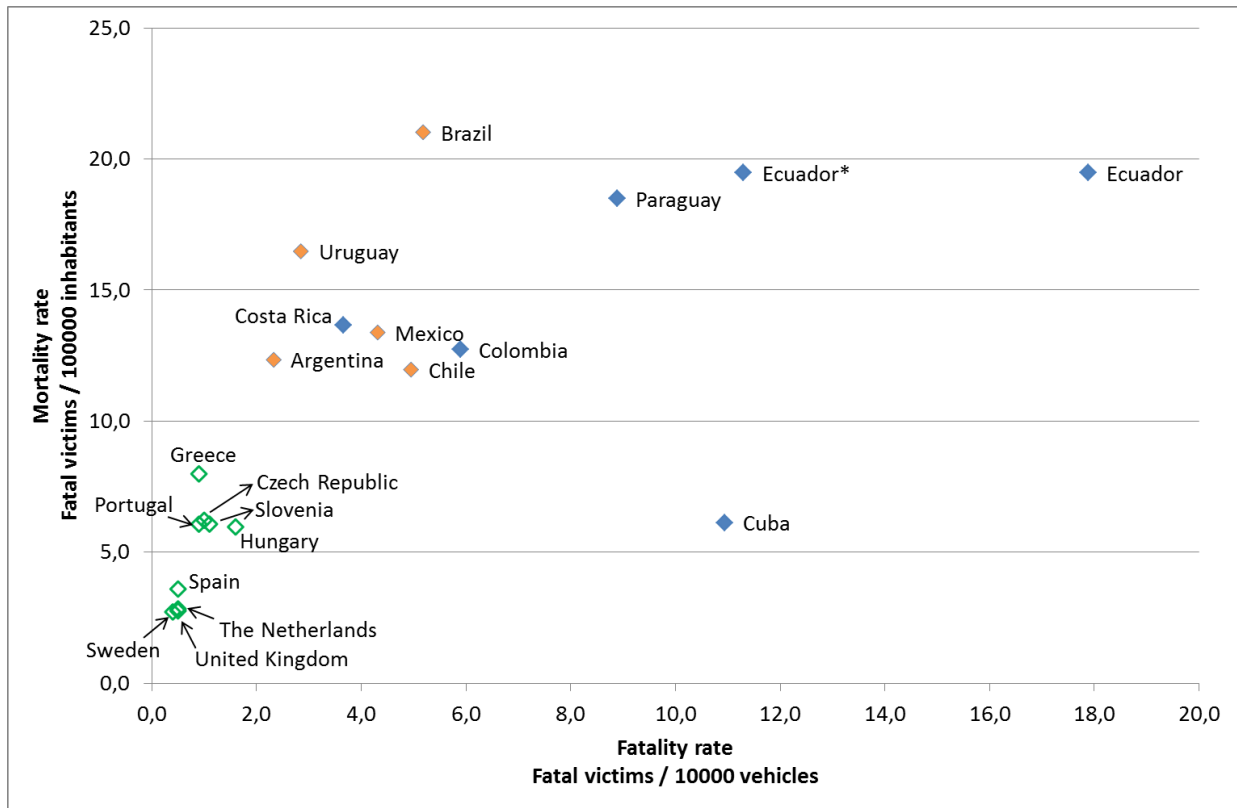
Figure 5.8 presents the rates of fatal victims per 100 000 inhabitants (mortality rate) and per 10 000 vehicles (fatality rate) for 2013 for the 10 countries under review and a selection of EU countries. Naturally, a low mortality rate per population and per registered vehicle is a sign of good performance, and vice versa. A relatively low mortality rate per population and high risk per vehicle are usually found in countries with low level of motorisation but where the risk is quite high. We find the same in high motorised countries: low mortality rates combined with low fatality rates. Usually, when motorisation increases, the fatality rate decreases, but initially the mortality rates goes up, and after a turning point comes down again.

Figure 5.7. Fatal victims and motorisation trends



Note: Index=100, based on the oldest year for which both data are available.

Figure 5.8. Mortality rate and fatality rate for 2013



Note: Group 1 – blue; Group 2 – orange; Reference to European Union countries – green.

Ecuador: 2014 data. Fatal victims/10 000 vehicles calculated with the estimated number of vehicles of 2 717 886.

For Costa Rica and México, the mortality rate was calculated with the number of persons killed as a result of road crash during the year of its occurrence. For Chile a correction factor of 1.3 has been applied to the raw data to match the 30-days definition.

One can identify in the graph a group of countries composed of Chile, Argentina, Colombia, Mexico, Costa Rica and Uruguay with the same mortality rates but a difference of two in the fatality rate. Both rates are considerably higher than rates for European Union countries.

Ecuador, Paraguay and Cuba present very different patterns from the other countries. Ecuador and Paraguay have both high mortality rates and fatality rates. Two values are presented for Ecuador: the highest one was calculated with the official number of vehicles and the lowest one was calculated with the additional million vehicles not registered. This highlights the importance of the accuracy of the databases, since it can bias the analysis. In the first case, Ecuador is clearly an outlier, presenting the highest values from all the analysed countries; on the second case, although it is still presenting the highest indicators, the position is much closer to the remaining countries. Cuba has a relatively low mortality rate per population and a high rate per vehicle probably explained by the small motorisation of this country. Brazil has an opposite position: a high mortality rate and a fatality rate similar to countries like Chile and Colombia.

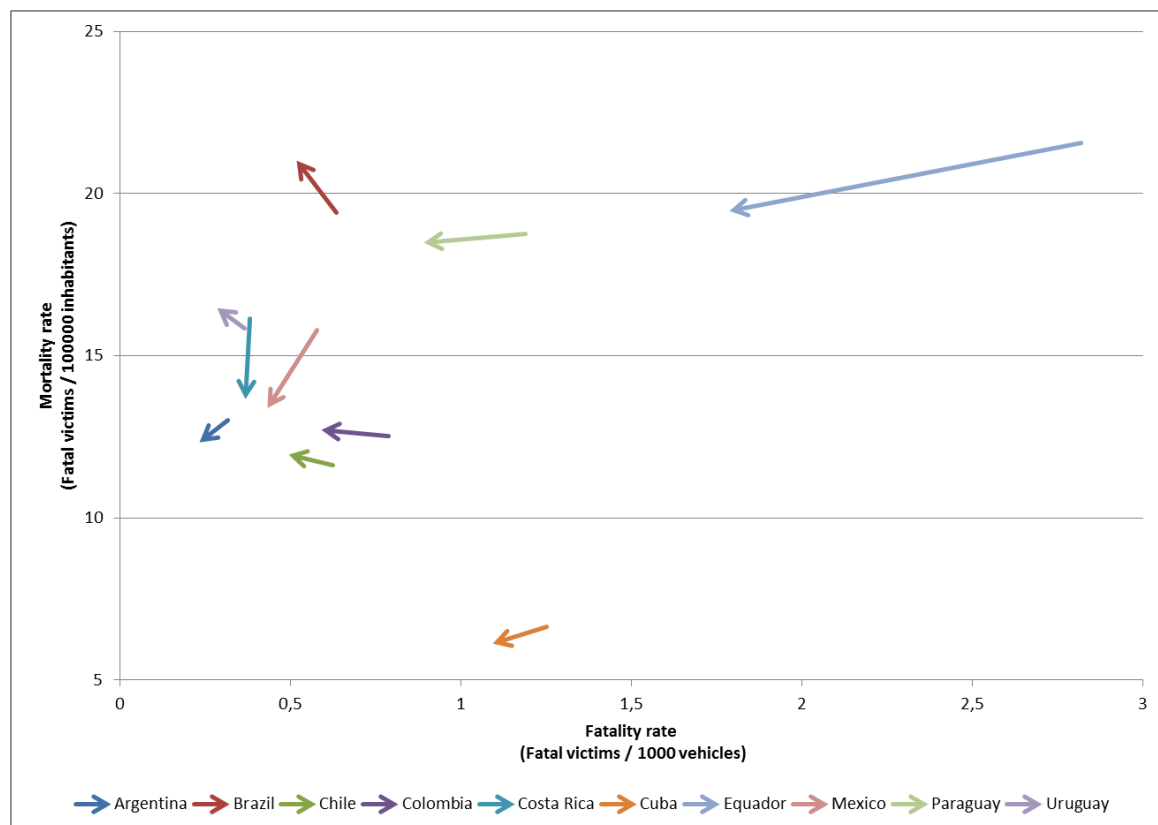
Information on the European countries which participated in the Sunflower projects is also presented as an example of how far a country can progress. Comparing their position with the remaining countries it is possible to notice their lower positions for both indicators. Sweden, United Kingdom and

the Netherlands have very close positions, with lower rates, followed by Spain; Portugal, Czech Republic, Slovenia and Hungary.

Figure 5.9 presents the general evolution for the two indicators used in the previous figure: mortality rate and fatality rate between 2009 and 2013. The natural trend for a positive evolution would be to have a line that gets closer to the origin of axes (upper right to the lower left), revealing a decrease in both indicators. The dimension of the arrow also shows the magnitude of change.

In general terms, all countries are moving from right to left, revealing a decrease in the fatality rate. There is greater diversity in the mortality rate, as well as smaller changes; for example the mortality rate is reducing in Argentina, Costa Rica, Cuba, Ecuador, Mexico and Paraguay, and increasing in Brazil and Uruguay and to a lesser extent in Chile and Colombia. In terms of magnitude of change, Ecuador revealed the highest improvement of all countries in the fatality rate (-37%); Costa Rica and Mexico presented the highest reduction in the mortality rate (-15% for both countries).

Figure 5.9. Mortality rate vs. fatality rate evolution, 2009-13



Note: Costa Rica and Paraguay: evolution calculated for the period 2011-13.

Ecuador: evolution calculated for the period 2010-13.

For Costa Rica and Mexico, the mortality rate was calculated with the number of persons killed as a result of road crash during the year of its occurrence. For Chile a correction factor of 1.3 has been applied to the raw data to match the 30-days definition.

Fatalities by type of users

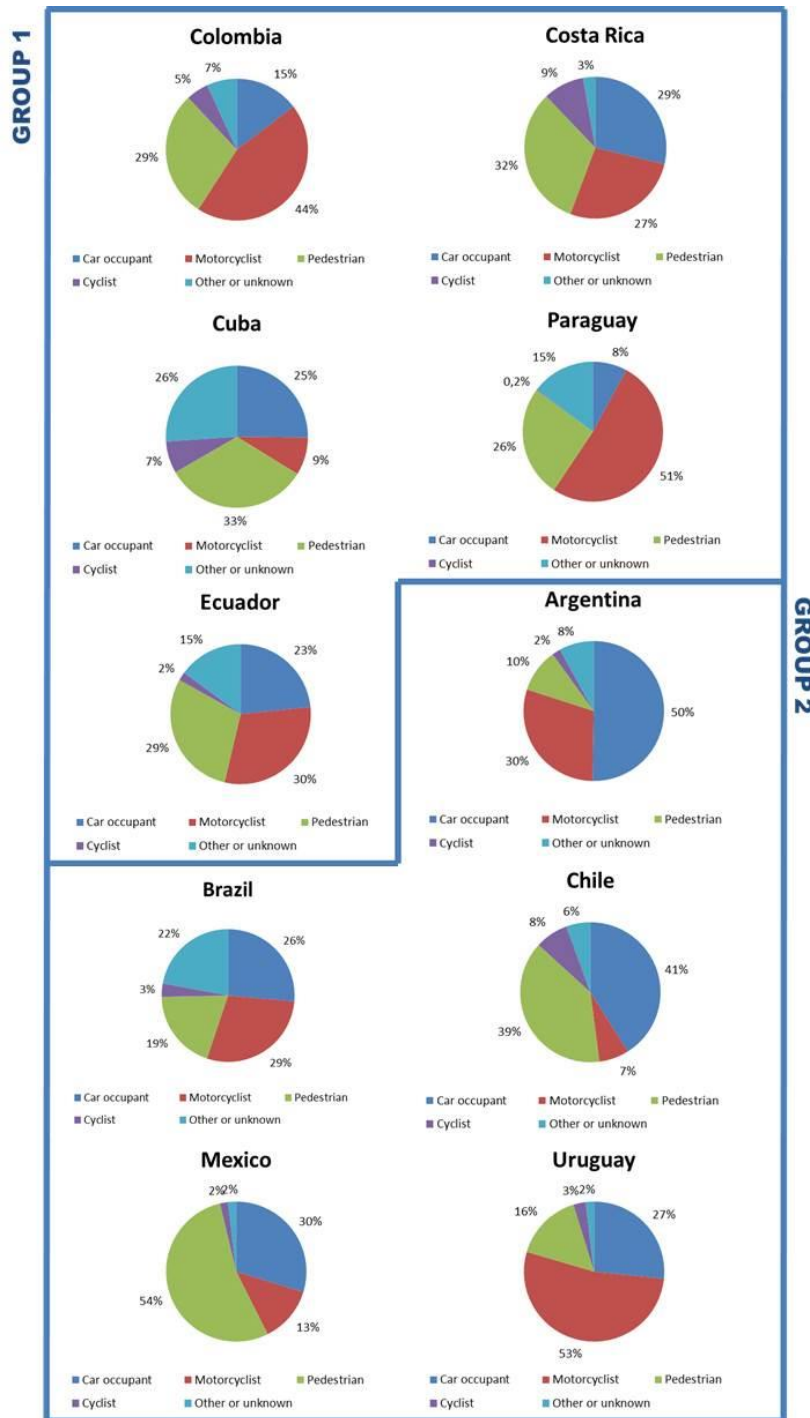
Figure 5.10 presents the distribution of fatalities by type of users. In all countries, pedestrians are either the main or secondary victims of road crashes. In Group 1, the main difference between countries is the share of motorcyclists killed which varies from 9% in Cuba to more than 50% in Paraguay. Colombia also has a high share of motorcyclists killed (44%). This is to be analysed taking into account the share of motorcycles in the vehicle fleet (see also chapters 3 and 7).

For some countries the “other or unknown” category represents a high share, which is often due to incomplete crash reports. For Cuba, the high share of “other” concerns heavy vehicle occupants. In Cuba, trucks are commonly used as public transport due a lack of conventional public transport services.

In Group 2, there is also a wide variation in the number of motorcyclists killed from 7% in Chile to 53% in Uruguay. These two countries represent the lowest and highest percentages of motorcycles in the fleet (3.3% and 54.9% respectively), and this is reflected in the share of fatal victims. There is also wide variation in the number of pedestrians killed from 10% in Argentina to 54% in Mexico. In Argentina, more than half of the road deaths are car occupants.

In all these countries the share of cyclists killed is relatively low. More information is needed to understand whether this is related to a low usage of bicycles or an underreporting issue. In the case of Colombia, this is fundamentally related to a low use of the bicycle as a means of usual transportation. However, as of 2014, bicycle use has increased, and although its share of number of fatalities remains low (around 8%), the trend shows an increase in recent years.

Figure 5.10. Distribution of road deaths by user group, 2013



Note: *Car occupant=Driver + passengers

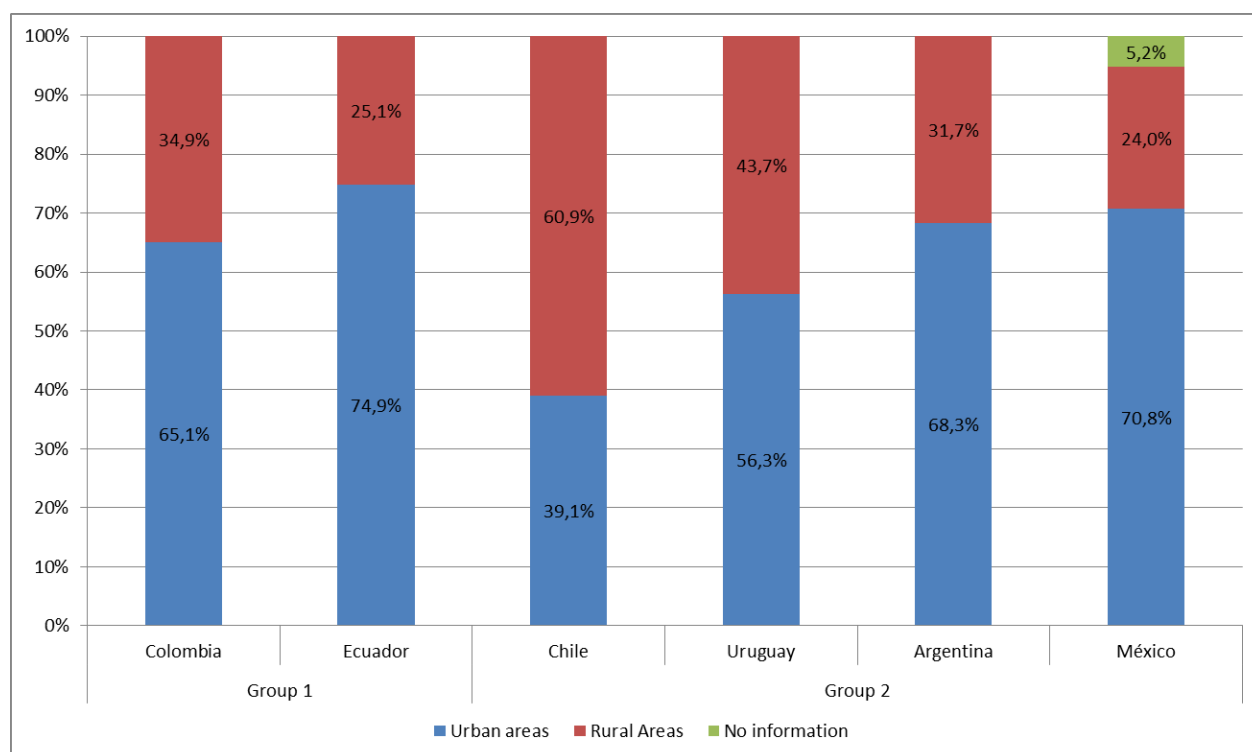
Ecuador: 2014 data

Mexico: police data. A significant share of road fatalities cannot be attributed to a road user category. Extrapolation by the Health Ministry shows that pedestrians represent more than half of total fatalities.

Fatal victims by location

Figure 5.11 illustrates the distribution of fatal victims between urban and rural roads. It was not possible to collect these data for Brazil, Costa Rica, Cuba or Paraguay. In all countries, except Chile, the majority of victims are killed in urban areas. By comparison, the majority (around 60%) of victims in most European countries are killed on rural roads. This difference may be due to the fact that Latin America is one of the most urbanised regions in the world (UN, 2014), and the urbanisation process developed very quickly over half a century, with insufficient planning in response to the population exodus from rural to urban areas.

Figure 5.11. Distribution of road deaths by road type (urban and rural roads), 2013



Note: Ecuador: 2014 data.

Conclusions

Mortality rates (number of road deaths per 100 000 inhabitants) and fatality rates (fatality per 10 000 motorised vehicles) are substantially higher in the ten countries under review than in the European Union average. The only exception is a relatively low mortality rate in Cuba, where the motorisation is low compared to the other nine countries. Some countries (e.g. Ecuador and Paraguay) are seeing a rather significant increase in the number of road deaths in recent last years. In others, the number of road deaths has slightly increased or has more or less stabilised, despite strong motorisation increase.

Mortality rates differ considerably between the ten countries, with Cuba as a successful “outlier”. Four countries have rather similar rates of about 13 (Chile, Argentina, Colombia, Mexico and Costa Rica). The other four countries have mortality rates that are significantly higher (Uruguay, Paraguay,

Ecuador and Brazil). Mortality rates are decreasing for almost all countries, with the exception of Brazil and Uruguay. (However, most recent data for Uruguay for the years 2014 and 2015 indicate strong improvement and the mortality rate in 2016 was of 12.8 deaths for 100 000 inhabitants).

When comparing the trend in the number of road deaths with the trend in motorisation (fatality rates), we observe a decrease in all ten countries. This pattern (decreasing fatality rate with a motorisation increase) is occurring in other countries in the world as well.

In almost all countries, the groups with the higher mortality rate are the young people, 20-24 year olds, and the senior citizens above 65. Senior citizens are particularly vulnerable as pedestrians due to their physical frailty.

Motorcyclist's safety is of critical importance in all countries, especially in Colombia, Uruguay and Paraguay, where motorcyclists constitute more than 40% of the road deaths. Measures targeting motorcyclists are needed and are discussed in Chapter 7.

Pedestrians are also particularly vulnerable. They constitute the largest or second-largest group of road deaths. Improving the safety of pedestrians should be a priority. Chapter 6 discusses how more analysis is needed to understand accident patterns of pedestrian (location, age, type of crash).

Car occupants represent a high share of casualties. Improving driving behaviour is a priority in all countries, in order to improve personal safety and reduce the risk drivers pose for other road users. It is important to identify in each country the causes of crashes and the behaviour issues underneath. Speed (Chapter 10) and drink driving (Chapter 8), as well as the use of seat belts (Chapter 9) are analysed in the following chapters.

In almost all countries, the majority of fatal victims die in a crash occurring in urban areas. The only exception is Chile, whose distribution is similar to that of European countries. It is important to identify typical crash scenarios inside and outside urban areas to design the most effective measures. Speed, a main contributing factor, is discussed in more detail in Chapter 10.

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Chapter 6. Pedestrian safety

Challenges of pedestrian mobility and safety

Almost half of the deaths on the world's roads are vulnerable road users – pedestrians, cyclists and powered two- or three-wheel vehicle occupants, and pedestrians alone represent 22% of the total (WHO 2015). More than 23 500 pedestrians were killed on the roads in Latin America and the Caribbean in 2010, making pedestrians the most vulnerable group of road users in the region.

In Latin America, as elsewhere, walking is an essential pillar of mobility. Walking is at the beginning and end of any trip and it is a daily necessity for many people who do not have access to other forms of transport. A recent survey by CAF (2015) of 29 cities showed that most trips were undertaken on foot (26%) or by public transport (42%), but motor vehicles have been given more attention and space in the road systems of Latin American countries (PAHO, 2013). Increasing safety for pedestrians is a transport priority in all countries.

Data presented and analysed in this chapter are based on fatalities, due to scarce information and data on injuries, but this is the tip of the iceberg with many times more seriously injured pedestrians. Improving crash data collection, including on serious injuries will allow a more accurate diagnosis of the pedestrian safety issue and the design of better targeted interventions (WHO, 2013).

Trends in pedestrian fatalities

Table 6.1 presents the number of pedestrian fatalities in the ten countries for different time periods, and the average annual change to get an idea of the relative trend in the various countries. Figure 6.1 presents the trend of pedestrian and other user fatalities.

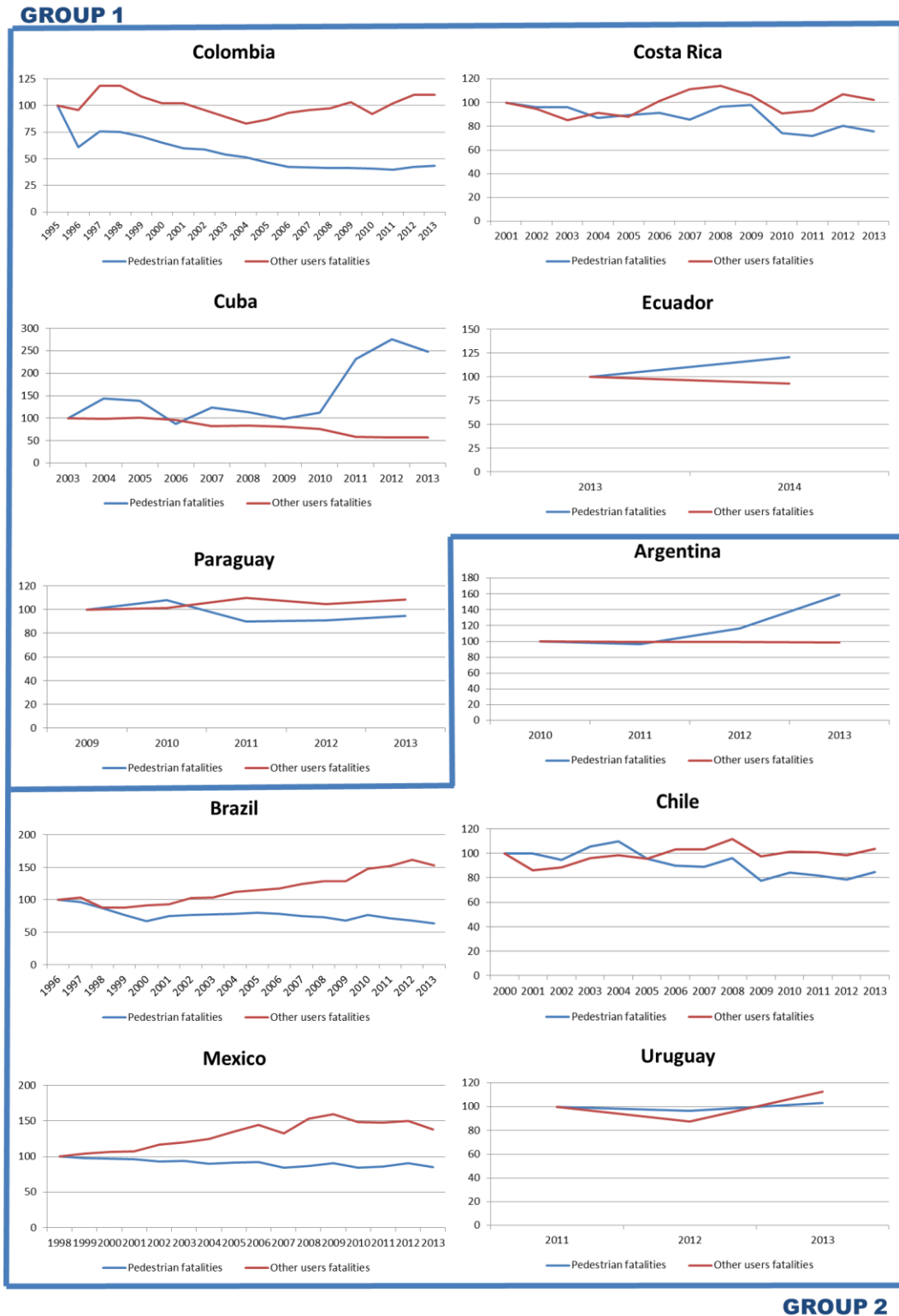
Table 6.1. Number of pedestrian fatalities, 1995-14

Year	Argentina	Brazil	Chile ^a	Colombia	Costa Rica ^b	Cuba	Ecuador	Mexico ^b	Paraguay	Uruguay
1995	-	-	4 009	-	-	-	-	-	-	-
1996	-	12 952	2 433	-	-	-	-	-	-	-
1997	-	12 500	3 033	-	-	-	-	-	-	-
1998	-	11 227	3 019	-	-	-	-	5 859	-	-
1999	-	9 886	2 836	-	-	-	-	5 719	-	-
2000	-	8 696	2 602	-	-	-	-	5 668	-	-
2001	-	9 720	2 406	273	-	-	-	5 619	-	-
2002	-	9 947	2 366	262	-	-	-	5 469	-	-
2003	-	9 991	1 022	2 173	260	91	-	5 504	-	-
2004	-	10 166	1 061	2 065	238	131	-	5 255	-	-
2005	-	10 320	926	1 863	244	126	-	5 356	-	-
2006	-	10 147	867	1 694	249	80	-	5 400	-	-
2007	-	9 657	858	1 688	234	113	-	4 954	-	-
2008	-	9 474	927	1 662	264	104	-	5 059	-	-
2009	-	8 799	748	1 649	268	90	-	5 298	324	-
2010	329	9 944	815	1 626	203	102	-	4 917	350	-
2011	317	9 244	790	1 604	196	211	-	5 027	292	93
2012	382	8 819	758	1 691	219	251	-	5 328	294	90
2013	524	8 220	820	1 736	207	226	-	4 993	307	93
2014	-	8 082	-	-	-	-	901	-	-	-
% change	59% 2010-13	-38% 1996-13	-15% 2000- 13	-57% 1995-2013	-24% 2001-13	148% 2003- 13	comparison not possible	-15% 1998-2013	-5% 2009-13	0% 2011-13
Geometric average annual change	16.8%	-2.6%	-1.3%	-4.5%	-2.3%	9.5%		-1.1%	-1.3%	0.0%

Notes: a) A correction factor of 1.3 has been applied to the raw data to match the 30-days definition.

b) Mexico: police data.

Figure 6.1. Trend of pedestrian and other user’s fatalities



Note: Indexed for different years according to country.

The timeframe for which data are available varies for all countries, thus making comparison difficult. Nevertheless Table 6.1 shows that, for different time periods, the safety of pedestrians improved in all countries, except Argentina and Cuba (for Ecuador there is no historical data). In nearly all countries, the safety level of pedestrians improved when compared to other road users.

The highest average annual decrease is found in Colombia (annual average decrease of 6.1%). However, according to local sources, this is not due to any specific pedestrian safety policies, but is instead mostly due to a modal shift to motorcycle use, resulting from non-satisfactory public transport services. Many former public transport users started using motorcycles, leading to a reduction in walking trips. This information was only reported by Colombia, but taking into account the explosion in motorcycle use (see Chapter 7) in nearly all countries, it is possible that walking exposure has decreased in other countries as well.

There were also reductions in Brazil, with an annual average change of -2.7% over the past 18 years, followed by Chile (-1.6%), Mexico and Uruguay (both with -0.7% per year). Data for the most recent period show a stronger reduction in the number of pedestrian fatalities in Brazil (-6.4%) and less favourable developments in the other countries.

In Cuba the number of pedestrians killed increased on average by 7.5% annually, but mainly between 2011 and 2010, when the number of pedestrians killed more than doubled. One possible explanation for this is that it became legal to use private cars for commuting, which may have resulted in a sharp increase in vehicle-pedestrian conflicts.

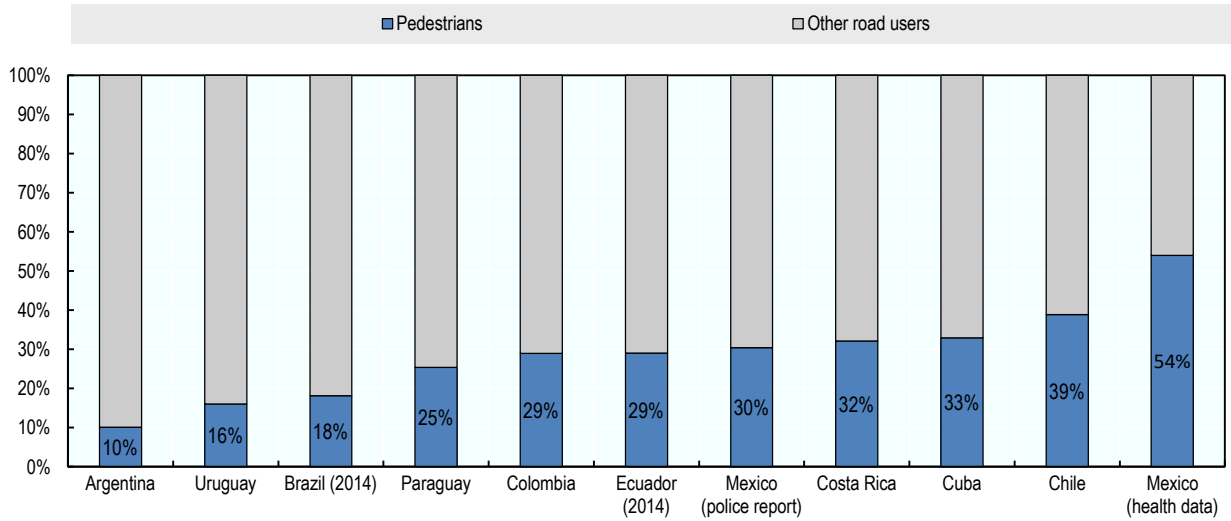
Share of pedestrians fatalities

Figure 6.2 presents the share of pedestrian fatalities among all fatalities, for the year 2013 and Figure 6.3 presents developments in the share of pedestrian fatalities between 2001 and 2013 compared to all road fatalities. Taking the longer available historical data series, all countries show a decrease in the share of pedestrians among all fatalities. However, the results are slightly different when looking at data for the period 2010-13. In both cases, Cuba stands out as an outlier, its share of pedestrian fatalities increasing from 10% in 2006 to more than 35% in 2013.

The share of pedestrian fatalities among all fatalities in 2013 ranges from 10% in Argentina to 39% in Chile. In Paraguay, Colombia, Mexico, Costa Rica, Cuba and Chile, pedestrians represent more than a quarter of the casualties. Pedestrians are particularly vulnerable in Chile, including on the rural road network where it is frequent for pedestrians to walk along the carriageway. In Mexico, based on police reports, 30% of fatalities are pedestrians. However based on extrapolation by the Ministry of Health, pedestrians represent more than half of total fatalities.

The share of pedestrian fatalities in Argentina (10%) and Uruguay (16%) is relatively low, when compared to other countries under review and even EU countries. At the same time, these two countries have the highest motorisation rate among the countries under review. Figure 6.4 illustrates a possible relationship between motorisation (number of vehicles/1 000 inhabitants) and the share of pedestrian fatalities. Ideally, however, in policy terms, any reductions in pedestrian travel are matched by increases in mass transit use.

Figure 6.2. Pedestrians as a percentage of all road deaths, 2013



Notes: Two sets of data are presented for Mexico: one based on police reports and the other based on health data. The difference is due to the fact that in police reports around 40% of fatalities cannot be attributed to a road user category. Health data are based on extrapolation.

Figure 6.3. Share of pedestrian fatalities, 2001-13

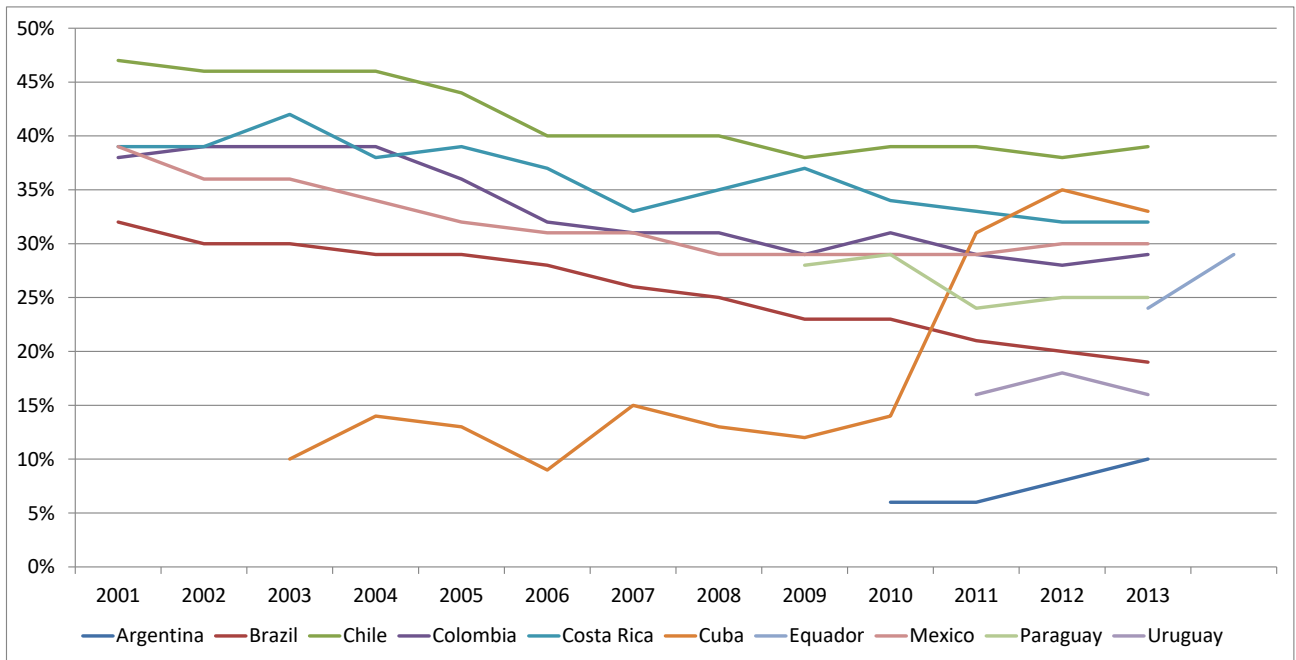
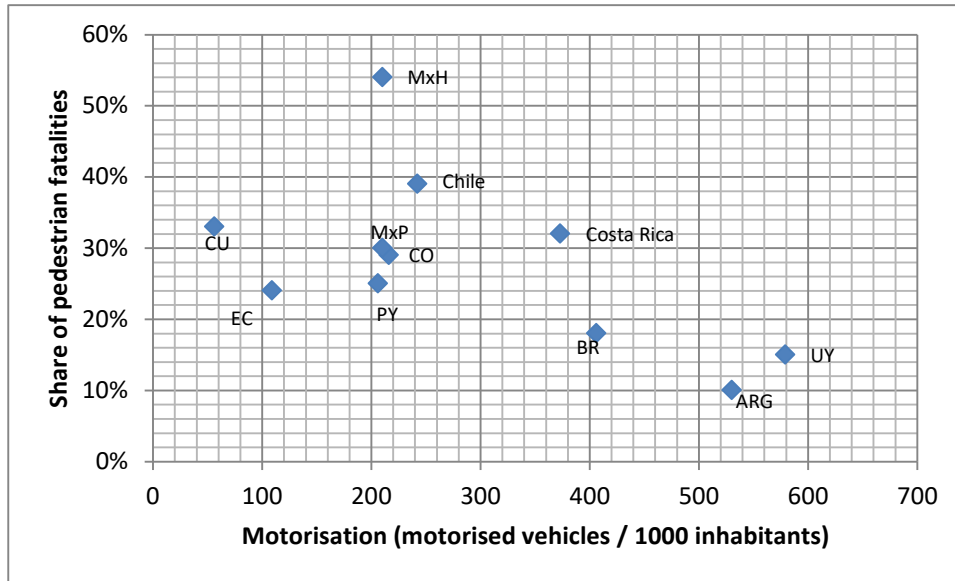


Figure 6.4. Motorisation rate and share of pedestrian fatalities 2013

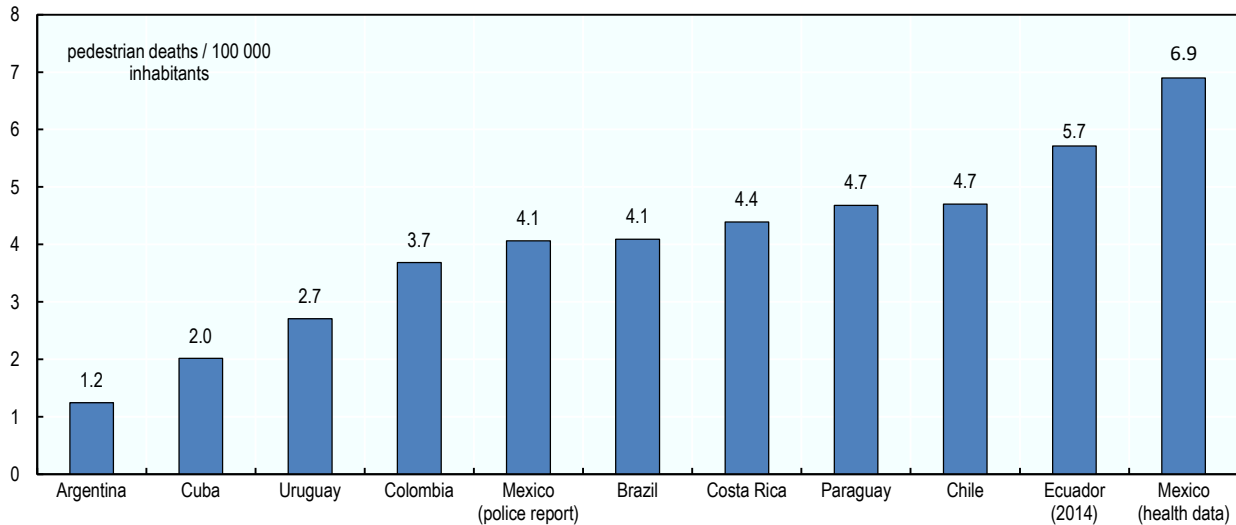


Note: For Mexico there are two data points: MxP based on police data and MxH based on health data.

Pedestrian mortality rates

Figure 6.5 presents the number of pedestrian fatalities per 100 000 population (mortality rate) for 2013. Ecuador is the country with the highest pedestrian mortality rate.

Figure 6.5. Pedestrian mortality rate, 2013



Note: Mortality rate = Number of pedestrians deaths per 100 000 inhabitants. Two sets of data are presented for Mexico: one based on police reports and the other based on health data.

In order to visualise the relative risk of pedestrians compared to other road users, Table 6.2 compares the mortality rate of pedestrians with the mortality rate of other road users (that is, total road deaths minus pedestrians). For Mexico, when taking into account data from the Health Ministry, it is striking that pedestrians are far more at risk than other road users. For Argentina, Brazil and Uruguay, the mortality rate of pedestrians is proportionally much lower than for other road users; suggesting that safety issues of other road users are more prominent. It also highlights that in Chile, there is a specific pedestrian issue, with a pedestrian rate proportionally much higher compared to other road users.

Table 6.2. **Relative mortality rate of pedestrians compared to other road users**

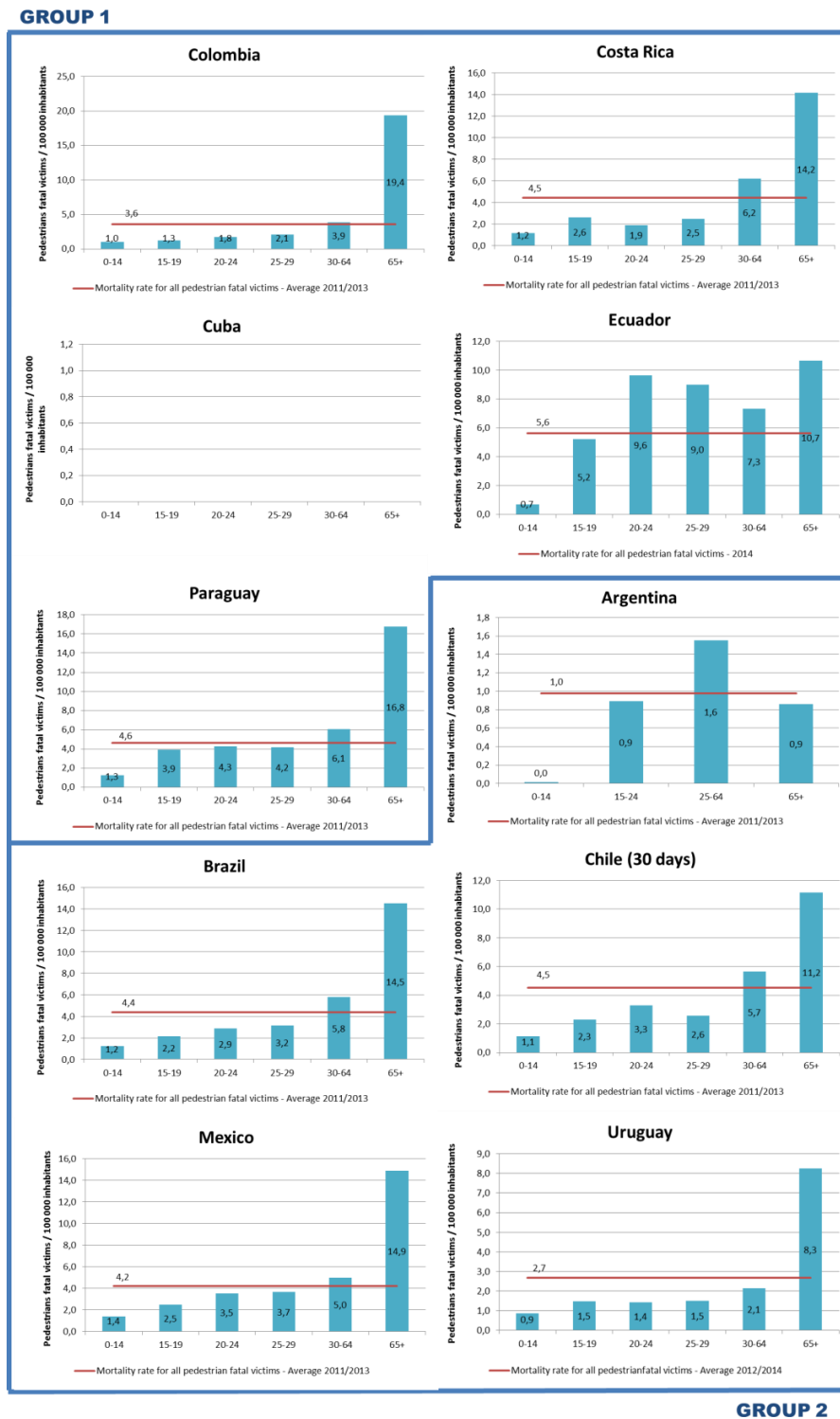
	Pedestrians	All other road users	Relative mortality rate between “pedestrians” and “others”
Argentina	1.2	11.1	0.11
Brazil	4.1	16.9	0.24
Chile	4.7	7.3	0.64
Colombia	3.7	9.0	0.41
Costa Rica	4.4	9.3	0.47
Cuba	2.0	4.1	0.49
Ecuador (2014)	5.6	13.5	0.41
Mexico		9.2	
Police data	4.2		0.46
Health data	6.9		1.06
Paraguay	4.7	13.8	0.34
Uruguay	2.7	13.8	0.20

Note: Two sets of data are presented for Mexico, one based on police reports and the other based on health data.

Age distribution of pedestrian fatalities

Figure 6.6 presents the average pedestrian mortality rate by age group for the period 2011-13. These values were obtained by dividing the number of pedestrian fatalities in each age group by the respective population in each age group, and then calculating the average. The figure also presents the average mortality rate without desegregation, calculated for all pedestrian fatalities.

Figure 6.6. Pedestrian mortality rates by age group (average 2011-13)



Note: No data available for Cuba; Ecuador’s data is for 2014. Uruguay’s data is for 2012-14. For Costa Rica, the mortality rate was calculated with the number of pedestrians killed as a result of road crash during the year of its occurrence. For Mexico, the reporting period can be above one year.

Almost all the countries have a far higher mortality rate for older age groups. In general, elderly persons are more fragile and have more difficulty recovering from injuries. While travel data is needed, it is likely that elderly people make less frequent car or motorcycle trips (either because they don't have a license or because they are too old to drive), and more frequent public transport or walking trips, with higher exposure to risk. Figure 6.6 highlights the need for safety policies directed at this age group and safety interventions addressing their mobility problems.

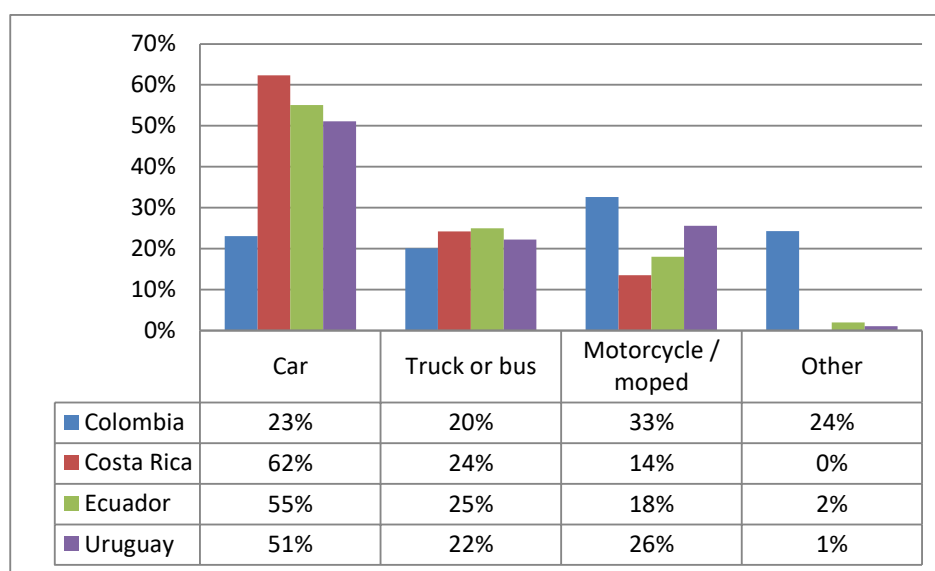
Ecuador and Argentina are the only countries with different patterns of pedestrian fatality rate distribution by age, and this merits further investigation. Road widening in small villages, creating a particularly dangerous road environment at night, has been suggested as a potential issue in Ecuador.

Pedestrian fatalities by collision partner

Figure 6.7 presents, for the year 2013, the percentage of pedestrian fatalities disaggregated by the type of vehicle involved in the crash. This information was only available in the required disaggregated data for four countries.

Not surprisingly, the car is usually the most frequent vehicle type. In Costa Rica, Ecuador and Uruguay, more than half of pedestrian fatalities result from a collision with a car. In all countries, an important share of pedestrians are fatally hit by buses and trucks, suggesting in particular that securing access to and areas around public transport stations should be carefully studied. The situation is different in Colombia, where the share of pedestrian fatalities due to collision with a motorcycle is particularly high (32.5%). Collisions with motorcycles are problematic in Uruguay as well, (25% of pedestrian fatalities).

Figure 6.7. Percentage of pedestrian fatalities disaggregated by crash vehicle type, 2013



Note: Ecuador's data is for 2014.

It was not possible to assess the percentage of pedestrian accidents that occurred in a crosswalk. A main reported problem is the absence of marking on the pavement to signal the intersection, except on main roads in urban areas. Clearly identifying and increasing the visibility of pedestrian crossing is a priority. Another issue concerns the right of way of pedestrians at a crosswalk. Mexico and Costa Rica

reported that it is not mandatory for vehicle drivers to stop and give way to pedestrians. These countries should review their legislation in order to incorporate this change.

Although it is considered a good policy to give the right of way to pedestrians, the fact that it is mandatory does not mean that it is, in practice, accomplished. Countries should survey the behaviour of drivers in order to understand if in fact this is a problem that deserves additional attention.

Pedestrian fatalities by location

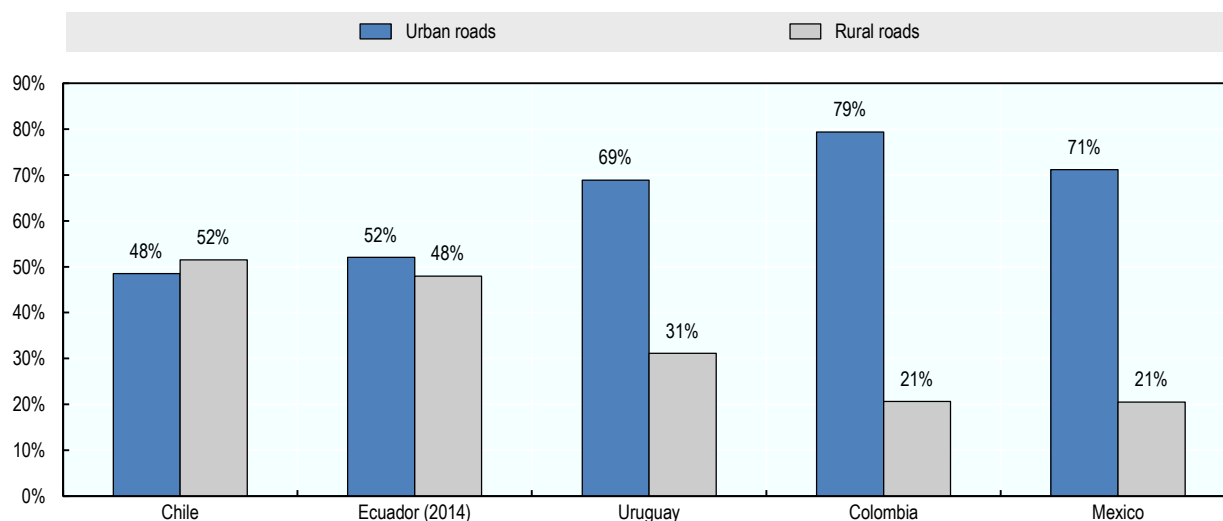
Figure 6.8 presents the distribution of pedestrian fatalities between urban and rural roads. Logically one would expect a higher share of pedestrian fatalities in urban areas, as there is higher pedestrian activity in these areas, but not all the countries show this pattern. One explanation is that the road classification is not always consistent.

In Chile and Ecuador, pedestrian fatalities occur almost with the same frequency on urban and rural roads, with slightly more fatalities in rural roads for Ecuador. This shows that rural roads are particularly unsafe for pedestrians in those countries. Without further information on pedestrian mobility patterns and infrastructure quality, it is not easy to make direct recommendations; nevertheless a safety inspection programme of the rural road network would be a useful initiative.

In Uruguay, Mexico and Colombia, most pedestrian fatalities occur in urban areas.

Several countries report big challenges where major roads pass through small towns and villages, especially when those small towns grow without long-term land use planning or strategy. There is clearly a need for better integration of land-use planning, land-use regulation and mobility planning.

Figure 6.8. Distribution of fatal pedestrian crashes according to road environment (%), 2013



Note: The location of 8% of crashes was unknown in Mexico (police data). Ecuador: 2014 data.

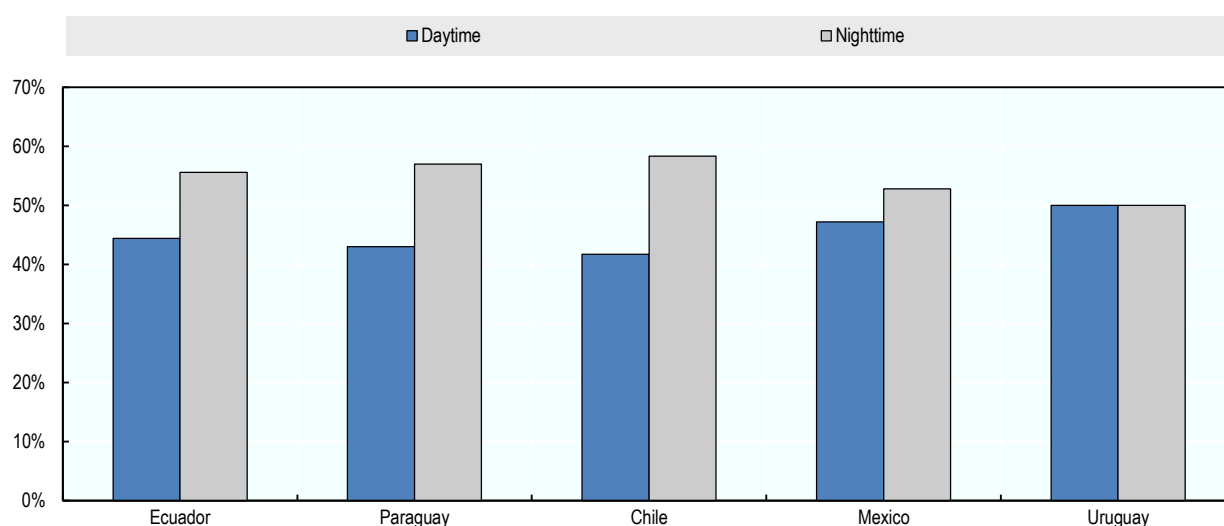
Pedestrian fatalities by time of day

The proportion of pedestrian fatalities by time of day is presented in Figure 6.9, as a means of considering risk associated with lighting conditions. An important share of pedestrian fatal crashes

occurs during night-time. As seen in Figures 6.10 and 6.11, many crashes occur between 18:00 and 22:00.

In several of the countries, walking is often the only option for people travelling to and from work, and they may be particularly vulnerable at night where there is a lack of lighting and more motorised traffic coinciding with work-home journeys. It is also likely that driving speeds are higher at night, thus increasing crash risk. More deliberate action is required to develop well-lit networks of pedestrian paths and crossing points, based on a risk based assessment of travel patterns and needs of the local population.

Figure 6.9. **Proportion of pedestrian fatalities by time of day, 2013**



Note: For Mexico, deaths on the scene of the crash only in urban areas. Ecuador: 2014 data.

Figure 6.10. **Proportion of pedestrian fatalities by hour of day for Group 1 countries**

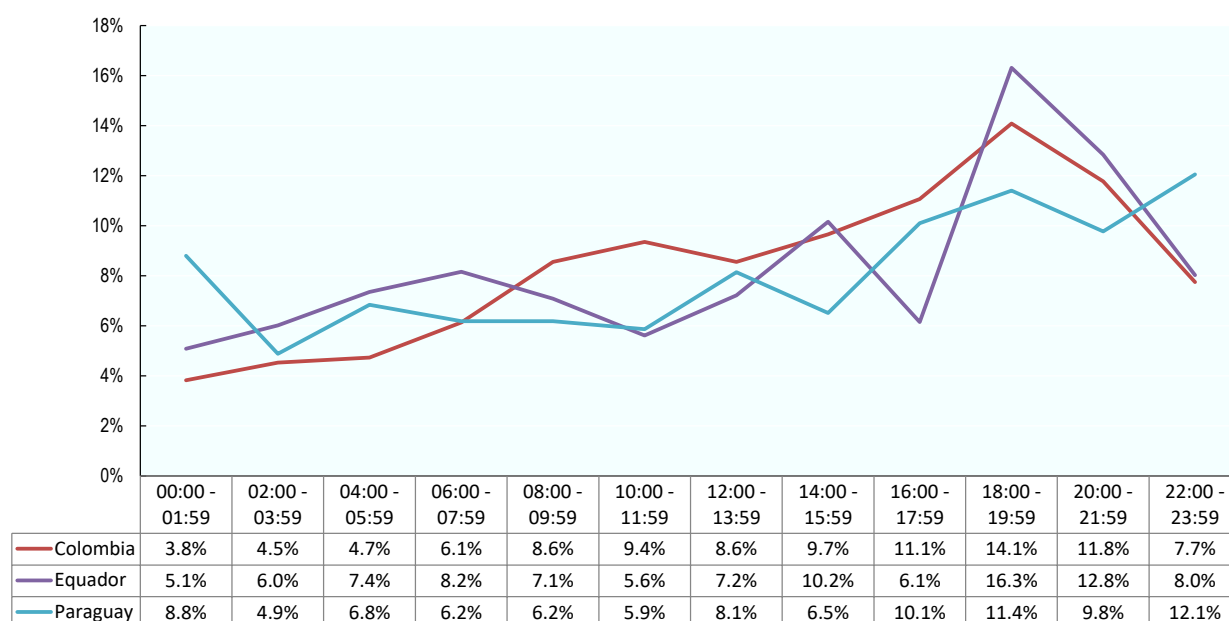
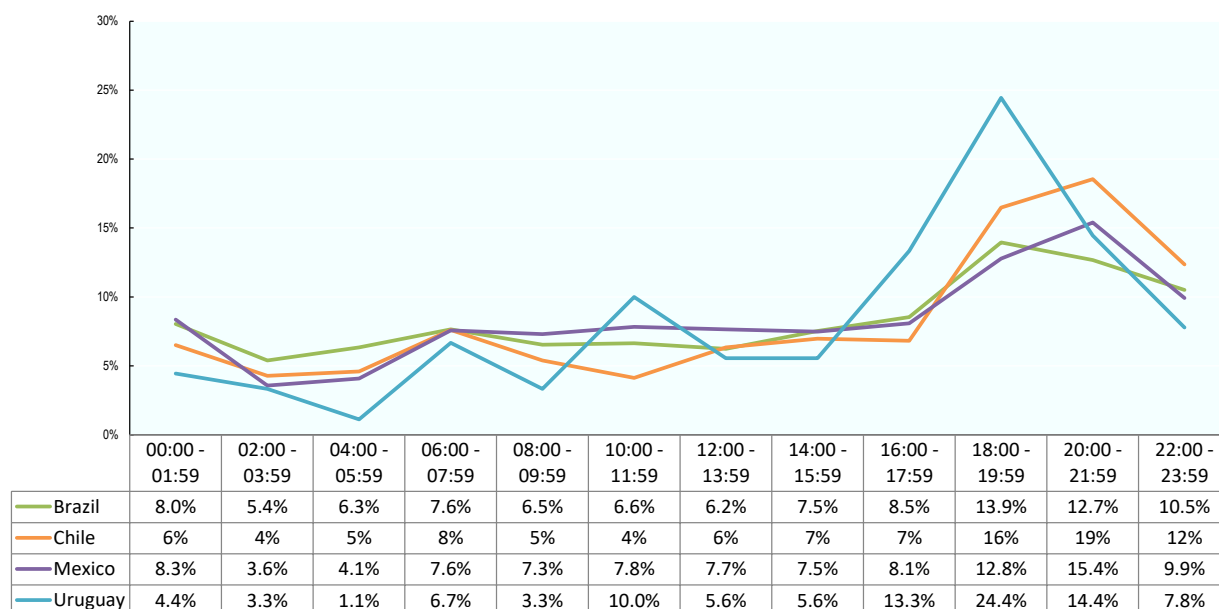


Figure 6.11. Proportion of pedestrian fatalities by hour of day for Group 2 countries



Pedestrian safety interventions

The above sections clearly show that improving walking conditions of pedestrians is a priority in most countries. In 2013, PAHO/WHO urged all countries in Latin America to make roads safer for pedestrians through actions ranging from better enforcement of speed limits and drink-driving laws to the creation of pedestrian-friendly infrastructure such as speed bumps, refuge islands or raised crosswalks.

An ITF (2012) report on pedestrian safety called for a clear vision, improved and more comprehensive knowledge about walking, and a systematic approach to understanding and defining infrastructure quality for pedestrians. Good practice transport policies promote walking and cycling within a wider health and sustainability agenda, and the safety of pedestrians is a critical contributor to this.

The EU-funded project SUPREME focused on the best practices in road safety in the Member States of the European Union as well as in Switzerland and Norway, and this references pedestrian safety interventions (Winkelbauer, 2010). WHO has also published a manual for decision makers and practitioners on how to improve pedestrian safety, which is highly relevant to the ten countries (WHO, 2013). The manual provides practical guidance on assessing and prioritising pedestrian safety issues and suggests focusing interventions on:

- reducing pedestrian exposure to vehicular traffic
- reducing vehicle speeds
- improving the visibility of pedestrians
- improving pedestrian and motorist safety awareness and behaviour
- improving vehicle design for pedestrian protection
- providing care for injured pedestrians.

Road marking and signage should also be upgraded to facilitate safe crossing by pedestrians.

Conclusions and recommendations

Walking is the main transport mode for many citizens, and pedestrian safety needs to be given high priority in all countries under analysis. There has been a gradual decline over time in the proportion of pedestrian fatalities in Chile, Colombia, Costa Rica, Mexico and Paraguay (and further analysis is required to understand whether this is related to a reduced exposure of pedestrians, i.e. less walking, or to a reduced risk for pedestrians), but little recent progress is observed in reducing the annual number of pedestrian fatalities. For most countries pedestrians represent more than a quarter of the registered road fatalities and up to 39% in Chile and probably than 50% in Mexico based on estimation by the Ministry of Health.

Securing safer access to and around public transport stations/stops should be a priority. In nearly all countries, older pedestrians aged 65 years and above have a substantially higher mortality rate, explained by their higher exposure and frailty. As can be expected, most pedestrian fatalities occur in urban areas, but not in Chile and Ecuador, where pedestrians are also extremely vulnerable when walking along rural roads.

Land-use planning is very important for pedestrian safety. New pedestrian focussed safety interventions are needed to support safe movements across and along major roads through cities, villages, and in high pedestrian areas around shops, schools, churches etc. This includes increasing priority and space for pedestrians by ensuring, for example, that encroachment by shops or other commercial activity do not force pedestrians into motorised traffic. All countries could consider applying, on a massive scale, effective interventions to reduce pedestrian risks. Knowledge on how to address this (sidewalks, safe crossings) is available.

It is recommended that all countries give significant priority to pedestrian safety needs, using recommended interventions (particularly pedestrian facilities and speed management) as part of supporting programmes of road network developments, public transport services and access, and urban planning improvements. Consideration should also be given to the development of specific pedestrian safety action plans, and performance indicators to monitor progress in addressing pedestrian safety.

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Chapter 7. Motorcyclist safety

Motorcyclist safety: A priority issue

Motorcycle safety is a growing and critical issue in Latin America. The number of motorcycles is exploding in nearly all countries and represents more than 50% of the motor vehicle fleet in several of them. Motorcycles are gaining in popularity because of their relative low operating cost, the growing congestion in many cities and the lack of efficient public transport. This has a serious impact on the level of road safety. As seen in Chapter 5, the number of motorcyclists killed is increasing everywhere, and in several countries these users represent the largest share of traffic casualties.

Reducing the number of road deaths will only be possible through stringent actions to make motorcycle use safer, as well as developing an integrated urban transport plan.

This chapter reviews the current trends in the evolution of the motorcycle fleet, its use and the number of fatalities among motorcyclists. While, because of data availability, this chapter is based on fatality data, it should be highlighted that due to their vulnerability, motorcyclist are also those who suffer the most from serious non-fatal traffic injuries, entailing lifelong disabilities and huge costs for society.

Vehicle classification and registration

There are two main types of powered two-wheelers, classified by the UNECE in its 1958 Agreement (UNECE, 1958), and by the United Nations in the 1968 Vienna Convention (United Nations, 1968):

- Mopeds: usually with an engine less or equal to 50 cm³ (L1 category)
- Motorcycles, with an engine above 50 cm³ (L3 category).

Scooters can belong to either of these categories, depending on their displacement.

Mopeds and motorcycles may have very different crash characteristics (ITF, 2015) and it may be useful to analyse them separately. However this requires a clear distinction in the classification and registration. Mopeds are registered as motor vehicles in Argentina, Brazil, Cuba, Ecuador, Paraguay and Uruguay; and mopeds must have a registration plate, except in Cuba. In Chile, Colombia, Costa Rica and Mexico, mopeds are not registered as motor vehicles. A new resolution in Colombia adopted in 2017 will impose that new mopeds be registered. In the crash data analysis of this chapter, there is no distinction made, and both types are analysed in an aggregated way.

The powered two-wheeler fleet

In many Latin American countries, the sale and use of powered two-wheelers has increased considerably over the past 10 years, with the motorcycle fleet growing every year by about 10%. Table 7.1 illustrates the evolution in the number of powered two-wheelers since 1990. The motorcycle fleet:

- doubled in Argentina between 2009 and 2014
- tripled in Uruguay between 2000 and 2013
- quadrupled in Colombia and Costa Rica between 2001 and 2013
- increased by five times in Brazil and Chile between 2000 and 2013
- increased by six times in Mexico between 2000 and 2013.

It was not possible to differentiate fleet statistics for mopeds and motorcycles. In countries with a distinct registration system, mopeds represent a very low share of the fleet of the powered-two wheelers (for example less than 1% in Brazil and Costa Rica).

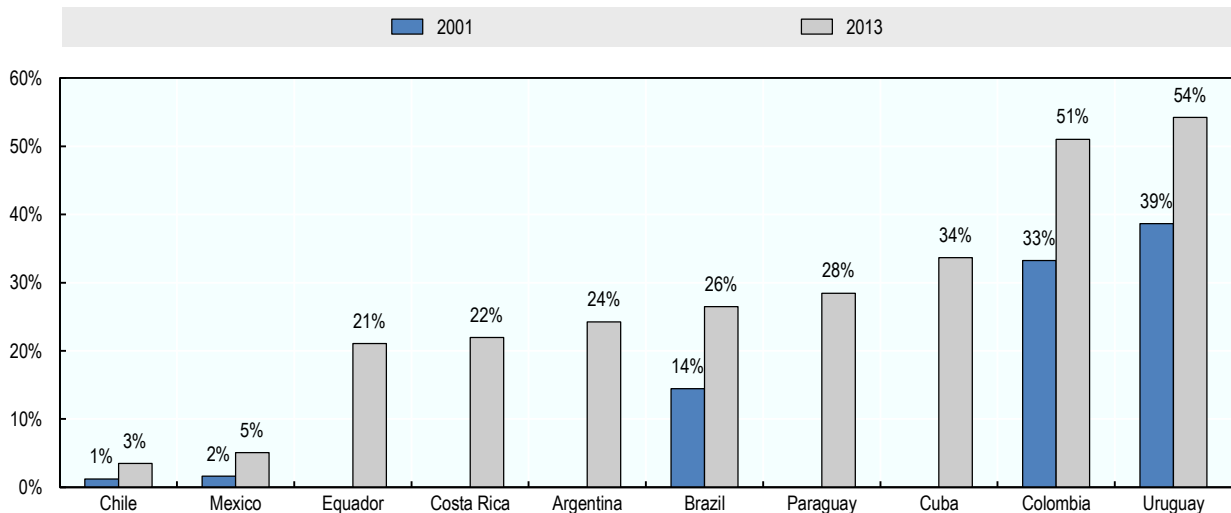
Table 7.1. Evolution in the number of powered two-wheelers

Year	Argentina	Brazil	Chile	Colombia	Costa Rica	Cuba	Ecuador*	Mexico	Paraguay	Uruguay
2000		4 033 994	27 284		92 964			293 924		348 641
2001		4 611 164	26 318	1 267 906	101 095			280 806		364 066
2002		5 806 767	24 761	1 323 066	107 731			369 522		372 476
2003		6 221 435	24 315	1 402 983	114 193			439 517		378 707
2004		7 123 330	22 870	1 506 233	119 617			518 307		399 454
2005		8 155 017	27 741	1 684 862	125 921			588 543		443 092
2006		9 446 372	40 689	2 045 271	137 401			722 309		518 345
2007		11 157 866	63 257	2 462 841	162 087			879 005		614 928
2008		13 083 947	87 545	2 966 309	200 453			1 080 073		703 962
2009	3 002 423	14 695 095	96 213	3 332 629	246 773			1 198 253		770 981
2010	3 550 622	16 500 436	102 314	3 661 544	273 612			1 154 145		879 075
2011	4 091 369	15 705 395	112 806	4 107 866	295 065		301 349	1 313 122	275 076	972 004
2012	4 774 109	20 080 708	133 640	4 640 482	319 156		296 086	1 581 725	342 779	1 041 471
2013	5 499 148	21 597 261	148 455	5 188 933	384 018	211 395	362 357	1 873 093	387 707	1 080 017
2014	6 250 913	23 027 720			405 173					
% of ptw in the motor vehicle fleet in 2013	24%	26%	3%	51%	22%	34%	23%	5%	28%	54%

Note: For Argentina and Ecuador, this corresponds to the number of *registered* motorcycles. The real number of motorcycles in the fleet is probably much higher.

Figure 7.1 presents the share of motorcycles in the vehicle fleet in 2001 and 2013. In 2013, motorcycles made up between 3% (Chile) and 54% (Uruguay) of the motorised vehicle fleet. For all countries for which available data, the share of motorcycles in the vehicle fleet has considerably increased in the past decade, and it is expected that in all countries the motorcycle fleet will continue to grow in the coming years.

Figure 7.1. Share of motorcycle in the vehicle fleet in 2001 and 2013



The use of motorcycles

Motorcycles are becoming more and more popular in many Latin American countries. With congestion becoming a major issue in large cities, motorcycles are considered as an efficient means of transport and also to be cheaper than public transport. According to a recent study by CAF (Rodriguez et al., 2015) covering 50 cities, the main factors explaining the increasing use of motorcycles include:

- higher revenues by capita
- low cost of purchasing a motorcycle
- facility to get loans from motorcycle retailers
- bad quality of public transport
- the reliability of this transport mode in congested cities
- a way of acquiring a social status.

The CAF study compared the costs of traveling by car, public transport and motorcycle (Rodriguez et al., 2015). In all cities but one, motorcycle is the cheapest way of traveling, thus partly explaining the increasing popularity of motorcycles. Several cities report a marked transfer from public transport to motorcycle and this has important consequences for road safety.

Improving the safety of motorcyclists will not only come from measures targeting riders, but also from measures aiming to provide accessible and affordable public transport options, in order to reduce reliance on motorcycling which is the least safe transport mode.

In some countries, motorcycles are commonly used as a taxi (see Table 7.2). According to the CAF study (Rodriguez et al., 2015), the phenomenon of “moto taxis” is exploding in many cities in Latin America although this practice is not legal everywhere. In Mexico, 2.6% of the motorcycle fleet are moto taxis, and passengers are not obliged to wear a helmet.

In many countries, it is common to carry three or more people on a motorcycle (in Mexico, there are three or more people on around 3% of motorcycles). In most cases, it is not legal, but the motorcycle is often the only affordable, individual, motorised transport for many families. This raises, however, safety concerns: from a design and engineering point of view, motorcycles are not designed to carry more than two people. Several countries reported that the third or fourth passengers rarely wear a helmet, therefore further increasing their risk of injury. Table 7.2 summarises the situation regarding the use of moto taxis and the transport of three passengers or more.

Table 7.2. Use of motorcycles as moto taxi and for transporting three or more passengers

Country	Legality of moto taxis and helmet wearing by moto taxi passengers	Regular carriage of three or more passengers
Argentina	No, moto taxis are illegal	Yes
Brazil	Yes, moto taxis are legal Helmet is compulsory for passengers	Yes, in some parts of the countries, although it is illegal
Chile	No, moto taxis are illegal	No
Colombia	Yes, moto taxis are legal in some areas Helmet is compulsory for passengers	Yes
Costa Rica	No, moto taxis are illegal	Yes
Cuba	Yes, moto taxis are legal Helmet is compulsory for passengers.	No
Ecuador	Yes, tricycles used as moto taxis are legal Helmet is compulsory for passengers.	On tricycles, but not on motorcycles
Mexico	Yes, moto taxis are legal Helmet is not compulsory for passengers	Yes
Paraguay	Yes, moto taxis are legal Helmet is compulsory for passengers.	Yes
Uruguay	No, moto taxis are illegal.	Yes

Box 7.1. Use of motorcycles in selected countries

In **Argentina**, motorcycles are the second-most used vehicle and many are unregistered. The reasons for the increasing use of motorcycles are the socio-economic changes that took place during the last years, public transport's structural problems in some cities and accessible loans offered by retailers. The number of motorcyclist fatalities increased by 68% between 2009 and 2014). Motorcycles are mainly used in cities.

In **Brazil**, motorcycles are considered a cheap transport mode and are used in urban and rural areas alike. A federal tax policy encourages favourable financing conditions, and the purchase and use of motorcycles by lower income families is an alternative to public transport, which is considered to be costly and inefficient. The government has introduced a law to authorise and regulate taxi and courier by motorcycles.

In **Colombia**, there has been a significant modal shift from public transport to motorcycles. Motorcycle ownership is increasing fast, with the National Administrative Department of Statistics Quality of Life Survey showing an increase in the proportion of Colombian households owning a motorcycle increasing from 18% in 2011 to 23% in 2013. More than half of all motorcyclists ride for between five and 10 hours a day, and started riding a motorcycle when they were between 15 and 20 years of age (16% started when they were younger than 14).

In **Costa Rica**, the use of motorcycles has increased since 2006, for commuting, recreation purposes and as a family vehicle in some remote areas. Frequently, more than two people are carried. There is still no dedicated motorcycle licensing system or compulsory use of headlamps on motorcycles. However, an improvement has been reported since 2015, with the adoption of the National Motorcycle Safety Plan.

In **Ecuador**, motorcycles are used for many purposes. It is used as a private mode of transport and often constitutes the main family vehicle. Three-wheel motorcycles (with a roof and complying with specific standards and regulations) are used as moto taxis. They are also frequently used for deliveries.

In **Uruguay**, the motorcycle fleet has grown very fast to comprise more than 50% of the motor vehicle fleet in 2013. Registered motorcycles have outnumbered passenger cars since 2007. This is explained by the increase in the purchasing power of the population in the last decade (especially for the lower-middle class), the credit facilities offered by motorcycle dealers, and the relative low operational costs of motorcycles. In addition, the low quality and excessive cost of public transport services encouraged a modal shift to private transport modes, like motorcycles.

Analysis of road safety data

This section analyses fatality data regarding powered two-wheeler users. Because only a few countries have comprehensive historical data, it is difficult to compare countries over the same time period.

Trends in motorcycle fatalities

Table 7.3 presents the evolution in the number of motorcyclists killed. In all countries the number of motorcyclists killed increased significantly (with Argentina's increase also explained by improved reporting):

- Argentina: +319% between 2005 and 2014 (average annual increase of 17%)
- Brazil: +304% between 2001 and 2014 (average annual increase of 11%)
- Chile: +147% between 2002 and 2013 (average annual increase of 9%)

- Colombia: +96% between 2001 and 2013 (average annual increase of 6%)
- Costa Rica: +55% between 2001 and 2013 (average annual increase of 4%)
- Mexico: +484% between 2001 and 2013 (average annual increase of 16%)
- Paraguay: +19% between 2009 and 2014 (average annual increase of 4%)
- Uruguay: +10% between 2010 and 2014 (average annual increase of 3%).

Table 7.3. Evolution in the number of motorcyclists killed, 2001-13

Year	Argentina	Brazil	Chile	Colombia	Costa Rica	Cuba	Ecuador	Mexico	Paraguay	Uruguay
2001	n.a.	3 130	n.a.	1 359	112	n.a.	n.a.	198	n.a.	n.a.
2002	n.a.	3 773	59	1 140	112	n.a.	n.a.	203	n.a.	n.a.
2003	n.a.	4 292	81	1 202	99	n.a.	n.a.	260	n.a.	n.a.
2004	n.a.	5 067	59	1 334	107	n.a.	n.a.	288	n.a.	n.a.
2005	293	5 995	72	1 296	113	n.a.	n.a.	356	n.a.	n.a.
2006	418	7 198	75	1 624	102	n.a.	n.a.	473	n.a.	n.a.
2007	541	8 118	91	1 782	140	n.a.	n.a.	588	n.a.	n.a.
2008	656	8 939	112	2 038	195	n.a.	n.a.	616	n.a.	n.a.
2009	691	9 306	95	2 275	195	n.a.	n.a.	709	481	n.a.
2010	733	10 894	111	2 092	170	n.a.	n.a.	704	486	n.a.
2011	882	11 485	98	2 316	150	n.a.	n.a.	841	582	249
2012	1 130	12 544	146	2 515	209	n.a.	n.a.	1 037	598	250
2013	1 254	12 040	146	2 665	174	59	n.a.	1 156	613	299
2014	1 228	12 652					928		574	275

Notes: n.a. - no data available.

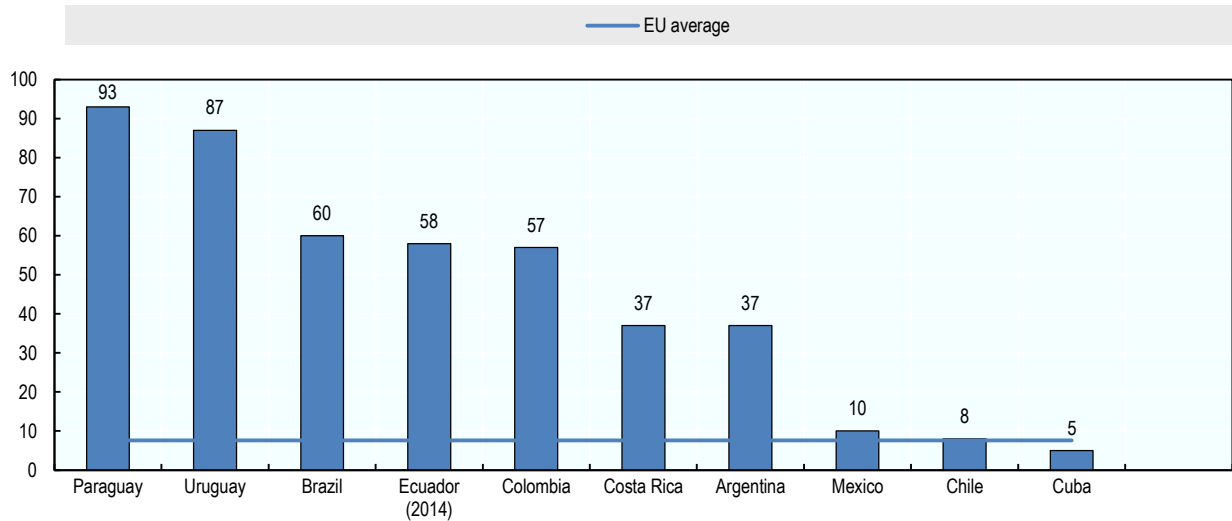
Ecuador: a new data system was implemented in 2014. There are data for the previous years but they are not comparable.

Mexico: police reported data. Estimation from the health ministry gives a much higher figure for the number of motorcyclists killed.

Rate per population and vehicles

Figure 7.2 illustrates the number of motorcyclists killed per million inhabitants in 2013. There are huge variations with rates ranging from five to 93 deaths per million inhabitants.

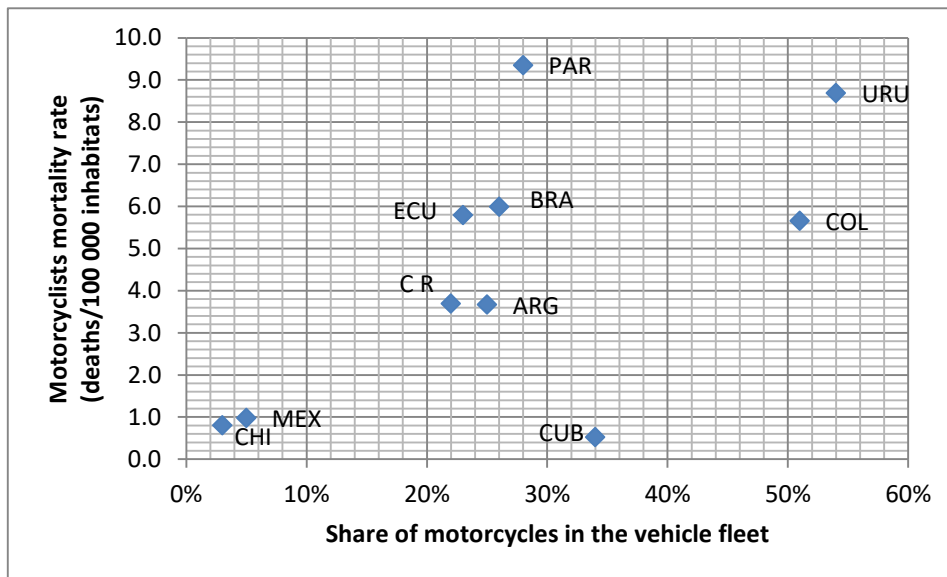
Figure 7.2. Number of motorcyclists killed per million inhabitants and comparison with EU average, 2013



Note: Mexico’s rate is based on police reported data. The actual rate is likely to be much higher.

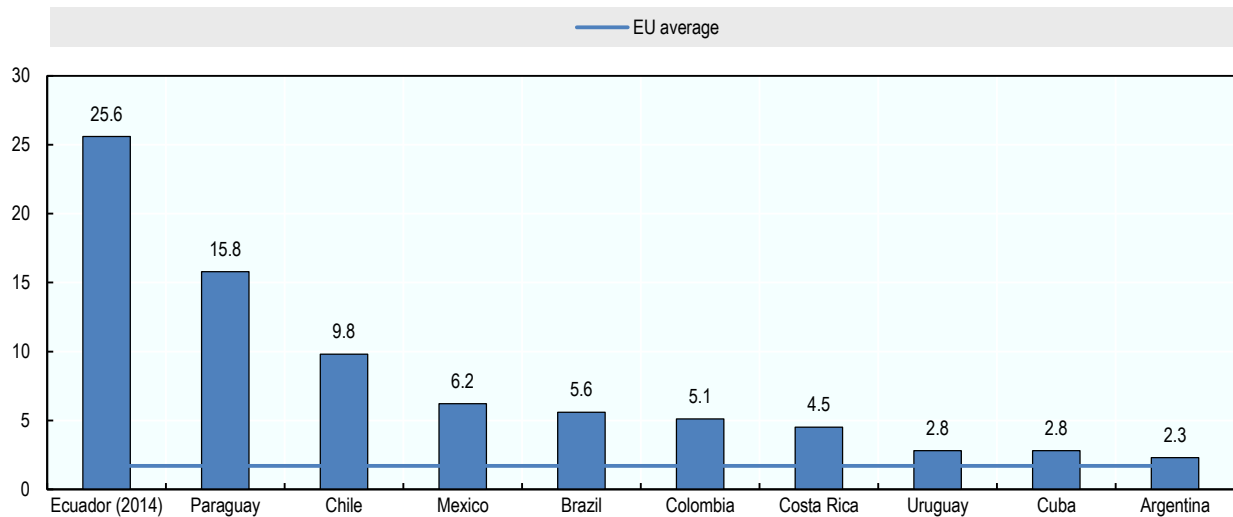
Figure 7.3 relates the share of motorcycles in the fleet with the mortality rate of motorcyclists. It suggests that when the share of motorcycles is bigger, the mortality rate increases. This graph nevertheless identifies countries with “higher than expected” risk, such as Paraguay, and countries with lower than expected risk, such as Cuba. Further research is needed to understand these differences.

Figure 7.3. Share of motorcycles and motorcyclists mortality rate



To assess the risk of motorcycling, it is useful to calculate the fatality rate per distance travelled by motorcycle, but there is no information available in the countries under review. An alternative is to calculate the rate by the number of motorcycles (bearing in mind that this indicator presents some bias as it is dependent on the accuracy on the vehicle fleet data and supposes a similar level of driving). This is illustrated in Figure 7.4.

Figure 7.4. Number of motorcyclist fatalities/10 000 registered motorcycles, 2013



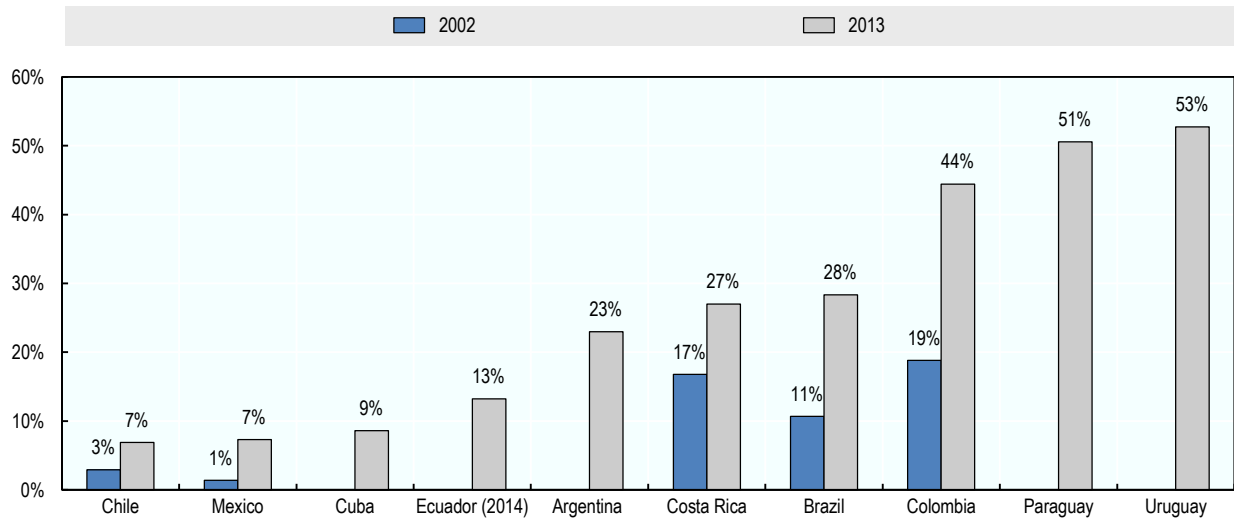
Note: The rates for Ecuador and Argentina are calculated based on the number of registered vehicles. The real number of motorcycles is probably much higher. In Argentina, fatality data are probably underreported, but constitutes the best estimate.

Argentina, Cuba and Uruguay have a much lower risk per registered vehicle. Costa Rica, Colombia, Brazil, Mexico and Chile have a risk between 4.5 and 9.8 deaths per 10 000 registered motorcycles; Paraguay and Ecuador have the highest risk (even in Ecuador, when adjusted with estimation on the *real* number of motorcycles). In these countries, the high mortality rate of motorcycles is in line with the mortality rate in general. In Chile and Mexico, where there is today a low share of motorcycles, the risk is relatively high.

Share of motorcyclists killed

In 2013, the share of motorcyclists killed compared to total road deaths ranged from 7 to 53%. Figure 7.5 shows that the share of motorcyclists killed increased significantly between 2002 and 2013 in countries for which data are available, suggesting that safety has deteriorated for these road users. In Mexico, the share of motorcyclists killed was of 1% in 2002 and 7% in 2013 (representing a 425% increase). The share of motorcyclists killed increased by 148% in Brazil, by 135% in Chile and Colombia and by 61% in Costa Rica.

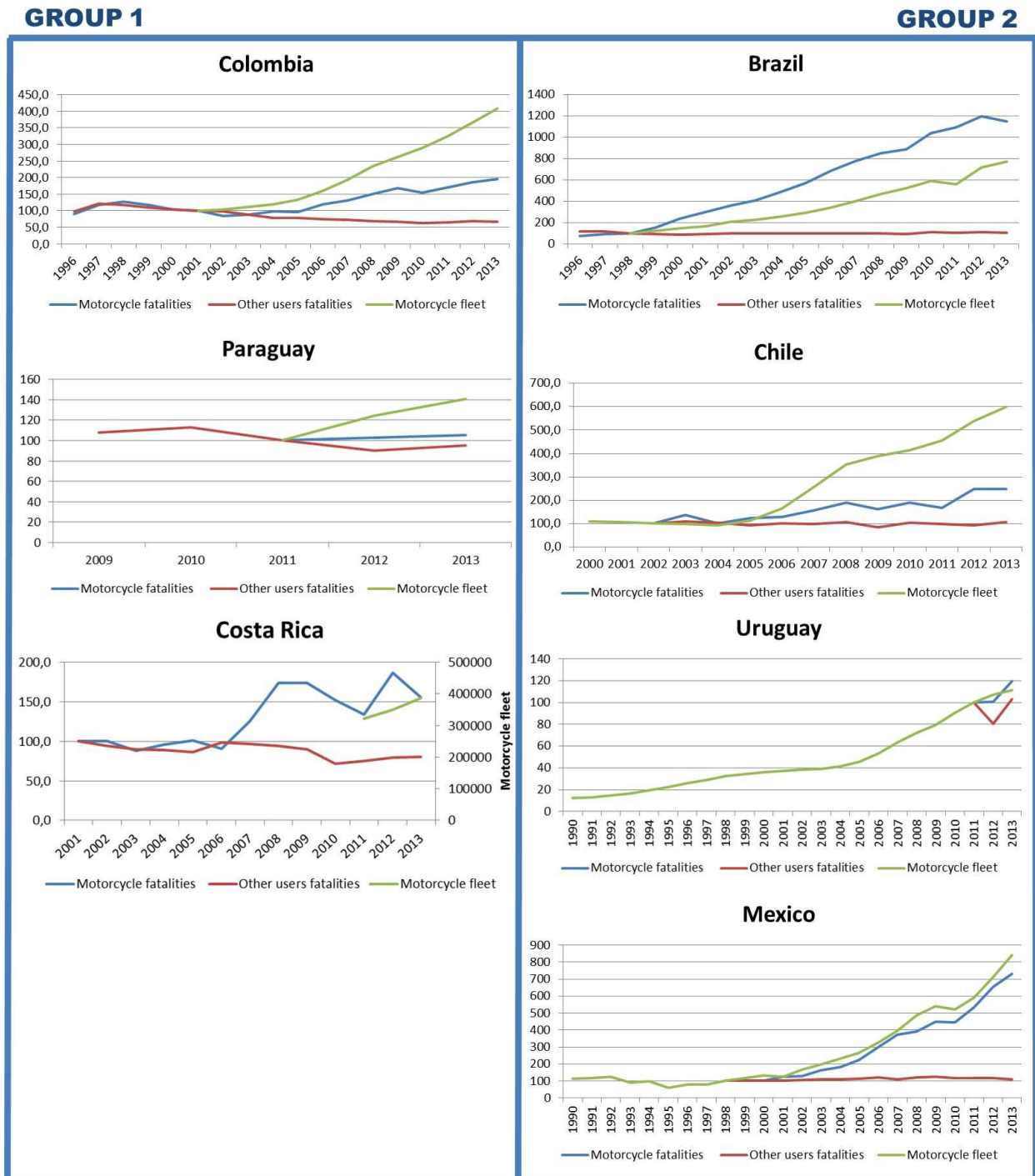
Figure 7.5. Share of motorcyclists fatalities compared to total fatalities, 2002 and 2013



Note: For Mexico, data are based on police reports in which around 40% of fatalities cannot be attributed to a road user category. The actual share of motorcyclists killed is likely to be higher.

Figure 7.6 compares the trend in motorcycle fatalities with the trend in other road user fatalities and the trend in motorcycle fleet, and shows that the number of motorcyclists killed increased much more rapidly than other road users.

Figure 7.6. Trend of motorcycle fatalities, other road users fatalities and motorcycle fleet



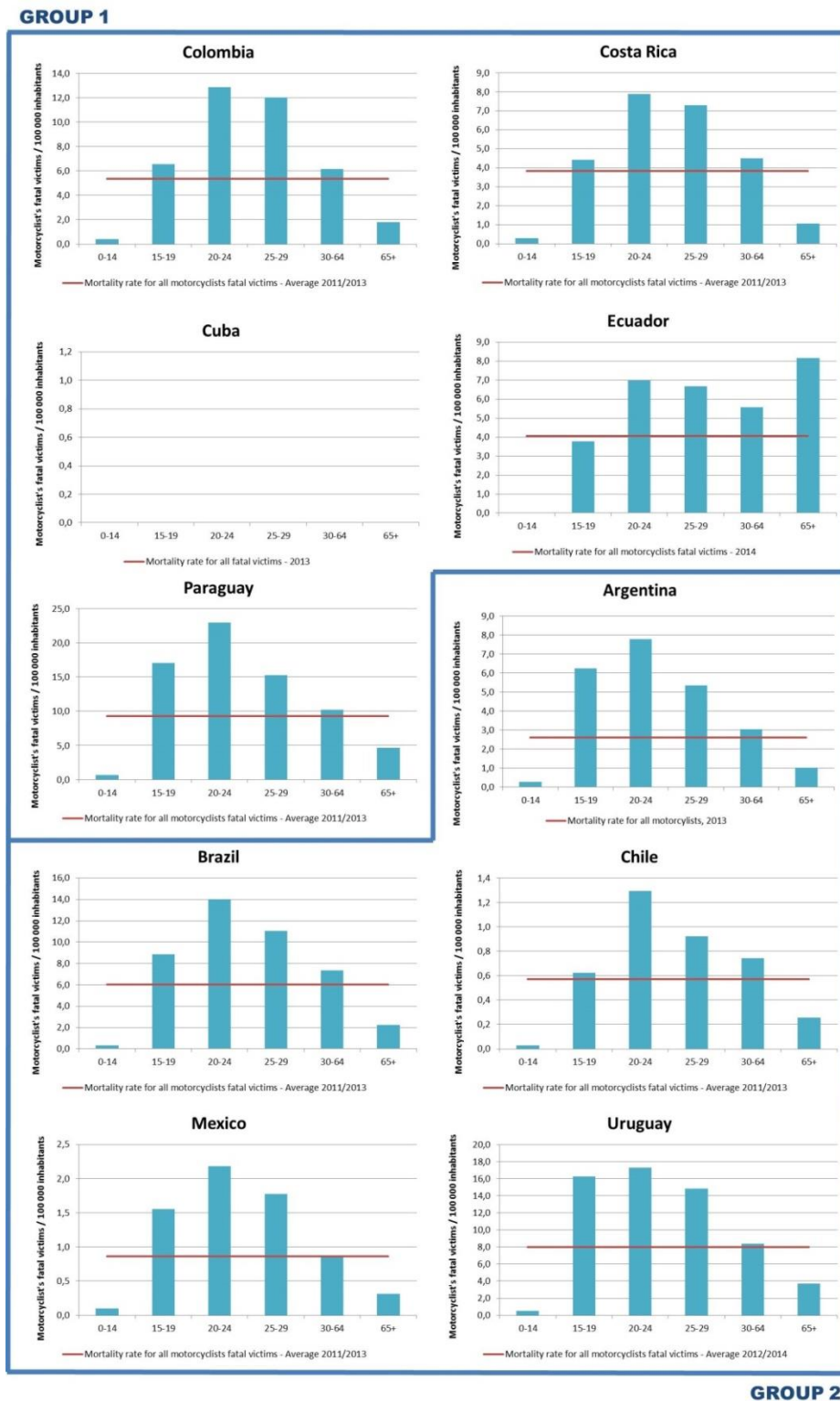
Note: Indexed for different years according to country. No consistent data over time for Argentina, Cuba and Ecuador.

Distribution by age group

Figure 7.7 illustrates the mortality of motorcyclists by age group. In most countries the 20-24 age group is the most at risk among motorcyclists, followed by the 25-29 age group. Ecuador presents a markedly different pattern, as the most at-risk group is the above 65 age group – some investigation of this is warranted.

According to a CAF survey among 50 cities (Rodriguez et al., 2015), 35% of motorcycle drivers have less than two years' experience. Data from Bogota (Colombia) indicate that 50% of injured motorcyclists have been licensed for less than two years and 25% for less than ten months. Maturity and experience of riders is likely to be a key issue in Bogota, and most Latin American cities, which should be addressed through graduated licensing systems.

Figure 7.7. Mortality of motorcyclists by age group, average 2011/2013
Deaths per 100 000 population of the same age group



Note: Argentina: data for 2013; data is not available for Cuba.

Distribution by road type

Table 7.4 presents the proportion of motorcyclist fatalities and other road user fatalities between urban and rural roads. For all countries around two-thirds of motorcycle fatalities occur on urban roads. For Colombia, Ecuador and Mexico, this is the same proportion as for other road users, indicating that safety issues in general are concentrated in urban areas. There is a different pattern in Chile and Uruguay, where the majority of fatalities of “other road users” occur on rural roads, while the majority of motorcycle fatalities occur on urban roads. Measures to improve the safety of motorcyclists’ safety should therefore be a priority on measures in urban areas.

Table 7.4. **Distribution of motorcyclists and other fatalities, 2013**

	Urban roads		Rural roads	
	Motorcyclists	Other road users	Motorcyclists	Other road users
Chile	66%	37%	34%	63%
Colombia	63%	67%	37%	33%
Ecuador (2014)	78%	73%	22%	27%
Mexico	67%	75%	30%	25%
Uruguay	68%	43%	32%	57%

Licensing and training

Licensing, training and education are essential tools for improving the safety of motorcyclists. Table 7.5 summarises the conditions to get a motorcycle (or moped) driving license regarding the minimum age, compulsory training, and theoretical and practical tests.

Table 7.5. Requirements to get a moped or motorcycle driving licence

Country	Minimum age	Compulsory pre-licensing training	Theoretical test	Practical test	Medical exam	Comments
Argentina	Moped: 16 - with parent consent Motorcycle up to 150 cc: 18 Motorcycle 150-300 cc: 20 and licence for the below category for at least 2 years. Motorcycle: +300 cc: 22 and licence for the below category for at least 2 years.	For mopeds: 5 hours (mix of theory and practice)	Yes	Yes	Yes	For moped licence: Young people below 18 need consent from an adult who is responsible for any damage caused by the young drivers.
Brazil	Moped: 18 Motorcycle: 18	Mopeds: Theory: 20 h; Practice: 10 h Motorcycles Theory: 45 h; Practice: 10h	Yes	Yes	Yes	
Chile	Moped: 18 Motorcycle: 18	No No	Yes	Yes	Yes	
Colombia	Moped: no licence, no minimum age. As of 2017, license for new mopeds will be required. ¹ Motorcycle: 16	Motorcycles up to 125 cc: Theory: 25 h; Practice: 11 h Above 125 cc: Theory: 25 h.; Practice: 18h	Yes To be implemented	No	Yes	
Costa Rica	Moped: no licence, no minimum age Motorcycle up to 125 cc: 16 Motorcycle above 125 cc: 18	No No	Yes	Yes	Yes	The license is not specific to mopeds. It is the same as for driving a car.
Cuba	Moped: 16 Motorcycle: 16	Theory: 30 hours.	Yes	Yes	Yes	Practical training is not compulsory.
Ecuador	Moped: 17 Motorcycle: 17	For mopeds and motorcycles: Theory: 10 h; Practice: 10 h; Mechanics: 1 h; First aid: 1 h; Driving psychology: 2h	Yes	Yes	Yes	
Mexico	Moped: no licence, no minimum age Motorcycle: 18	No No	No	No	Yes	
Paraguay	Moped: 18 Motorcycle: 18	No No	Yes	Yes	Yes	
Uruguay	Moped: 16 Motorcycle up to 200 cc: 18 Motorcycle above 200 cc: 21	No No	Yes	Yes	Yes	

Note: 1.Colombia: The Ministry of Transport of Colombia, through resolution 160 of 2017, established that new mopeds must have the National Automotive Registry of the National Registry of Transit (RUNT), have a driving license and carry a mandatory SOAT insurance and the Certificate of Mechanical Technical Review.

Licence requirements

In countries where mopeds are not registered as motor vehicles (Chile, Colombia, Costa Rica, Mexico), there is no specific requirement or license to drive a moped. Ecuador is the only country with a compulsory training for future moped riders. In the remaining countries, a minimum age requirement is the only condition to ride a moped. In Colombia, following the adoption of resolution 160 in 2017, new mopeds will need to be registered and a driving licence must be required.

Regarding motorcycles, all the ten countries require a license to ride a motorcycle. In all countries, except Mexico and Colombia, the license is issued following a theoretical and practical test. In Colombia, only a theoretical test is required. In Mexico, there are no compulsory theoretical or practical tests. In Costa Rica and in some jurisdictions in Mexico (for example Mexico City), there is not a specific motorcycle license and the car license is sufficient to drive any kind of motorcycle, without any specific training or test.

Further information is needed to go deeper in the analysis of motorcycle safety. In particular it would be useful to collect and analyse the following data:

- proportion of riders licensed
- number of exams taken every year and success rate
- number of (un)licensed riders in traffic
- risk of unlicensed riders.

Age requirements

In countries where mopeds are registered as motor vehicles, the minimum age to drive a moped is 16 in Argentina, Cuba and Uruguay, and 18 in the other countries. In Argentina, consent of a responsible adult is required for young people below 18. The minimum age to drive a motorcycle is 16 in Colombia, Cuba and Costa Rica, 17 in Ecuador, and 18 in the remaining countries.

There is a graduated system in Argentina, Costa Rica and Uruguay which takes into account the power of the motorcycles. In Uruguay, to drive a motorcycle with an engine size above 200 cc, you need to be at least 21 and have a minimum experience of three years on a smaller engine. In Argentina, there are three categories of motorcycles (up to 150 cc; 150-300 cc, and above 300 cc). To drive a motorcycle above 150 cc, you need a minimum experience of two years on the category below.

A graduated licensing system is now the norm in all European Union countries and is recommended in a recent report of the ITF (2015). Member states of the European Union have a harmonised licensing system, which came into force in January 2013. Within this directive, mopeds were included in the licensing system for the first time and a strict graduated approach was mandated for access to heavier motorcycle. Based on experience in other countries, and in Europe in particular, a graduated approach is recommended in all countries.

Pre-licensing training

Riding a motorcycle requires technical skills – more so than for driving a car – and novice riders should be trained. Adequate theoretical and practical training is essential to providing the future rider with the right skills to ride a motorcycle.

Only five countries (Argentina, Brazil, Colombia, Cuba and Ecuador) have a compulsory training system. In the others, it is possible to ride a motorcycle of any engine displacement without training. In Argentina, only five hours of training is required, while in Colombia and Ecuador, a more complete curriculum exists. Implementing a mandatory pre-licensing training programme should be a priority in Chile, Costa Rica, Paraguay, Mexico and Uruguay.

Based on current best practices in Europe and Australia, mandatory pre-licensing training should include both theoretical and practical classes and focus not only on basic manoeuvring skills and mastering traffic situations, but also on addressing attitudes towards safety, with a special emphasis on hazard perception and defensive riding.

Given the high share of motorcyclists, better training and licensing systems should be a priority in most countries. To set up these training programmes, inspiration could come from the European Initial Rider Training programme (see Table 7.6).

Table 7.6. **Structure of the Initial Rider Training Programme (Spanish version)**

Theoretical	Machine Control	Traffic interface
1. Road regulations <ul style="list-style-type: none"> • general rules and regulations • motorway rules and regulations 	1. Machine familiarity <ul style="list-style-type: none"> • automatic controls • manual controls • advanced braking systems 	1. Positioning <ul style="list-style-type: none"> • slower than traffic • at traffic speed
2. Signs and markings <ul style="list-style-type: none"> • general signs and markings • motorway signs and markings 	2. First movements	2. Distance
3. Machine dynamics	3. Gears, brakes and direction <ul style="list-style-type: none"> • automatic gears • manual gears • separate braking systems • advanced braking systems 	3. Curves and bends <ul style="list-style-type: none"> • right hand • left hand
4. Hazard awareness <ul style="list-style-type: none"> • other road users • environment and infrastructure 	4. Steering and counter-steering	4. Anticipation <ul style="list-style-type: none"> • other road users • environment and infrastructure
5. Helmets and appropriate clothing	6. Low speed manoeuvring	5. Junctions
6. Social responsibilities <ul style="list-style-type: none"> • noise • first aid and accidents 	6. Hazard management <ul style="list-style-type: none"> • swerving • emergency braking 	6. Overtaking
7. Impairment		7. Motorways
8. Attitude and behaviour		8. Group riding
		9. Journey planning

Source: European Commission (2011).

Helmet and other protective equipment

Legislation

The helmet is the most important source of protection against injury for both motorcyclists and moped riders. It contributes to a dramatic reduction in the risk of being killed or severely injured. Helmets can prevent damage to the brain, which may result in very severe physical and psychological handicaps. A lot of research has been conducted worldwide on the effectiveness of wearing a helmet for both riders and passengers. The results show slightly different effects, depending on the study type, age,

speed, etc., but they all conclude that helmets reduce the risk of mortality and head injury in motorcycle riders. For example, an international review of 61 studies on the use of a helmet shows that the risk of severe head injury decreases by about 69% when wearing one and the risk of being killed in a motorcycle crash decreases by about 42% (Liu et al., 2007). For the update of the handbook of road safety measures, Høye (2016) found that helmet reduced the risk of death by 25% for riders of light motorcycles and by 64% for riders of heavy motorcycles.

All countries should have and enforce a helmet law that makes wearing a helmet mandatory for all drivers and passengers of mopeds and motorcycles. All countries should have a long-term objective of a 100% wearing rate.

Other protective equipment such as airbag jackets and protective clothing (gloves, jackets and boots) are also very effective in reducing the severity of injury. A recent ITF report recommends promoting the use of this equipment with adequate safety standards (ITF, 2015).

Table 7.7 summarises the current situation regarding the existence of a helmet law, respectively for mopeds and motorcycles and the use of other protective equipment. Regarding moped riders, helmet use is compulsory in all countries except Chile, Colombia and Mexico. However, in Mexico, there is a helmet law for moped riders in 26 out of 32 federative entities as well as on some national roads under federal jurisdiction (but this mainly concerns the state of Jalisco). Wearing a helmet on a motorcycle is compulsory in all countries, for both the rider and the passenger. In Chile the use of gloves and closed shoes is also mandatory. Reflective clothing is required in Costa, Rica, Ecuador and Uruguay.

Table 7.7. **Helmet laws for mopeds and motorcycles**

Country	Helmet law – mopeds (rider and passenger)	Helmet law –motorcycles (rider and passenger)	Other mandatory protective equipment
Argentina	Yes	Yes	Protective glasses for drivers (unless the motorcycle has an appropriate windshield)
Brazil	Yes	Yes	Reflective jacket for the transport of freight or passengers
Chile	No	Yes	Gloves and closed-toe shoes Eye protection (glasses or helmet viewer), on roads with a speed limit > 80 km/h, clothing that covers arms and legs.
Colombia	No	Yes	No
Costa Rica	Yes	Yes	Reflective clothing
Cuba	Yes	Yes	No
Ecuador	Yes	Yes	Reflective clothing
Mexico	Yes in 26 out of the 32 federative entities	Yes	No
Paraguay	Yes	Yes	Reflective jacket
Uruguay	Yes	Yes	Reflective clothing

Helmet standards

A helmet wearing law is a necessity, as is the use of helmets that meet appropriate standards. Table 7.8 presents an overview of the standards in application in the ten countries. In Costa Rica, a standard is being elaborated. In Mexico and Paraguay, standards have been developed and will be implemented

shortly. The other seven countries have either implemented a national standard or adopted an international standard such as the UNECE ECE 22.05 standard.

Helmet quality is a problem encountered in some countries where it is possible to buy sub-standard helmets, which are often cheaper. Relevant authorities should be taking strict action on this.

Table 7.8. **Overview of helmet standards in application**

Country	Application of a helmet standard	Standards
Argentina	Yes	Norma IRAM-AITA 3621 Work is on-going towards the adoption of the UNECE Standard ECE R22
Brazil	Yes	Resolución n° 356, 02 of August 2010 and Resolución 453, DE 26 of September 2013
Chile	Yes	UNECE standard ECE/22.05 US Standard FMVSS 218 Japanese standard JIS T 8133.
Colombia	Yes	National standard NTC4533 The new regulations that will come into effect after 2017 will be based entirely on the United Nations Standard UNECE R22.05, but will also allow the sale of references of helmets that comply with the US standard FMVSS 218
Costa Rica	Under elaboration	Under elaboration
Cuba	Yes	National standard NC 1087: 2015 “Cascos De Protección Para Conductores De Ciclomotores Y Motocicletas” — Clasificación, Requisitos, Métodos De Ensayo Y Marcado.
Ecuador	Yes	National technical standard NTE INEN 2669 - “Cascos de protección para conductores de motocicletas y pasajero”
Mexico	Under finalisation	National Standard NOM-206-SCFI/SSA2-2016 “Cascos de seguridad para la prevención de lesiones en la cabeza de motociclistas – acciones de promoción de la salud – especificaciones de seguridad y métodos de prueba, información comercial y etiquetado”.
Paraguay	Under implementation	Under elaboration by Instituto Nacional de Tecnología y Normalización (INTN)
Uruguay	Yes	National technical standard UNIT 650:2010 (UNIT equivalent to ISO in Uruguay) UNECE R22.05 of the United Nations or US standard FMVSS 218

It is outside the scope of this study to assess the quality of the national standards. Nevertheless, there are several recognised international standards, such as the UNE-CE R22.05 or the US FMVSS 218. It is recommended that countries adopt these standards or develop national standards based on these recognised standards.

The World Health Organization published a manual (available in Spanish and Portuguese) in 2006 which provides practical advice to road safety practitioners on how to achieve a much higher proportion of users of two-wheeled vehicles wearing helmets, including advice on developing a national standard for helmets (WHO, 2006). It is recommended that countries implementing a helmet programme follow the recommendations included in this manual.

Helmet use

Table 7.9 summarises the use of motorcycle helmets in seven countries for which data are available.

Table 7.9. **Helmet use by motorcycle drivers and passengers**

	Drivers	Passengers	Comments
Argentina	68% in 2014 65% in 2016	40% in 2014	
Brazil (2013-14)	83%	80%	Wide variations between regions. From 71% in the North to 94% in Central West. Higher wearing rate in urban areas compared to rural areas (86 % vs. 59%). Higher wearing rate among educated people.
Chile (2013)	99%	99%	
Colombia	91% in 2013 96% in 2016 <i>Based on surveys in urban areas</i>	79% in 2013 80% in 2016	2013: survey of CFPV 2016: OISEVI/WB Survey The helmet is often not adjusted or fastened. Higher use in large cities.
Costa Rica			
Cuba			
Ecuador (2014)			
Mexico	73-82%	41-57%	
Paraguay (2016)	38%	19% (1 st passenger) 5% (2 nd passenger) 0% (3 rd passenger)	Source: OISEVI survey Overall rate (driver + passenger): 15% Among passenger children: 2% Wide disparities between cities: 86% of drivers wear a helmet in the capital city Asunción
Uruguay	2013: 86% 2016: 93%	2013: 74% 2016: 82%	

Source: OISEVI and survey conducted for this study.

There is a wide variation regarding helmet use in ten countries. For drivers, there are good wearing rates, above 90%, in Chile (99%), Colombia (96%) and Uruguay (93%). This is good news especially in Colombia and Uruguay which have the highest share of motorcycles in the fleet. There is a relatively good wearing rate in Mexico (73-82%), an average wearing rate in Argentina (68%) and a very low wearing rate in Paraguay (38%). There are no data for the other countries. And this should be seen as a priority for them to start collecting data on helmet use. In a large number of OECD member countries, helmet wearing rate is close to 99%.

In all countries, except Chile, helmet use is much lower for passengers, who are often children. The rate is relatively good in Uruguay (82%), Colombia (80%) and Brazil (80%). It is low in Argentina (46%) and Mexico (41-57%) and very low in Paraguay (19% for the first passenger).

It should be noted that it is not sufficient to only wear a helmet it is also important that it is properly adjusted and fastened. Colombia reports non fastened or adjusted helmets as a major issue, and this is probably the case in other countries as well.

In countries with an average or low usage of helmet, urgent actions should be taken to increase the use of helmets. This means education through campaigns (television, radio, social media, etc.) backed up by intense enforcement. Enforcement activities should also concern the proper use and fastening of helmets.

Box 7.3. Uruguay's helmet wearing experience

In Uruguay, helmet wearing for motorcyclists has been compulsory since 2007. Since 2013, new motorcycles are necessarily sold with a certified helmet. Helmet wearing is regularly enforced and there are strict sanctions in case of non-wearing of certified helmets.

In 2010 the national technical standard UNIT 650 was updated. Simultaneously, the strict certification processes of these products are maintained, through accredited national testing laboratories. Helmets manufactured outside Uruguay must have a United Nations or FMVSS standard.

There are regular information and awareness campaigns focused on motorcyclists' protective equipment, including helmets and high-visibility clothing. However, there are many injured motorcyclists with certified helmets who were wearing certified helmets but did not correctly fasten them.

Data collected during 2011-16 show that 76.5% of motorcycles (drivers and passengers) wore a properly fastened helmet, although there are regional variations. The proportion of seriously injured and deceased motorcyclists who did not wear a helmet is significantly greater than those who used a helmet. Also, it is interesting to observe the pattern of use according to days of the week and months of the year – helmet use amongst motorcyclists is lower on the weekend than weekdays, and during summer.

The relatively good helmet use results for Uruguay are considered to be due to four key elements: national legal norms, strict enforcement, regular information and awareness campaigns, and the availability of certified helmets.

Vehicle regulation

ITF recommends that motorcycle safety actions in low- and middle-income countries should focus on headlamps and conspicuity (ITF, 2015). Anti-lock braking systems (ABS) should be the next priority, as it has important potential to significantly reduce the number of crashes.

Headlamps-on function

The lack of motorcycle visibility is a major factor in crashes. Driving with headlamps on, including during the daytime, is a proven measure to improve the visibility of motorcyclists and their safety (Wells et al., 2004; Umar et al., 1996; Yuan, 2000; Elvik et Vaa, 2004) and should be mandatory. To support this, most motorcycles are now equipped with an automatic headlamp-on system (AHO). AHO is a switch that ensures the headlight (main or dipped beam, or the daytime running lamp if the vehicle is equipped with such lights) is always on when the engine is running, and should be progressively installed for the motorcycle fleet. All ten countries, except Cuba, mandate the use of headlamp on (see Table 7.10).

Table 7.10. **Mandatory headlamp-on and automatic headlamp-on**

Country	Mandatory headlamp-on (including during daytime)	Mandatory automatic headlamp-on
Argentina	Yes, only on national roads	Yes, for all models sold after 2012
Brazil	Yes	Yes
Chile	Yes	Yes, for motorcycles registered after 2001
Colombia	Yes	No
Costa Rica	Yes	No
Cuba	No	No
Ecuador	No	No
Mexico	Yes, only on Federal roads	No
Paraguay	Yes	No
Uruguay	Yes	Under consideration. Could be introduced in 2018

Advanced braking systems for motorcycles

Advanced braking systems, which include anti-lock braking systems (ABS) and combined braking systems (CBS), are also proven to reduce crash risk in certain situations when other, basic, road safety policies are in place. ABS is progressively becoming compulsory on all motorcycles in OECD member countries, and all countries should consider the mandatory installation of ABS on new motorcycles sold (ITF, 2015). It is under consideration in Chile and Uruguay. The only regulation to date is in Brazil, where all new motorcycles sold in 2019 (imported or domestically manufactured) must be equipped with ABS or CBS.

National motorcycle safety strategies and plans

To respond to the growing concerns regarding motorcyclists' safety, a national safety strategy for motorcyclists, supported by the responsible Minister, is a useful tool to engage all stakeholders in a co-ordinated way. The national motorcycle strategy should be backed up by a periodic motorcycle safety plan. Typically a motorcycle plan involves the following steps:

- collection of data required to understand the country's specific motorcycle safety issues
- analysis of the data
- selection and prioritisation of interventions, and assessment of their expected effects
- implementation of the measures
- monitoring the effects.

Targets should be set for death and serious injury reduction and selected performance indicators such as helmet use, and these should be closely monitored. Table 7.11 lists the existing motorcycle safety plans or strategies. Only five countries have such a plan in place, but a national safety strategy or plan for motorcyclists is recommended for all countries.

Table 7.11. **Motorcycle safety plans**

Argentina	Plan estratégico de seguridad vial para motovehículos (2012-17) http://observatoriovial.seguridadvial.gov.ar/documentos/plan-motos-2012_.pdf A new motorcycle national safety plan is being prepared.
Chile	Plan de seguridad vial de motocicletas (2015-20) http://www.oisevi.org/a/archivos/documentos/Plan-Nacional-de-Seguridad-Vial-para-Motocicletas-2015-CONASET-Chile.pdf
Colombia	Motorcycle Safety Plan 2015-16 Programa Integral de Estándares de Servicio y Seguridad para el Tránsito de Motocicletas (2015-216)
Costa Rica	Motorcycle National Road Safety Plan
Mexico	Plan for the prevention of motorcyclist injuries, Ministry of Health/Technical Secretariat of the National Council for the Prevention of Accidents, 2012
Uruguay	Plan Motociclistas Más Seguros 2013-15 http://unasev.gub.uy/inicio/campanas/unasev/plan_motociclistas_mas_seguros

Conclusions and recommendations

Powered two-wheelers, which include motorcycles and mopeds, are rapidly increasing in number, and playing a growing role in mobility, particularly in large cities. In Colombia and Uruguay, motorcycles represent more than half of the motorised vehicles. In Chile and Mexico, the fleet is still modest (respectively 3% and 5% of the motor vehicle fleet) but is rapidly increasing and expected to play a bigger role in the years to come. Given the inherent higher risk of motorcyclists compared to other road users, improving the safety of motorcyclists should be seen as an urgent priority in all countries.

The level of motorcyclist safety is deteriorating in all countries, due largely to the explosion in the fleet and consequent use of motorcycles. All countries have seen an increase in the number of motorcyclists killed, in nominal terms and in comparison to other road users (car occupants, cyclists, pedestrians, bus occupants). In most countries, victims are young adults and their premature deaths represent an important economic loss. In most countries, motorcycle safety issues are concentrated in urban areas.

While some of the core mechanics are similar, motorcycle safety issues in Latin American countries are different from safety issues in Europe or Asia. The measures to improve motorcyclist safety must be based on the detailed analysis of mobility and safety patterns of motorcyclists in each country. As countries like Argentina, Colombia, Chile, Costa Rica and Uruguay have done, specific motorcycle safety plans and projects are needed at a country level.

Motorcycle specific license interventions would play a very valuable role in any national strategy. Pre-license training is particularly important for motorcycle safety, but a car license is sufficient to ride any kind of motorcycle in Costa Rica and in some Mexican jurisdictions, and only a theory test is required in Colombia. Introducing tighter graduated licensing systems, and age restrictions would also be effective.

Mopeds present a particular challenge to address. Although mopeds currently represent only a small share of the powered two-wheelers fleet, low purchase prices and easy access to licenses may induce an increasing trend. It is important that they are systematically registered as motor vehicles in all countries, so that the safety of this relatively high-risk transport mode can be effectively monitored and regulated.

All countries should have a long-term objective of a 100% helmet wearing rate (i.e. good quality helmets that are well fastened), building on the good wearing rates for riders in Chile (99%), Colombia (96%), and Uruguay (93%), and confirm that the legislated safety standards of helmets comply with the relevant UN regulation. Motorcycle anti-lock braking systems (ABS) are a highly effective safety technology, although only Brazil has mandated ABS on new motorcycles sold. This is reportedly under consideration in Chile and Uruguay, and it is strongly recommended that all countries consider legislating ABS on new motorcycles sold.

It is recommended that all countries give priority to improve the safety of motorcycles, in particular by:

- providing safer and affordable public transport to avoid modal shift to a more risky mode of transport
- requiring the registration of all powered two-wheelers, including mopeds
- developing national road safety plans and projects to tackle motorcycle safety, specifically addressing licensing interventions and helmet wearing
- setting a target of achieving a 100% helmet wearing rate, and confirm that the legislated safety standards of helmets comply with the relevant UN regulation
- considering Argentina's example in reducing the maximum authorised blood alcohol content level for motorcycle riders
- introducing a mandatory motorcycle headlamp-on requirement
- consider legislating antilock braking systems (ABS) on new motorcycles sold.

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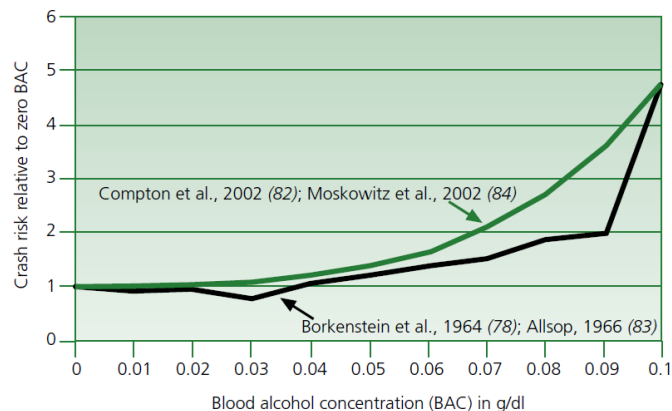
Chapter 8. Drink driving

The role of alcohol in road crashes

Alcohol is a major factor in road crash occurrence and severity. Alcohol changes the driver's judgement, depth perception, and vital motor skills required to drive safely. It reduces alertness and reaction time, and impairs the driver's ability to fully execute the skills necessary for safe driving. Increased blood alcohol concentration (BAC) has been linked to increased crash risk. According to Compton et al. (2002), this risk increases significantly at a BAC level of 0.04 g/dl (see Figure 8.1).

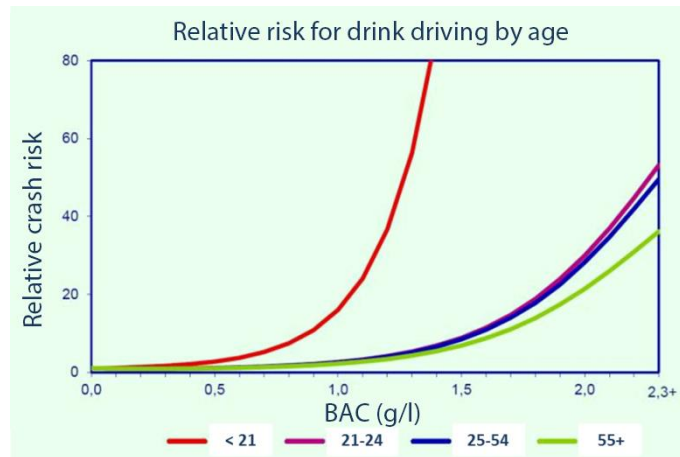
A lot of research has been conducted in Europe on this topic (European Road Safety Observatory, 2006). The crash rate of a driver with a BAC of 0.8 g/l is 2.7 times that of sober drivers. With a BAC of 1.5 g/l, a driver has a crash risk 22 times that of a sober driver. Crash severity increases rapidly with increasing BAC, so that a driver with a BAC of 1.5 g/l has a fatal crash rate about 200 times that of a sober driver.

Figure 8.1. Relative risk of driver involvement in police-reported crashes



The risk of a road crash when a driver is under the influence of alcohol varies with age and experience. Inexperienced young drivers with a BAC of 0.5 g/l have 2.5 times the risk of a crash compared with more experienced drivers (WHO, 2004). Research conducted in New Zealand concluded that teenage drivers are estimated to have more than five times the risk of drivers aged 30+ at all BAC levels. Drivers in their twenties are estimated to have three times the risk of drivers aged 30+ at all BAC levels. Also, teenage drivers who are alcohol impaired are at increased risk of having a road crash if they have passengers in the car (Keall et al., 2004; Peck et al., 2008). This is illustrated in Figure 8.2.

Figure 8.2. Relative risk of fatal crash involvement by blood alcohol concentration and age



Source: SWOV, derived from Peck et al. (2008).

Box 8.1. Research on drinking and driving conducted in Latin America

A lot of research has also been conducted in Latin America on this topic:

Barrios, G., C. Juambeltz, G. Rossi, M. Ardu, L. Paulette, G. Lencina and F. Rolando (2006), “Implicancias y riesgos del consumo de alcohol en los individuos asociado a su comportamiento en el tránsito”. Presidencia de la República Oriental de Uruguay, Junta Nacional de Drogas, Montevideo, Uruguay..

Cabeza, C. (2010), “Los delitos de conducción bajo la ingesta de alcohol o sustancias estupefacientes como delitos de peligro”. Revista de Derecho de la Pontificia Universidad Católica de Valparaíso, Vol. 34,

González Wilhelm, L., J. Johnson, R. Carnevali and G. Ruiz (2012), “Ley chilena de tolerancia cero al alcohol: fortalezas, falencias y carencias que no deben ser obviadas”. Rev. méd. Chile. Vol.140/7.

Guanche Garcell, H., Martínez Quesada C., Gutiérrez García, F. (2007), “Efecto del alcohol en la capacidad de conducción de vehículos automotores”. Rev. Cubana Salud Pública. Vol. 33/1, Ciudad de La Habana.

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Murillo, W., M. Matamoros Zelaya and M. Alvarenga (2016), “Una pareja explosiva: Alcohol y Conducción”. Revista de Ciencias Forenses de Honduras. Vol. 2/1.

Ruiz, A., F. Macías, C. Gómez Restrepo, M. Rondón, J.M. Lozano (2010), “Niveles de alcohol en sangre y riesgo de accidentalidad vial: revisión sistemática de la literatura”. Bogotá, Colombia.

Uría Huaita, D. and M. Villarroel (2010), “Ocurrencia de accidentes de tránsito a consecuencia del consumo de alcohol”. Cochabamba, Bolivia. Revista de Investigación e Información en Salud. Versión ISSN 2075-6194.

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Legal drink driving limits

Table 8.1 summarises the legal drink driving limit in the ten countries.

Table 8.1. **Maximum blood alcohol concentration level (g/l) for drivers**

Country	Car drivers	Novice drivers	Professional drivers (e.g. bus, truck drivers)
Argentina	0.5 g/l 0.2 g/l for motorcyclists	0.5 g/l	0.0 g/l
Brazil	0.0 g/l	0.0 g/l	0.0 g/l
Chile	0.3 g/l	0.3 g/l	0.3 g/l
Colombia	0.2 g/l	0.2 g/l	0.2 g/l
Costa Rica	0.5 g/l	0.2 g/l	0.2 g/l
Cuba	0.25 g/l	0.25 g/l	0.25 g/l
Ecuador	0.3 g/l	0 g/l	0 g/l
Mexico	0.8 g/l	0.8 g/l	0.2 g/l may vary by state
Paraguay	0.0 g/l	0 g/l	0 g/l
Uruguay	0.0 g/l	0.0 g/l	0.0 g/l

There is no uniformity regarding maximum BAC level among the 10 countries. Overall countries apply a low limit, when compared to most OECD member countries where the limit is generally set at 0.5 g/l.

- Three countries (Brazil, Paraguay and Uruguay) have a zero tolerance law.
- Four countries (Chile, Colombia, Cuba and Ecuador) have such a low legal limit at 0.2-0.3 g/l as to be almost zero.
- Two countries (Argentina and Costa Rica) have a legal limit of 0.5 g/l.
- Mexico has a legal limit of 0.8 g/l.

In 2017, the large majority of OECD member countries had a legal limit of 0.5 g/l or below (Mexico, the United States and Great Britain are the main exceptions with New Zealand recently reducing from 0.8 g/l) and it is now widely accepted that 0.5 g/l should be the maximum legal limit (WHO, 2004). Lowering the legal limit in Mexico to 0.5 g/l is recommended.

Among the three countries with a legal limit of 0.5 g/l or above, Argentina and Mexico do not apply a lower limit for novice drivers. Given the heightened vulnerability of novice drivers when under the influence of alcohol, and the fact that most of them are young people, more prone to a risky behaviour including drinking and driving, lowering the legal limit to 0.0-0.2 g/l for young and novice drivers in Argentina and Mexico should be considered.

Amongst other driver categories, it is noted that there is a zero or very low drink driving limit for professional drivers in all countries, and that Argentina has set a lower legal limit at 0.2 g/l for motorcyclists. This is consistent with the heightened vulnerability of motorcyclists when impaired by alcohol due to the additional physical skills required to drive a motorcycle. This initiative deserves further research and analysis. Some OECD member countries (Austria, Greece and Lithuania) also have a lower limit for motorcycle drivers.

Sanctions

This section summarises the sanctions applied when a driver is detected with a BAC above the legal limit. In most countries, there are different levels of sanctions based on the actual BAC and several thresholds are set to define the sanctions. In addition to fines, which are common to all countries, there may also be:

- points withdrawal: Argentina, Brazil, Costa Rica, Cuba and Ecuador
- license withdrawal: all countries except Ecuador and Mexico
- seizure of the vehicle: Ecuador and Colombia
- imprisonment: Ecuador, Costa Rica, Chile Brazil.

Overall, the sanctions (summarised in Table 8.2) are similar to or tougher than what is found in most OECD member countries. Fines are relatively high. For example in Brazil, the minimum fine for driving under the influence of alcohol is approximately USD 930, while the average monthly salary is around USD 1 000. Further information is needed to understand whether these tough sanctions really apply in practice or instead lead to an informal sanction regime and, more particularly, whether they have a real deterrent effect on drink driving.

In all countries, there are tougher sanctions in case of recidivism.

Table 8.2. Sanctions for driving above the legal limit

Country/ legal limit (g/l)	BAC (g/l)	Fines (equivalent USD)		Licence withdrawal (months)		Imprisonment	Other
		Mini	Max	Mini	Max		
Argentina 0.5	0.5 and above	250-1 200 The amount of the fine is indexed on the price of fuel		-	-	up to 12 hours	
Brazil 0	Between 0 and 0.6	930	1 860	12	Up to 24		Vehicle seizure
	0.6 and above	930	1 860		Up to life withdra- wal	6 months to 3 years	Vehicle seizure
Chile 0.3	Between 0.3 and 0.8	65	300	3	-	-	-
	0.8 and above	500	1 200	Lifelong withdra- wal	-	3 to 10 years	
Colombia 0.2	Between 0.2 and 0.4	80	80	6	12		Vehicle seizure
	Between 0.4 and 1	80	80	12	36		Vehicle seizure Rehabilitation course (40 hours)
	Between 1 and 1.5	80	80	36	60		Rehabilitation course (80 hours)
	1.5 and above	80	80	5 years	10 years	No	Vehicle seizure
Costa Rica 0.5	Between 0.5 and 0.75	530	530	-	-		Points withdrawal
	0.75 and above	530	530	2 years	4 years	1 to 3 years	Points withdrawal
Cuba 0.25	Between 0.25 and 0.5	60	60	12	36	In case of injury or death to other persons	Points withdrawal
	0.5 and above	60	60	3 years	5 years	In case of injury or death to other persons	Points withdrawal
Ecuador 0.3	Between 0.3 and 1.2	320	640	-	-	5 days	Points withdrawal Vehicle seizure for 24h
	1.2 and above	640	640			90 days	Points withdrawal Vehicle seizure for 24h
Mexico 0.8	0.8 and above	40	2 000	-	-	12-32 hours	Non-commutable administrative arrest in Mexico city and other jurisdictions
Paraguay 0.0	0.0	30	200	-	-	Up to 2 years	The current law is under review by Congress for modifications
Uruguay 0.0	Between 0.0 and 1.2	360	360	6	24		-
	1.2 and above	360	360				Judicial process

Note: In Uruguay, licence withdrawal is being considered, but this first requires harmonisation of the licence requirements throughout the country.

Definition of an alcohol-related crash

Assessing the prevalence of alcohol in fatal crashes requires defining an alcohol-related crash. There is no internationally agreed definition of an alcohol-related fatal crash. Taking into account several European projects on this topic, IRTAD recommends defining it as a fatal crash where at least one of the active participants (including motorcyclists and cyclists) is found with a BAC above the legal limit (ITF, 2017). This definition is also based on a 30-day definition for a road fatality. However, it does not guarantee that pedestrians and cyclists are considered as “any active participant”, because in most countries a legal limit on blood alcohol concentration for these groups does not exist.

In practice not all countries have yet adopted this definition, and the legal limit also varies between countries. There are at least three broad definitions of an alcohol-related crash:

- any level of alcohol (even below the legal limit) is detected in at least one of the active participants
- the definition is extended to include alcohol detected in a pedestrian involved in a crash
- the definition only considers drivers of motorised vehicles.

Thus comparing the prevalence of alcohol in (fatal) crashes in different countries requires careful consideration. Table 8.3 summarises the national definitions of an alcohol related fatality in the 10 countries.

Table 8.3. Comparison of definitions of an alcohol related fatality

Country	General maximum BAC (g/l)	Definition of an alcohol-related fatality
IRTAD	-	Any death occurring within 30 days as a result of a fatal crash in which any active participant is found with a BAC above the legal limit
Argentina	0.5	Any death occurring within 30 days as a result of a fatal crash in which any active participant (including pedestrians) is found with a BAC above 0
Brazil	0	No definition
Chile	0.3	<i>IRTAD Definition (pedestrians and cyclists included)</i>
Colombia	0.2	No definition
Costa Rica	0.5	IRTAD definition (but with no reference to 30 days)
Cuba	0.25	IRTAD definition (pedestrians not included)
Ecuador	0.3	Any death occurring as a result of a fatal crash where an active participant (including pedestrian) is under the influence of alcohol
Mexico	0.8	<i>IRTAD definition (pedestrians and cyclists included)</i>
Paraguay	0	<i>IRTAD definition (pedestrians and cyclists included)</i>
Uruguay	0	<i>IRTAD definition (pedestrians and cyclists included)</i>

Prevalence of alcohol in fatal crashes

Table 8.4 presents the prevalence of alcohol in fatal crashes, as reported by the countries for the WHO Global Status report (WHO, 2015) or the IRTAD annual report (ITF, 2016).

Table 8.4. Share of road deaths in alcohol related crashes

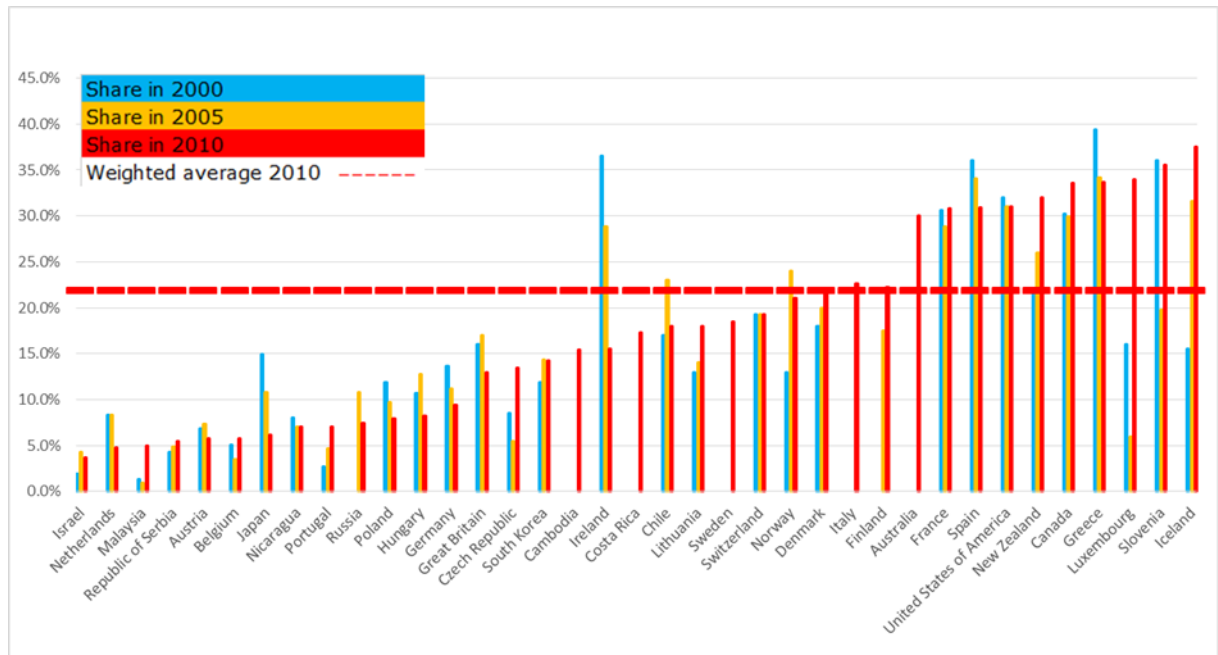
Country	Legal limit of BAC (g/l)	Share of road deaths in alcohol related crashes	Source
Brazil	0	-	-
Chile	0.3	14% in 2013 9% in 2014	2013: Chilean Police in WHO report 2014, Chile Police in IRTAD report
Colombia	0.2	8% in 2013	Road Statistical Information System (SIEVI), National Police in WHO report
Costa Rica	0.5	1% in 2012	2012, Judicial Morgue in WHO report
Cuba	0.25	4% in 2013	Crash Registration 2013, in WHO report
Ecuador	0.3	-	-
Mexico	0.8	5% in 2012 9% in 2014	2012, Epidemiological Surveillance Systems of Addictions; in WHO report 2014, INEGI in IRTAD report
Paraguay	0	-	-
Uruguay	0 in 2016 0.8 in 1997	38% in 1997	1997, Dr. Guido Berro Forensic Technical Institute in WHO report

Source: WHO (2015) and IRTAD annual report ITF (2016).

Given the wide variety of sources, the different legal limits and definitions of a road fatality, these figures are difficult to interpret. Latest available data from Uruguay are from 1997, and therefore probably not representative of today's situation. For other countries where data is available, the reported share of alcohol-related road fatalities ranges from 1% in Costa Rica to 27% in Argentina (in Argentina, this figure comes from a declarative survey conducted in 2012, which sample is small and not representative of the whole country).

A recent IRTAD report (ITF, 2017) analysed official statistics on the share of alcohol-related fatalities in 37 countries between 2000 and 2010. In 2010, the share of alcohol-related fatalities ranged from approximately 5% to 35% and in ten countries it was above 30%. In general, the share of alcohol-related fatalities has remained stable over the years. In 2010, the weighted average was 21.80% (see Figure 8.3).

Figure 8.3. Share of alcohol-related road fatalities in 2000, 2005 and 2010 from official statistics, IRTAD countries



Source: IRTAD.

It is also interesting to note that while around one-fifth of fatal crashes are alcohol-related, the number of drivers in the general driving population with a BAC above the legal limit is rather low. As an example, in Sweden, it is estimated that 0.2% of the driver population has a BAC above the legal limit (0.2 g/l), but they contribute to 25% of crashes.

The same IRTAD report also found that in most countries, official statistics are affected by underreporting. Moreover, the proportion of 21.8% does not include pedestrian and cyclist fatalities that were alcohol-related and above the legal limit because those are not recorded due to lack of legal limits on BAC for these groups. Therefore the weighted average of 21.8% is surely too low.

Even if WHO reports lower alcohol consumption in Latin American countries compared to European countries (WHO, 2014), it is very likely that the share of alcohol-related fatalities reported in Latin America, as presented in Table 8.3, is underreported. IRTAD refers to the following factors to explain why alcohol-related crashes are underreported:

- Most official statistics are solely based on police reports and the police do not always perform alcohol tests for all (fatal) crashes.
- Not all countries systematically test blood alcohol concentration (BAC) on all road users involved in road crashes.
- In some countries drivers who are killed on the spot are not tested for alcohol.
- Reporting an alcohol-related crash often involves a lot of paperwork and is seen as an administrative burden.

- In some countries a substantial number of road casualties are admitted to hospitals without being known to the police.

For a better understanding of both the injury severity and the total number of alcohol-related road casualties, the use of hospital data in addition to police data is highly important and contributes to better international comparisons (ITF, 2011).

It would be interesting to conduct a large survey in Latin America, under the umbrella of OISEVI and based on a common methodology, to assess drinking and driving prevalence. Box 8.2 summarises the IRTAD recommendations for reporting alcohol-related crashes. These recommendations are relevant for the ten countries under review.

Box 8.2. IRTAD recommendations for reporting alcohol-related crashes

Review how data on alcohol-related road crashes is collected

In order to come to more reliable and comparable data on alcohol-related serious road injuries and fatalities, countries should begin by assessing their current status on the recording of data on alcohol-related road fatalities and serious injuries.

Aim for a systematic alcohol testing of every road user actively involved in a serious crash

Ideally, 100% of active road users who are involved in a road crash that resulted in death or serious injury should be tested for alcohol. If a systematic alcohol testing at this level is not possible, countries should apply additional methods for adjusting the official numbers of alcohol-related road fatalities and serious road injuries.

Harmonise definitions of alcohol-related road casualties

To make official country statistics comparable, definitions of alcohol-related road casualties should be harmonised. A number of European countries have already adopted the definition proposed by the 2009 SafetyNet project, as “any death occurring within 30 days as a result of a fatal road crash in which any active participant was found with a blood alcohol level above the legal limit”. If countries are unable to apply these recommended definitions, developing algorithms to allow for conversion of these definitions is recommended.

Use statistical analysis methods to better estimate the number of alcohol-related road fatalities

Additional statistical analysis methods as described in this study can help to obtain better estimates of alcohol-related serious road crashes. Methods should be developed and applied that align with the legal system and data collection framework of individual countries, rather than harmonise methods internationally.

Conduct future research on the introduction of legal limits on BAC for pedestrians and cyclists

In order to make sure pedestrians and cyclists are also counted as active participants in the definitions on alcohol-related fatalities and serious injuries, further research is needed regarding the possibilities to introduce legal limits on blood alcohol concentration for pedestrians and cyclists.

Drink driving check and enforcement

Random breath tests

Police enforcement of drink driving laws, including random breath testing, combined with publicity campaigns is necessary to increase the perceived risk of being detected and apprehended and to address the problem of drinking and driving (WHO, 2004; Sweedler, 1995). Police enforcement and publicity campaigns should be carried out regularly in order to be effective.

Drink driving enforcement is usually done on the roadside through breathalysers. There are two main strategies for drink driving enforcement: selective testing (after suspicion) and random breath testing (anywhere, anytime). Both are effective, but research found that random breath testing was twice as effective as selective testing (Henstridge et al., 1997). Doubling the number of random breath tests in the Netherlands led to a 25% reduction in the number of drink driving offenders (Mathijssen, 2005). The effectiveness of random breath testing is enhanced when it is done near places where alcohol is consumed and at specific times and specific days when the prevalence of drink driving is high, such as weekend nights near bars and nightclubs. Table 8.5 reviews current practices regarding drink driving enforcement and testing in the ten countries under review.

Table 8.5. **Drink driving enforcement and testing**

Country	Roadside Random Breath Testing legally possible	Does the law impose a systematic (breath or blood) testing in case of an injury crash	Possibility to conduct post-mortem test
Argentina	Yes	Not performed although mandatory	Yes
Brazil	Yes	Yes (for drivers only)	Yes
Chile	Yes	Yes	Yes
Colombia	Yes	Yes	Yes
Costa Rica	Yes	Yes (for drivers only)	Yes
Cuba	Yes	Yes	Yes
Ecuador	Yes	Yes (breath test only)	Yes, in case of legal request
Mexico	Yes	Not systematic. Only deceased victims (including pedestrians)	Yes (including pedestrians killed)
Paraguay	Yes	Yes	Yes
Uruguay	Yes	In 2013, tests conducted for 93% of crashes and 100% of fatal crashes.	Yes

In the ten countries, there is regular random roadside breath testing to detect drivers under the influence of alcohol, but it was not possible to get good estimates on the level of enforcement. In all countries, drivers are legally required to be tested for alcohol in case of an injury crash, except Mexico, where this is only the case for fatal crashes. There is no information on whether tests are always performed in practice.

In all countries, legislation allows post-mortem alcohol tests to be conducted. However, this may not always happen in practice.

In order to assess the level of drink driving enforcement, Table 8.6 summarises the number of roadside breath tests conducted in 2013 (either randomly or following a traffic violation or a crash). This information was only available in five countries. Whether normalised by the number of vehicles or the population (there is no data on the number of licenced drivers), the level of enforcement varies from a factor of up to 17 among the five countries. Based on this data, the level of enforcement is higher in Paraguay followed by Chile, while it is lower in Ecuador and Colombia.

Table 8.6. Number of roadside breath tests performed in 2013

Countries	Number of breath tests	Population	Number of vehicles	Number of tests/100 registered vehicles	Number of tests/100 inhabitants
Chile	200 649	17.63 million	4.26 million	4.7	1.1
Ecuador	34 072	16.03 million	1.72 million	2.0	0.2
Colombia	71 126	47.12 million	11.29 million	0.6	0.2
Mexico	676 011	118.39 million	36.74 million	1.8	0.5
Paraguay	148 616	6.56 million	1.4 million	10.6	2.3

It would be more appropriate to assess the level of enforcement based on the number of licenced drivers, but unfortunately this data was not available. Box 8.3 summarises the experience of Finland, where nearly 70% of car drivers are checked over a period of three years, and about 40% are checked more than once.

Table 8.7 presents the results of positive breath tests in Chile, Ecuador and Paraguay. In Ecuador, more than 21% of drivers tested had a positive BAC. This figure is 4.9% and 7.6% in Paraguay and Chile respectively. Even assuming these are samples from enforcement campaigns, these figures are very high.

Overall, this is an area that deserves further data and analysis. It would be very beneficial for a large survey to be conducted under the umbrella of OISEVI to assess the level of enforcement (annual number of breath tests/licensed drivers), and the number of positive tests (by users, age, time etc.).

Such a survey, using a common methodology, would provide a good starting point to analyse the level and effectiveness of enforcement and design adequate counter measures to combat drinking and driving.

Box 8.3. Case study: Reducing drink driving in Finland

Combatting drinking and driving is a priority in Finland. Since the 1970s, the Finnish police have pursued systematic random breath testing backed up by intense publicity campaigns. The risk of being caught for drink driving increased considerably since 1977 when the police were first empowered and equipped to carry out random breath testing. Based on annual breath test surveys, in 1979, 0.50% of car drivers were under the influence of alcohol and this share dropped to 0.25% in 1990, 0.17% in 2000 and 0.13% in 2015.

The police currently perform around 2 million random tests every year. On average, over a three-year period, nearly 70% of car drivers are checked for alcohol, and about 40% are checked more than once. In 2015, 12 000 drivers (out of the 3.7 million driving licence holders) were convicted for drink driving and an additional 5 000 for drugs and driving. This means that on average 0.13% of drivers are under the influence of alcohol. This is a small proportion, but they are responsible for 20% of road deaths and about 10% of road injuries.

Several measures have been introduced in the last decade to reduce the number of drivers under the influence of alcohol. Since 2005, Finland has introduced an alcohol interlock programme for drink driving offenders. The device prevents drivers starting the vehicle, if their breath sample contains alcohol more than 0.1 mg/l (equivalent to a BAC of 0.2 g/l). The alcohol interlock programme is voluntary for all drink driving offenders. To avoid a licence suspension, the drink driving offenders must install an interlock device in their vehicle and have a consultation with a doctor or another health care professional.

Since August 2011 alcohol interlocks have been mandatory in all chartered school and day care transport. In 2016, more than 10 000 taxis and busses were equipped with an alcohol interlock device. Several transport companies have equipped their fleet with interlocks either voluntarily or through public procurements.

Since 2013, preventive measures are being conducted in co-operation with health professionals. Medical doctors have the obligation to inform the police if a driving licence holder does not meet the health requirements for driving. In the case of alcoholism, the doctor may propose to the patients the installation of an alcohol interlock device in order to keep their driving licence.

For young drivers, the Sober Road programme has been developed involving police and social and health care services with the objective to prevent serial drink driving. The programme is based on discussions with young drivers about the use of intoxicants.

Source: Trafi.

Table 8.7. Results of breath tests in Chile, Ecuador and Paraguay

Countries	Number of breath tests	Legal limit (g/l)	% of drivers above the legal limit
Chile	200 649	0.3	7.6%
Ecuador	34 072	0.3	21% tests show presence of alcohol
Paraguay	148 616	0	4.9%

Alcohol testing following a crash

Ideally, all active participants involved in an injury or fatal crash should be tested for alcohol. Information on the number and results of breath or blood test in case of a fatal crash was only available for two countries (Ecuador, Paraguay). Table 8.8 shows that a test is only performed in 7% of fatal crashes in Ecuador. In Uruguay tests are performed on all fatal crashes, however due to administrative burdens, results are only partly processed (for 52% of fatal crashes in 2013 and 60% of fatal crashes in 2012). It also shows that in Ecuador, 60% of drivers involved in a fatal crash and tested for alcohol have a positive test. This figure is 10-13% in Uruguay.

These figures should still be interpreted with caution. First it is not known whether all active participants are tested or whether the fatal victims are tested. Second, tests are only made on 7% of fatal crashes in Ecuador. Nevertheless they suggest that in Ecuador, the problem of drink driving is a very important one. Data from Uruguay suggests that the problem of drink driving is more contained. Box 8.5 presents recent initiatives in Uruguay to combat drinking and driving. However a large number of lives could still be saved through better compliance with the law.

Table 8.8. **Results of alcohol tests in case of a fatal crash**

Country	Year	Number of fatal crashes	Fatal crashes for which tests were performed		Fatal crashes with driver above the limit	
			Number	%	Number	%
Ecuador	2014	1 983	142	7.2%	85	60%
Uruguay	2013	525	272 *	52%	36	13%
	2012	475	287*	60%	28	10%

Note: In Uruguay, tests are performed in 100% of fatal crashes, however, results are only partly processed.

Measures to combat drink driving

In 2007, the World Health Organization and the Global Road Safety Partnership published a good practice manual on drink driving (GRSP, 2007). The manual draws on experience from countries that have succeeded in reducing drink driving, and proposes simple, effective and low-cost solutions that can be implemented on a national or local level. It targets governments, non-governmental organisations and road safety practitioners, particularly those in low- and middle-income countries.

There is not one single measure that can solve the problem. The concurrent implementation of measures such as drivers' education, enforcement, rehabilitation, etc. is necessary to combat driving under the influence of alcohol. Box 8.4 summarises the main recommendations of the GRSP Manual. It was outside this study's scope to assess in detail the policies and measures in place to combat drink driving, and this could be the scope of a further study.

Box 8.4. What works to reduce drink driving: Extract of the GRSP Manual on Drink Driving

The following practices have been found to act as deterrents for drink driving:

- setting BAC limits
- enforcing BAC levels:
 - random and selective breath testing
 - severity of punishment
 - swiftness of punishment
- treatment of repeat offenders
- restriction on young or inexperienced drivers:
 - lower BAC for young and novice drivers
 - licensing restrictions, e.g. graduated driver licensing
- designated driver and ride service programmes
- alcohol ignition interlocks.

Source: GRSP (2007).

Box 8.5. Case study from Uruguay

In Uruguay, there is a zero tolerance policy for drink driving. It has been a long journey to reach this point. The process started in 1994 when campaigns were launched to raise public awareness on the danger of drinking and driving and when, for the first time, a legal limit for blood alcohol content was set at 0.8 g/l for general drivers. The legal limit was lowered again from 0.8 to 0.5 g/l (in 2008), then to 0.3 g/l (in 2009) and finally to 0 g/l (in January 2016).

These measures have had a very strong impact in the reduction of alcohol-related crashes. According to various studies by Prof. Dr. Guido Berro from the Technical Forensic Institute and UNASEV, the number of injured drivers with a BAC above the limit was reduced by nearly two-thirds between 2009 and 2015 (from 3 500 to 1 200).

In Uruguay, the population is very much aware of the high risk of drink driving. A recent survey among 131 500 persons revealed that 90% of the population is favourable of a zero drink-driving limit. This is rather unique in Latin America, where there is little public support for lowering the maximum BAC level (Bianchi et al., 2014).

Based on the experience in Uruguay and other countries, lowering the BAC limit was the starting point of useful discussions and debates that led to the implementation of important measures such as education, prevention and communication campaigns, and more stringent enforcement.

The zero tolerance policy has brought clear changes in the behaviour of the Uruguayan population, as reflected in crash statistics. The lowering of the legal limit over time has had a positive impact on all drivers (whatever their level of BAC) and especially on young drivers.

Conclusions and recommendations

Alcohol's very harmful role in the occurrence and severity of road crashes is well known. The risk and severity of crashes increases exponentially with a blood alcohol concentration above 0.5 g/l, and young and novice drivers are more at risk than older drivers when under the influence of alcohol. Information and data about drink driving and the prevalence of alcohol in crashes is scarce across the ten countries, which impeded analysis of a significant road traffic safety issue.

All countries have set a maximum blood alcohol content and have the legal framework for police to enforce these laws, and courts to administer sanctions. However, there seems to be insufficient enforcement in some countries. The maximum legal limit for blood alcohol concentration should not be above 0.5 g/l. This is a particular recommendation for Mexico, which should consider lowering its legal limit from 0.8 g/l to 0.5 g/l. A well-enforced differentiated limit for young and novice drivers has proven to be an effective safety measure, and it is recommended that Argentina, Costa Rica and Mexico adopt a lower legal limit for novice drivers such as zero or 0.2 g/l.

There is little comparable information on the prevalence of drivers above the legal limit, the share of alcohol-related crashes and the level of enforcement. However based on recent research conducted by IRTAD in 37 European and non-European countries which highlights the problem of underreporting in many countries, one can expect that the number alcohol-related crashes and casualties in official statistics in most Latin American countries is also underreported. An OISEVI umbrella project could use the same methodologies to get a better picture of the extent of the drink driving problem in Latin America.

It is recommended that all Countries seriously address the issue of drink driving by:

- setting the general maximum BAC limit at 0.5 g/l, and 0.2 g/l or zero for young and novice drivers
- massively intensifying alcohol checks, through random breath testing targeting all vehicles, combined with mass media campaigns to make drinking and driving unacceptable in Latin America
- increasing knowledge about the drink driving issue, by systematically testing all road users and all participants of an injury crash (either breath test on the roadside for non-injured people or blood test at hospital for injured or killed people).

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Chapter 9. Seat belts and child restraint systems

Safety of vehicles

Cars are becoming safer. An impressive study summarising the results of the safety effects of all sorts of vehicle features, devices and technologies for the United States (Kahane, 2015) estimated that safer cars saved more than 600 000 lives over a period of 40 years. In 2012 (the most recent year studied) almost 22 000 people were killed in the United States in a passenger car, light truck or van, and it is estimated that more than 27 000 lives were saved by vehicle safety technologies.

Vehicle safety improvements are the results of research and development investments by manufacturers, mandatory vehicle standards set by Government, and consumer information published by car assessment programmes. These three approaches are bringing safer cars to the roads. Considerable improvement in vehicle safety is possible in Latin American countries. As noted in Chapter 2, the adoption of vehicle safety regulations developed by the World Forum for Harmonisation of Vehicle Regulations (UNECE WP29) is a legislative priority for Latin America. Three vehicle safety items are presented in the WHO Global Status Report 2015 (WHO, 2015) as top priority (frontal impact, Electronic Stability Control [ESC] and pedestrian protection) and only some Latin American countries have included these regulations in their national regulation (Argentina and Brazil for example included basic crash tests in their regulation and announced to be committed to introduce ESC). UNECE WP29 regulations are globally applicable and relevant to this region, both in terms of new cars, and of imported second-hand cars. Careful consideration has to be given to the impact of introducing vehicle regulations on consumers, but as recommended in several UN-declarations and statements, a minimum set of safety regulations should be adopted by all UN member countries, at whatever stage of development.

Safety improvements are coming from active safety systems (to prevent crashes such as ESC for example, to reduce the chance of a roll-over) and from passive safety systems which aim to diminish the consequences of a car crash. Seat belts, airbags and child restraint systems (CRS) belong to this latter group of interventions. Research clearly indicates that seat belts (also called safety belts) need to be used in addition to airbags and not to replace them (NHTSA, 1999). Seat belts are especially effective in head-on collisions, and prevent car occupants from being ejected out of a car in side-impact and roll-over collisions. In rear-end crashes seat belts have a limited value: in these crash types head rests are very relevant to protecting car occupants from whiplash injuries (neck injury), a very serious type of injury that sometimes is a life-changer. Serious injuries in rear-end crashes can occur even at relatively low impact speeds.

Seat belts

Effectiveness of seat belts

Seat belts in cars are generally regarded as the single most effective life-saving measure in road safety history. The above-mentioned study from the United States (Kahane, 2015) concluded that 75% of the lives saved through vehicle technologies (in 2012) is related to seat belts, airbags, child restraints and side-impact protection. This result was measured when the wearing rates of seat belts in the United States was 87%.

This explains why improving seat belt wearing rates is a cornerstone in every mature road safety strategy, and must be a focus of vehicle legislation and assessment programmes. Strategies should start with effective seat belts and proper anchorage points in every car. Next, seat belts should be used and efforts should be made to increase seat belt wearing, given seat belt wearing is legally obliged. The goal is to achieve a 100% wearing rate.

A lot of research has been carried out to establish the safety impact of seat belt wearing for individual car occupants. Studies have also been carried out to establish the safety effects of changing wearing rates in a vehicle population. There is no doubt about the positive safety effects of seat belts, of airbags and of child restraints. Additionally, there is no proof that those who wear a seat belt are taking more risks while driving (through risk compensation or behavioural adaptation). The measured effects for front seat occupants are higher than for those in the rear seat. The effects for fatalities are higher than the effects for (serious) injuries.

According to Elvik et al. (2009), the use of seat belts in drivers of light vehicles (private cars and vans) leads to a 50% reduction in death probability for front seat occupants and 25% for rear seats. More recent studies come with even higher effects. It seems reasonable to expect that these reduction percentages are about correct in Latin America.

Seat belt legislation in Latin America

Table 9.1 presents a summary of the current legislation on seat belts. All ten countries have seat belt legislation for the front seats and for the rear seats. Rear seat legislation for some countries is rather recent and sometimes related to the availability of seat belts in cars. It is expected that cars without seat belts will phase out over time.

Only four countries (Argentina, Brazil, Chile and Uruguay) report implementation of relevant UNECE standards (such as Regulation 14 and 16 for seat belts; and 44 for child restraints) in national legislation. In general, countries in Latin America should consider becoming a contracting party of the 1958 Agreement (UN ECE Vehicle Regulations) and the 1998 Agreement (Global Technical Regulations). Capacity building in the national governments is needed to arrive at informed decisions when closing this regulatory gap, and in ensuring compliance with usage laws.

Legislation of seat belts in (school) buses, in public transport vehicles and in trucks is generally more complicated, as illustrated in Box 9.1.

Table 9.1. Legislation on seat belt use

Country	Seat belt			
	Mandatory since	Occupants	Current legislation	
			Law	Level
Argentina	1995	Front	Law 24.449 year 1994 - Art. 30 (Item A)	National
		Rear	Art. 40 (Item K)	
Brazil	1997	Front	Law 9.503 de 1997 – Art. 65	National
		Rear		
Chile	1991	Front	Law 18.290 – Art. 75	National
	2002	Rear		
Colombia	1995	Front	Law 769 year 2002, Art. 82	National
	2004	Rear	Law 769 year 2002, Art. 82 y Resolution 19200 year 2002	
Costa Rica	1993	Front	Law 9078 year 2012 – Art. 94	National
		Rear		
Cuba	2011	Front	Law 109 year 2010 – Art. 89	National
		Rear		
Ecuador	1996	Front	Decree No. 1738 – Art. 157 and 298	National
	2009	Rear		
Mexico	2012 (urban roads)	Front	Reglamento de Tránsito en Carreteras y Puentes de Jurisdicción Federal/2012 Art. 84 and 95	National
	2015 (federal roads)			
	2012 (urban roads)	Rear		
	2015 (federal roads)			
Paraguay	2014	Front	Law 5016 year 2014 – Art. 51 and 58	National
	2014	Rear		
Uruguay	1993	Front	Law 18.191 year 2007 Art. 31	National
	2013	Rear		

Box 9.1. Particular aspects about the legislation in some countries

Chile: In accordance with article 75 of Law No. 18 290, item 10, cars manufactured in 2002 or later must have seat belts for rear seats occupants. The same obligation applies for public interurban buses whose year of manufacturing is 2008 onwards and for private interurban buses whose year of manufacturing is 2012 onwards. The use of seat belts is mandatory in vehicles that carry out school transport whose year of manufacturing is 2007 onwards.

Colombia: According to Resolution 19 200 of 2002, municipal public passenger transport vehicles that are imported or assembled in the country are obliged to install seat belts in the driver's seat and the accompanying passenger's seat. Vehicles used for public transport on interurban roads must also have installed seat belts in every seat that does not have other seats in front, including school, special, tourist and disabled transportation. All seat belts must comply with the technical characteristics in standard NTC-1570, or the standard that modifies or replaces it.

Costa Rica: According to the current legislation, Law 9 078, article 32, vehicles must have safety belts of at least three points in all lateral seats, unless their constructive nature does not allow it, in which case two point lap belts must be used. In the remaining seats, they must have sub-abdominal belts. The law exempts from this obligation the buses and mini buses that provide transport services. Article 35 establishes that school transport vehicles, except those for transportation of university students, must be provided with safety belts for all occupants.

Cuba: Resolution No. 4 of the Ministry of the Interior, complementary to Law 109 (Road Safety Code) mandates the use of seat belts in the front seats of imported light-duty vehicles since 2000, and in the back seats of light-duty vehicles, and in all other motor vehicles imported since 2009. Article 84 of Law 109 establishes that the driver of a motor vehicle is obliged to correctly use the seat belt and require its use by passengers. If they fail to comply, both driver and passenger can be punished with the imposition of a fine, whose amount is CUP 20 (Cuban pesos), and six points is withdrawn from the driver's license. Due to the age of the fleet in Cuba, it is estimated that only 25% of the vehicles have seat belts installed.

Uruguay: In accordance with Chapter II of Law 19 061 of 2013, which entered into force in 2014, all passenger vehicles in regular-, medium- and long-distance services, or travelling on national routes, must have seat belts, which must be used by all seated passengers.

Seat belt use

Information on seat belt usage is available for all ten participating countries. Although the information provided by the different countries is not fully comparable (because it reflects different years of collection and, more importantly, different methodologies for data collection) the data can be used as an individual reference of each country in relation to seat belt use.

Figure 9.1 shows seat belt wearing rates for each country. In all countries, the wearing rate is higher in front seats than in rear seats. The highest percentage for front seat occupants is reported in Cuba in a measurement carried out in 2013 with 85%, but this only concerns wearing rates in cars equipped with seat belts (see Box 9.1). Relatively high wearing rates were reported in Chile (77% in 2013) and in Brazil (79% in 2013, with wide variations depending on the region and the level of education). On the other hand, lower levels of seat belt use in front seats are reported in Mexico (36%), Argentina (37%) and Ecuador (39%).

Regarding rear seat belt use, the highest percentages are reported in Paraguay in 2012 with 65% (a level very similar to that of front seat occupants), in Costa Rica with 53% and Brazil with 50%. The

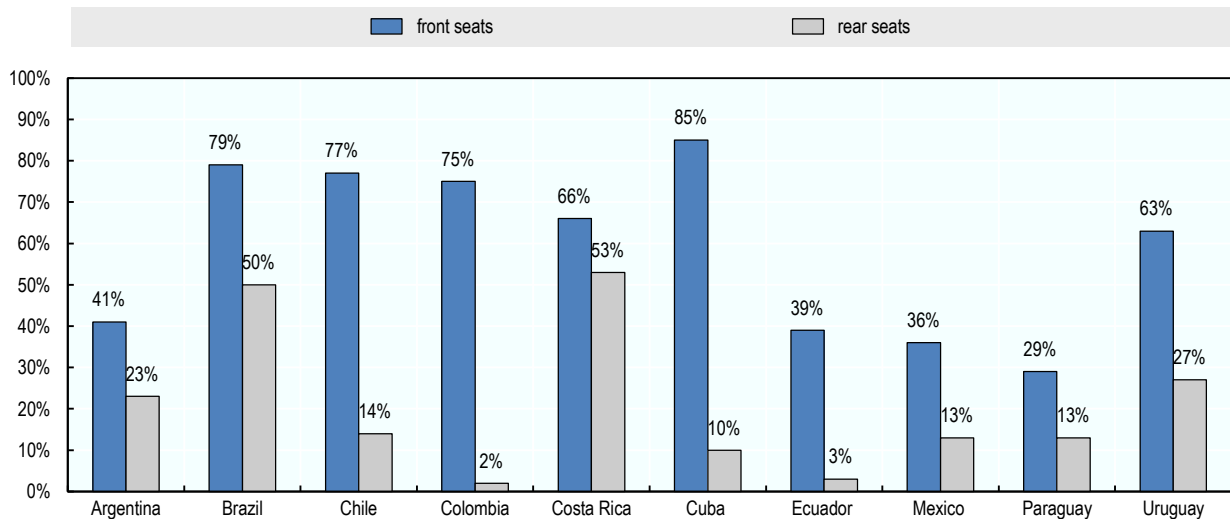
lowest percentages were found in Ecuador (3%), Cuba (10%), Mexico (13%) and Chile (14%), all for studies carried out in 2013.

Four participating countries conducted observational studies on seat belt use: Argentina, Chile, Ecuador and Uruguay (Dirección Nacional de Observatorio Vial, 2013; Comisión Nacional de Seguridad de Tránsito, 2013; GeoPlaDes, 2013; Unidad Nacional de Seguridad Vial, 2013). These surveys were only conducted in urban areas, except for Argentina, which also covered rural areas. Although these studies do not have a national coverage (with the exception of Argentina), they have the advantage of having followed a similar methodology, which allows more robust comparisons.

The methodology applied to carry out the studies arose from the agreement between the countries that are members of the OISEVI (Ibero-American Road Safety Observatory). Common parameters were defined to allow an adequate comparability between the results of the different countries, as well as a standard form. In 2016 measurements were carried out in Argentina, Colombia, Paraguay and Uruguay and these recent results are presented in Figure 9.1.

For comparison purposes, in 2015 the average seat belt wearing rate for IRTAD countries ranged between 80 to 100% for front seats and between 75% and 95% for rear seats (ITF, 2016).

Figure 9.1. **Seat belt use in passenger cars in front and rear seats.**



Sources: WHO (2013); Argentina: National Road Safety Agency – ANSV (2016); Brazil: Investigación Nacional de Salud (2013); Chile: National Traffic Safety Commission (CONASET) (2013). Colombia: Euroinvest (2016) Estudio Observacional de uso de cinturón y sri en Colombia. Buenos Aires, Euroinvest; Costa Rica: Study of Osa – COSEVI (2012); Cuba: National Police (2013); Ecuador: National Control and Regulatory Agency of Land Transport, Transit and Road Safety – ANT (2013); Mexico: STCONAPRA (2013); Paraguay: Euroinvest (2016) Estudio Observacional de uso de cinturón y sri en Paraguay (these data were not validated by the government of Paraguay); Uruguay: Forum Estudio de compartamiento observacional en Seguridad Vial en Uruguay UNASEV-OISEVI (2016). Montevideo Factum.

Child restraint systems

Effectiveness of child restraint systems

Carrying children safely in cars requires a determined commitment from society, sound legislation, good education of parents and effective enforcement. In the field of legislation most countries show

significant progress in recent years. The use of child restraint systems (CRS) need to be appropriate to the age and size of a child. Their use can reduce deaths and injuries in road crashes involving children under 12-years old by a better distribution of impact forces onto the body of children and preventing collision with other occupants of the vehicle or being expelled from the vehicle (Elvik et al., 2009).

UNECE's WP29 recommends that babies and toddlers are transported opposite the driving direction as long as possible (see Box 9.2), and UN Regulation No 44 lists technical provisions to ensure the high safety performance of components used for child restraints. In 2013 a new regulation on child restraints entered into force (UN Regulation No 129). This new regulation tries to minimise problems with misuse or incorrect use by introducing ISOFIX systems. The name of this regulation is "i-Size". An important difference is that UN No 129 no longer includes weight groups (whereas UN No 44 does).

The safety benefits of CRS are very substantial, and depend on the type of restraint used (Elvik et al., 2009). A child up to 4-years old has a 50% lower risk of injury in a forward-facing child restraint and 80% lower in a rear-facing seat. For children aged 5–9 years, child restraints reduce injury by 52%. For older children aged 10–14 years seat belts reduce injury by 46%. The effects of restraining children only with seat belts are considerably lower (20-32%).

Box 9.2. Rear-facing child seats

To reduce the risk of severe injuries in case of crashes, it is important that babies and toddlers are transported opposite the driving direction for as long as possible. Compared to older children and adults, they have weaker neck muscles carrying a relatively large and heavy head. A premature change into a forward facing child restraint system (CRS) increases the risk of severe injury to the cervical spine.

A rearward facing CRS is too small if the child's head is on the same height or above the upper edge of the shell, or if the child has exceeded the approved weight limit. The use of a rearward facing CRS on a vehicle seat with activated passenger airbag is prohibited by law due to the danger to the child.

The new UN Regulation No. 129 (UNECE, 2016), also known as "i-Size Regulation", creates a universal ISOFIX CRS that matches a corresponding seating position in the vehicle. CRSs that are produced based on the new "i-Size" Regulation provide the following major improvements for transporting children in cars:

- The regulation provides for the rear-facing position of children up to a minimum of 15 months, instead of 9 months in the current regulation. This will offer better protection for the developing head and neck of babies and toddlers by requiring children to be transported rearward facing until 15 months of age.
- The introduction of a side-impact test procedure which will lead to better protection of the child's head especially for younger children. Until today, there was no dynamic test requirement for lateral impacts.
- New generation dummies which more closely represent the actual effects of a crash on the body of real children.
- Fewer installation options with ISOFIX only, which results in a lower risk of the seat being incorrectly fitted in the car. A simplified guide to choosing the right seat for the child, by using the height of the child as the only guideline.
- Better compatibility between the car and the CRS: "i-Size" CRS will fit in any "i-Size" ready seating position in a car (a vehicle fitting list will no longer be required). Both the CRS and the seating position can be recognised by the "i-Size" logo.

Legislation

Table 9.2 presents the current legislation regarding CRS in motor vehicles for children less than 12 years of age in the ten countries under analysis. In general, this legislation is rather complicated in its nature because it tries to include relevant factors such as the age, height and weight of children. Legislation also addresses the minimum age for children to sit in a front seat, and the use of rear-facing seats in front seats (when the airbag is deactivated).

Table 9.2. **Legislation on child restraint systems (CRS)**

Country	Criteria that govern CRS legislation			Current legislation	
				Law	Level
Argentina (a)	Prohibition of traveling in the front seat		Under 10-years old	Law N° 24.449 – Art. 40 Item g and modifications introduced by Law N° 26.363	National
	Use of CRS	Age	Up to 4-years old	Law N° 24.449 and modifications introduced by Law N° 26.363	
		Height	x		
		Weight	x		
Brazil	Prohibition of traveling in the front seat		Under 10-years old	Law 9.503 year 1997 – Art. 64; Resolution No. 277 year 2008. Complemented by Resolution 391 year 2011	National
	Use of CRS	Age	Up to 7.5-years old	Law 9.503 year 1997 – Art. 64; Resolution No. 277 year 2008. Complemented by Resolution 391 year 2011	
		Height	x		
		Weight	x		
Chile (b)	Prohibition of traveling in the front seat		Under 12-years old	Law 18.290 year 2007 – Art. 75 modified by Law 20.904 year 2016	National
	Use of CRS	Age	Up to 4-years old	Law 18.290 year 2007 – Art. 75 modified by Law 20.904 year 2016.	
		Height	x		
		Weight	x		
Colombia	Prohibition of traveling in the front seat		Under 10-years old	Law 769 year 2002, Art. 82	National
	Use of CRS	Age	Up to 2-years old	Law 769 year 2002, Art. 82	
		Height	x		
		Weight	x		
Costa Rica	Prohibition of traveling in the front seat		Under 12-years old	Law 9078 – Art. 94	National
	Use of CRS	Age	Up to 12-years old		
		Height	145 cm		
		Weight	Up to 36 kg		
Cuba	Prohibition of traveling in the front seat		Under 12-years old	Law 109 - Art. 102. (Items 7 and 8)	National
	Use of CRS	Age	x	Law 109 - Art. 102. (Items 7 and 8)	
		Height	x		
		Weight	x		

Table 9.2. Legislation on child restraint systems (CRS) (continued)

Country	Criteria that govern CRS legislation			Current legislation	
				Law	Level
Ecuador	Prohibition of traveling in the front seat		Under 12-years old	Decree No. 1738 – Art. 157	National
	Use of CRS	Age	Up to 6-years old	Decree No. 1196/2012 – Art. 298	National
		Height	x		
		Weight	Up to 27 kg		
Mexico (c)	Prohibition of traveling in the front seat		Under 7-years old	Regulations for Traffic in Highways and Bridges of Federal Jurisdiction /2012 Art. 84	National
	Use of CRS	Age	x	There is no national legislation or regulation	National
		Height	x		
		Weight	x		
Paraguay	Prohibition of traveling in the front seat		Under 10-years old	Law 5016 year 2014 – Art. 58 item (g)	National
	Use of CRS	Age	Up to 5-years old	Decree 3427 year 2015 – Art. 22	National
		Height	Up to 1.10 m		
		Weight	Up to 36 kg		
Uruguay	Prohibition of traveling in the front seat		Under 12-years old	Law 18.191 de 2007 Art. 31and Decree 121/989 –Art. 5	National
	Use of CRS	Age	Up to 12-years old	Law N° 19.061 de 2013 – Art. 1 and 3	National
		Height	Up to 1.50 m		
		Weight	Up to 36 kg		

(a) Argentina: The table refers to national legislation. However, subnational authorities may consider specific laws with different requirements. For example, in the City of Buenos Aires, Law 5.294, voted in 2015, regulates and makes mandatory the use of CRSs in the City of Buenos Aires. The Law regulates that children less than 12-years old or 150 cm must travel in the rear seats using child restraint systems homologated and according to their weight and height.

(b) Chile: Prior to the Law 20 904 of 2016, article 75 of Law 18 290 of 2007, prohibited children less than 8-years old from traveling in the front seat of the vehicle.

(c) Mexico: The table refers to national legislation. 16 out of the 32 federal entities have legislation on CRS however only one is adequate (Jalisco).

All ten countries have legislation on transporting children in cars and this legislation differs country by country. Latin American countries should consider applying the relevant UN regulations in national legislation.

Use of child restraint systems

Figure 9.2 shows the percentage of use of CRS according to the specific studies carried out in six countries. As in the case of safety belts, the information provided by the different participating countries is not fully comparable. The percentage of use of CRS is very low in most countries. With the exception of Brazil (57%) and Argentina (47%), the percentage of use of child restraint systems does not reach 30%. Paraguay presents an extremely low percentage of CRS use: only 1%.

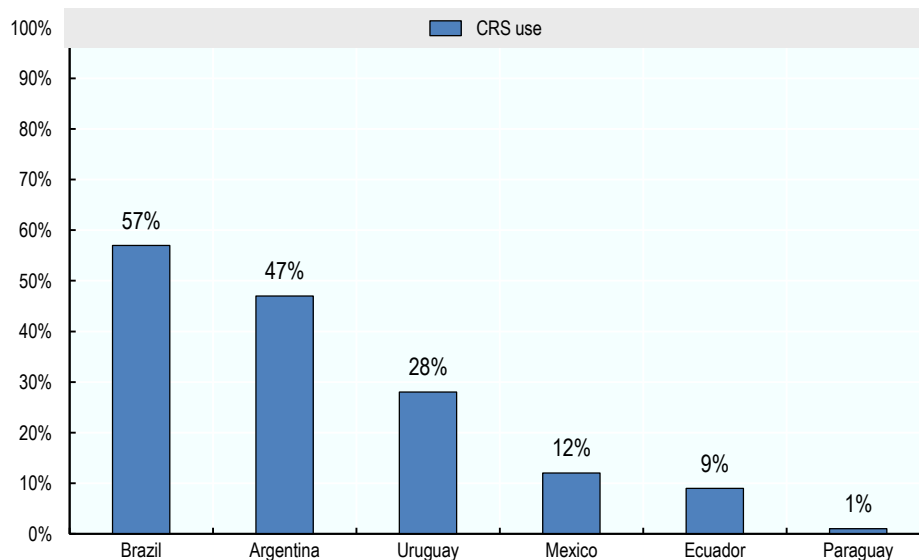
Usage rates are higher than 90% in countries such as Germany and the United States (UNECE, 2016), but many countries report misuse of CRS (UNECE, 2016). In Germany for example, only 35% of children in CRS are secured correctly. So in addition to proper legislation and adequate police

enforcement, education for parents should be a key cornerstone for policies to save children’s lives in car crashes.

It is not clear why the use of CRS is relatively low in Latin America. There are major differences regarding the decision-making process on the use of seat belts, airbags and child restraint systems. Almost all (modern) vehicles have seat belts, and not using them is a decision car occupants make at the start of every trip. For airbags the situation is different: they deploy in a certain crash and this is not dependent on any decision by the driver. But in case of child restraint, another and earlier decision has to be made: to buy a child seat, or not. Obviously, parents care for their children, yet CRS are hardly used in the countries studied here. According to local sources, only high-income families can actually buy this type of equipment for their children. It is worthwhile to further investigate this and to explore if high costs of purchasing a CRS are an important contribution to low CRS use. Further investigation should be carried out to understand the reasons why parents do not transport their children in child seats and how to substantially increase their use. If parents cannot afford to buy CRS, governments can take action to keep costs reasonable and help parents obtain a CRS, as suggested by Safe Kids Worldwide.

As shown in Figure 9.2, there is only information for six countries. It is recommended that all countries regularly collect this type of information. A common methodology to collect this type of information would be beneficial. OISEVI should have an important role in harmonising methodologies to collect these data.

Figure 9.2. Child restraint system use (%)



Source: Global Status Report on Road Safety (WHO, 2015), except with Ecuador and Paraguay.

Argentina: 2016, Observational Study in Argentina about behaviour and road culture. National Direction of Road Safety Observatory

Brazil: 2012, Safe Kids Brazil

Ecuador: 2014, National Control and Regulatory Agency of Land Transport, Transit and Road Safety – ANT

Mexico: 2012, ENSANUT

Paraguay: 2013, No source from the report of this information

Uruguay: 2013, Observational study of road behaviour. UNASEV

Tools to increase the use of seat belts and child restraints

The use of seat belts and child restraints is one of the most important measures to prevent injury in a motor vehicle crash. Although seat belts do not prevent crashes from happening, they reduce the severity of injuries and reduce, in this way, the number of people killed and seriously injured in a car crash.

The FIA Foundation developed a manual on seat belts and child restraints (FIA Foundation, 2009) which provides a comprehensive overview of relevant issues on the topic how to get seat belts and child restraints more and better used. This manual addresses:

- the need for seat belts and child restraints
- how to assess the situation in a specific country
- how to manage a seat belt programme
- how to develop and implement intervention
- how to evaluate the programme.

The building blocks of a successful contribution to have more car occupants use their seat belts start with legislation and penalties (seat belt fitting laws and usage laws: front and rear seats), seat belt standards and equipment, complemented by police enforcement and publicity campaigns.

It would be useful to carry out research projects in the ten countries on drivers' motivations to wear and not wear seat belts as a starting point for enforcement and campaigns to increase seat belt wearing. This is especially relevant for countries with relatively low wearing rates such as Argentina, Ecuador and Mexico. Special attention should be devoted to passengers sitting in the rear seats and for usage of CRS. There is also a need for surveys on road users' attitudes, perceptions, opinions, needs, experiences and expectations with respect to seat belts, as well as to road traffic risk. The European SARTRE project (Social Attitudes to Road Traffic Risk in Europe) can serve as a source of inspiration (<http://www.attitudes-roadsafety.eu/home/>). SARTRE is based on a common representative survey conducted in each participating member state, and a shared analysis of the large database. The information is useful for comparing the relative standing of member states on the issues examined.

The FIA has also developed a toolkit for child safety in cars (www.roadsafety.fia-grants.com). This toolkit is relevant to all countries and provides practical guidance on how to improve legislation and implementation regarding child restraint use. The toolkit is based on a stairway approach, taking into account the respective situation of each country.

It is good to know that in many high-motorised countries wearing rates are between 95-100%; Latin American countries should aim for this target in the coming years. The most recent vehicle features to improve seat belt wearing are audible seat belt reminders, which have been shown to increase seat belt wearing rates, and it is important that these enter Latin America markets in the future.

Figure 9.3. FIA Toolkit for child safety in cars



Source: FIA.

Road safety effects of increased seat belt wearing

It is possible to make an estimate at a national level of the number of lives saved due to wearing seat belts today and how many more lives will be saved if seat belt wearing rates are going up. For making these estimates several pieces of information are needed:

- the effectiveness of seat belts: E
- wearing rates in a reference year: R_{ref}
- the number of passenger car fatalities in a reference year: F_{ref}

With these three factors it is possible to estimate the number of passenger car fatalities when seat belt is zero (F_{zero}) and the number of passenger car fatalities for different wearing rates, for example 80% (F_{80} if R_{80}).

To the best of our knowledge no research results are available about the effectiveness of seat belt wearing in the ten participating countries. However, there are results from high-motorised countries and there is no reason to believe that effectiveness rates for Latin American countries will be very different. It is documented that the effectiveness for front-seat passengers is higher than for rear-seat passengers. However, because it is not known if people killed in a passenger car crash were sitting in the front or in the rear, this factor cannot be taken into account in these estimates. Therefore, the estimate is based on an effectiveness of 40% (see also the above section *Seat Belts*), which means that a belted person has a 40% lower probability of being killed in a crash than an unbelted person ($E = 0.4$). This is a rather conservative estimate. The calculation is based on wearing rates measured in the ten countries (see Figure 9.1).

The approach is simplified by two assumptions. The first one is that the effectiveness of seat belts is not dependent on the wearing rate. Furthermore, it is supposed that the effectiveness is the same for drivers and passengers (in the front and in the rear).

The number of fatalities in a reference year (F_{ref}) can be estimated starting with the number of fatalities if no one uses a seat belt (F_{zero}):

$$F_{\text{ref}} = F_{\text{zero}} - F_{\text{zero}} \times E \times R_{\text{ref}} \quad (1)$$

Or:

$$F_{\text{ref}} = F_{\text{zero}} (1 - E \times R_{\text{ref}}) \quad (2)$$

If we take, as an example, a wearing rate of 80%, the reduction in the number of fatalities is $0.4 \times 0.8 = 0.32$ and F_{ref} is 0.68 times F_{zero} .

If we change the wearing rate from 30% to 80%, we can estimate the reduction in the number of fatalities by using the following formula, derived from (2):

$$F_{80} = F_{30} \times (1 - E \times R_{80}) / (1 - E \times R_{30}) \quad (3)$$

Or: F_{80} is $(1 - 0.4 \times 0.8)$ divided by $(1 - 0.4 \times 0.3) = 0,727$ times F_{30} , a reduction of almost 28%.

Based on this approach three estimates are made for all ten countries: the number of people killed with wearing rates of 0%, of 80% and of 95%, compared with the number of fatalities reported for 2013. The results are summarised in Table 9.3.

The formula as presented in (3) is used and two more simplifications are made. First of all there is no information on the number of occupants sitting on front seats or in the rear seats. That is of relevance because of the different wearing rates for front and rear seats as presented in Figure 9.1. It is assumed that 75% of car occupants sit in the front, and 25% in the rear. Then it is possible to estimate a mean value of wearing rates per country using the information in Figure 9.1. A second simplification is that the impacts of seat belts and child restraint usage are not differentiated. The reason is that there are no data on the age distribution of car occupants and of fatalities in cars. But these limitations do not dramatically influence the results of this exercise.

Table 9.3 shows that an increase of wearing rates will make a substantial contribution in reducing the number of fatalities. Even with the rather conservative estimate on seat belt effectiveness, enormous positive safety impacts of increased wearing rates can be observed: the wearing rates in 2012/2013 saved already 20.6% (5 036/24 401) of car occupant fatalities in the ten countries (compared with a situation that no seat belts were used: R_{zero}). If it will be possible to increase wearing rates to 95% (this is a realistic option, based on the experiences in many other countries around the world, see for example \ ITF, 2016) *another* 22% (4 255/19 365) fewer car occupants will be fatally injured in a road crash (in total 20.6% + 22.0% = 42.6%).

Increasing seat belt wearing (and child restraint systems) will considerably improve road safety: thousands of lives have been saved already and many more will be saved if wearing rates and usage of child restraints are improved.

Table 9.3. **Estimates of number of killed and saved car occupants for three different wearing rates**
(as it was in 2012/2013, 0%, 80% and 95%)

Country	Reported wearing rate (%) (2013) (mean value*)	Fatalities 2013	Fatalities with F_{zero}	Number of lives saved in 2013 compared with R_{zero}	Fatalities with R_{80}	Number of additional lives that could have been saved in 2013 with a wearing rate of 80%	Fatalities with R_{95}	Number of additional lives that could have been saved in 2013 with a wearing rate of 95%
Argentina	34	2 619	3031	412	2 037	582	1 858	761
Brazil	64	9 727	13 073	3 346	8 851	876	8 106	1 621
Chile	61	586	775	189	527	59	481	105
Colombia	54	933	1 190	257	811	122	738	195
Costa Rica	63	169	226	57	154	15	140	29
Cuba	66**	171	232	61	158	13	144	27
Ecuador	30	448	509	61	346	102	316	132
Mexico	30	4 517	5 133	616	3 490	1 027	3 182	1 335
Paraguay	25	94	104	10	71	23	65	29
Uruguay	54	101	128	27	88	13	80	21
Total		19 365	24 401	5 036	16 533	2 832	15 110	4 255
Percentages		79.4	100	20.6	67.8	14.6	61.9	22.0

Notes: * the mean value of wearing rate assumes that 75% of car occupants are seated in front seats and 25% in rear seats.

** only for cars imported later than 2000

Conclusions and recommendations

There is generally adequate legislation on front and rear seat belt wearing, but major differences between countries when it comes to seat belt wearing rates. In general wearing rates are far lower than for the (many) best performing countries in the world where wearing rates are higher than 90%. Brazil, Chile, Colombia, Costa Rica, Cuba and Uruguay have front-seat wearing rates of 65-85%, while Argentina, Ecuador, Mexico and Paraguay have much lower rates of 30-40%. All countries experience very low rear-seat wearing rates (lower than 40%, and almost 0% in Colombia and Ecuador) where only Costa Rica is doing better than 50%.

Current wearing rates are already estimated to have substantially reduced vehicle occupant fatalities by 20%. However, this study estimates that, if a 95% wearing rate had been achieved, a further 4 255, or 22%, of car occupant fatalities would have been prevented in 2013 in the ten countries under review. Increasing wearing rates to 95% is considered a realistic option, based on the experiences in many other countries in the world, and should be a target set by all ten countries.

The use of child restraint systems (CRS) is remarkably low in all ten countries, and seems to be a neglected topic in all Latin American countries under review. Further research should be conducted in all countries to find out the causes of (extremely) low use of CRS and based on that to come up with additional activities.

All participating countries should prioritise increasing wearing rates of belts and use of CRS in their strategies. A combined approach is needed to significantly lift wearing rates: legislation on new and imported/second-hand vehicles, legislation and penalties on not using seat belts and CRS, enforcement and publicity campaigns to improve use of both front and rear seat belts and CRS (including specific parental campaigns for CRS, such as information and incentivised supply).

It is recommended that all countries implement a combined approach to lift rates of seat belt wearing and CRS through vehicle and behaviour legislation, and enforcement and promotion campaigns and set a target of achieving seat belt wearing rates of 95% for both front seats and back seats within the next five years.

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Chapter 10. Speed management

Speed and crash risk

Speed is related to the risk of being involved in a crash (for an overview, see for example Aarts and van Schagen, 2006). Higher absolute speeds lead to a greater risk of a crash and a greater probability of serious injuries in a crash. The increase in severity with higher impact speeds follows the laws of physics: the kinetic energy released in a crash increases by the square of the speed. The increase of crash probability with the increase of driving speed (sometimes called operating speed) can be explained through the increased distance travelled during the reaction time and the distance needed to stop. Studies suggest that as well as being a causation factor in around one-third of fatal crashes, speed is an aggravating factor in the severity of all crashes (OECD/ECMT, 2006).

If the average driving speed on a road increases, the risk of a crash also increases. The most well-known study of this relationship resulted in the power model of Nilsson (2004). The model, which is rather easy to understand, suggests that a 1% increase in average speed corresponds to an increase of 2% in injury crashes, 3% in serious injury crashes and 4% in fatal crashes. In other words: a 5% increase in average speed leads to a 20% increase in fatal crashes. Other models have been developed, also taking into account the type of road (urban streets, rural roads and motorways). And more recently it has been argued that an exponential model describing a relationship between speed and crashes was a better representation (Elvik, 2013). All models have rather similar results: higher speeds results in more and more severe crashes, and even relatively small changes in driving speeds can have significant effects on risks. Research has shown that speed changes in urban settings have a somewhat smaller effect than on non-urban roads (Elvik, 2009).

The severity of a crash is not just determined by the impact speed, but also by the mass differences between vehicles (a lower mass takes more of the kinetic energy in a crash than the higher mass) and by the crashworthiness of the vehicles and the vulnerability of the road users involved in a crash. We can protect the human body by adding more protection, for example by improving the crash-worthiness of vehicles (for example rated in New Car Assessment Programme [NCAP] tests of vehicles), by using seat belts and airbags or by using a crash helmet when riding a powered two-wheeler.

Vulnerable road users are hardly “protected” in a crash and for that reason rather low-impact speeds result in serious injuries for pedestrians and cyclists in a crash. Research reveals (Rosen et al., 2011) that 95% of pedestrians can survive a collision with a motorised vehicle at an impact speed of 30 km/h, about 40% survive at an impact speed of 80 km/h and hardly anyone survives at an impact speed of 100 km/h.

Speed management is a key issue of any road-safety strategy. Speed management should ideally reduce impact speeds to levels that, when a crash occurs, the forces on the human body are lower than levels resulting in serious injuries. This is one of the principles in the Safe System approach and leading to a concept called safe (impact) speeds described in Table 10.1.

Table 10.1. **Safe speeds given possible conflicts between road users**

Road configuration	Safe speed
Roads with possible conflicts between cars and unprotected road users	30 km/h
Intersections with possible transverse conflicts between cars	50 km/h
Roads with possible frontal conflicts between cars	70 km/h
Roads with no possible frontal or transverse conflicts between road users	≥ 100 km/h

Source: Wegman and Aarts (2006), based on Tingvall and Haworth (1999).

A safe speed is 30 km/h if motorised vehicles and vulnerable road users share roads or streets. At intersections an impact speed should be lower than 50 km/h in order for users to survive in a side impact; on rural roads impact speeds should be lower than 70 km/h in order for them to survive in case of a frontal crash. A safe speed above 100 km/h on motorways is acceptable from a crash impact perspective in the case of safe road sides, prevention of head-on collisions by appropriate barriers and by grade-separated intersections. But the essential principles are valid for this situation as well: higher absolute speeds lead to a greater risk of a crash and a greater probability of serious injuries in a crash.

Finally, it is also important to highlight that reducing operating speeds cannot only significantly reduce the number of traffic casualties but also contribute to less emissions of local pollutants and greenhouse gas, a reduction in noise levels and in turn a better quality of life for citizens, especially in urban areas (OECD/ECMT, 2006).

Speed limit systems

Speed limits are usually set for different road types. Speed limits should be set based on the functionality of the road and on the road environment. This means that each road should be categorised based on its function (see also Chapter 3) and each type of road should have a default speed limit. Speed limits may also be differentiated for different types of vehicles, for different weather conditions (in case of rain for example) and for different traffic conditions. The following sections review prevailing speed limits for the three main road categories: rural roads, motorways and urban streets.

In urban settings, the maximum default speed limit should be 50 km/h, with lower speed limits in residential areas and near schools. Higher urban speed limits are acceptable if conditions for higher travel speeds (i.e. no possible conflict with vulnerable road users) are met. In rural settings, without information on road design standards and the quality of the infrastructure for each country, it is not possible to draw conclusions on the appropriateness of speed limits. It is recommended that each country reviews its rural network speed limits, taking into account the quality of the road design, and the safe speed considerations set out in Table 10.1. Such a review can shed light on the appropriateness of the prevailing speed limits in the context of the road and traffic environment. Motorways are a high speed environment. Good design of motorways is crucial to create a safe environment for these high speeds. Further assessment of motorways is also needed to consider the appropriateness of speed limits

Speed limits for major rural roads

Table 10.2 summarises the speed limits on major rural roads, which are not motorways. A wide variation in speed limits for major rural roads can be observed, which range from 50 to 120 km/h. In several countries, speed limits are lower for trucks and buses.

Table 10.2. **Speed limits on major rural roads**

Country	Passenger cars	Buses/coaches	Trucks	Motorcycles	Comments
Argentina	110 km/h	90 km/h	80 km/h	110 km/h	Not applicable on motorways or semi-motorways
Brazil	110 km/h (double carriageway); 100 km/h (single carriageway) 90 km/h for car+trailer	90 km/h	90 km/h	110 km/h (double carriageway); 100 km/h (single carriageway)	For rural unpaved roads: 60 km/h for all vehicles
Chile	120 km/h if there are 2 or more lanes in each direction 100 km/h if there is one lane in each direction	90-100 km/h	90 km/h	120 km/h if there are 2 or more lanes in each direction 100 km/h if there is one lane in each direction	
Colombia	80-120 km/h	80 km/h	80 km/h	80-120 km/h	The default speed limit is 80 km/h; Speed limits for cars and motorcycles can be increased up to 120 km/h following an evaluation of the road. In practice very few roads meet the requirements for 120 km/h
Costa Rica	50-100 km/h	50-100 km/h	50-100 km/h	50-100 km/h	
Cuba	90 km/h 70 km/h car+trailer	90km/h	60 km/h	90 km/h	
Ecuador	100 km/h 70 km/h for car+trailer	90 km/h	70 km/h	100 km/h	
Mexico	100 km/h	95 km/h	80 km/h	100 km/h	
Paraguay	110 km/h	100 km/h 90-110 km/h for buses	90-110 km/h	90-110 km/h	
Uruguay	90 km/h	90 km/h	80 km/h	90 km/h	

Speed limits for motorways

Table 10.3 summarises the prevailing speed limits on the motorway network. A first remark is that several countries do not have a motorway network. Speed limits on motorways range from 90 to 130 km/h for cars. In all countries, there is a lower speed limit for trucks and buses.

Table 10.3. **Speed limits on motorways and length of the motorway network**

Country	Passenger cars	Buses/coaches	Trucks	Motorcycles	Length of motorway network
Argentina	120-130 km/h	90-100 km/h	80 km/h	120-130 km/h	2 237 km
Brazil	110 km/h (double carriageway); 100 km/h (single carriageway) 90 km/h for car+ trailer	90 km/h	90 km/h	110 km/h (double carriageway); 100 km/h (single carriageway)	10 000 km
Chile	120 km/h	100 km/h (coaches) 90 km/h (school buses)	90 km/h	120 km/h if there are 2 or more lanes in each direction 100 km/h if there is one lane in each direction	Unknown
Colombia	120 km/h		80 km/h		
Costa Rica	No motorways				
Cuba	100 km/h 90 km/h for rigid or articulated load light vehicles. 80 km/h car+trailer	100 km/h	80 km/h for pickups 60 km/h for trucks	100 km/h	656 km
Ecuador	100 km/h 70 km/h for car+trailer	90 km/h	70 km/h	100 km/h	Unknown
Mexico	110 km/h	95 km/h	80 km/h	110 km/h	9 174 km
Paraguay	No motorways				
Uruguay	No motorways				

Speed limits on urban roads

Table 10.4 summarises the speed limit on urban roads.

Table 10.4. Speed limits on urban roads

Country	Passenger cars	Buses / coaches	Trucks	Motorcycles	Comments
Argentina	20-60 km/h Default speed limit: 60 km/h	20-60 km/h	20-60 km/h	20-60 km/h	
Brazil	30 km/h – local roads; 40 km/h – collector roads; 60 km/h – arterial roads; 80 km/h - urban expressway	30 km/h – local roads; 40 km/h – collector roads; 60 km/h – arterial roads; 80 km/h - urban expressway	30 km/h – local roads; 40 km/h – collector roads; 60 km/h – arterial roads; 80 km/h - urban expressway	30 km/h – local roads; 40 km/h – collector roads; 60 km/h – arterial roads; 80 km/h - urban expressway	
Chile	60 km/h	50 km/h	50 km/h	60 km/h	30 km/h near schools
Colombia	60 km/h	60 km/h	60 km/h	60 km/h	30 km/h in residential areas
Costa Rica	50 km/h	50 km/h	50 km/h	50 km/h	
Cuba	40-50 km/h	40-50 km/h	40-50 km/h	40-50 km/h	
Ecuador	50 km/h	40 km/h	40 km/h	50 km/h	
Mexico	10 km/h – near schools, hospitals, parking lots and pedestrian roads where vehicles are allowed to circulate 20 km/h - traffic calming zones 30 km/h – residential roads 40 km/h – secondary roads and lateral roads 50 km/h – main roads 80 km/h – urban expressway with controlled access				
Paraguay	50 km/h	50 km/h	40 km/h	50 km/h	20 km/h near schools, hospitals, sport centres, churches...
Uruguay	45 km/h	45 km/h	45 km/h	45 km/h	

Speed limits vary from 45 to 60 km/h, with several countries mentioning lower speed limits in residential areas and near school zones, with the exception of Argentina (20 to 60 km/h) and Mexico (10 to 80 km/h), which have wide ranges for their urban speed limits.

OECD/ECMT (2006) has set the benchmark “default value” at 50 km/h speed limit for urban areas, although there are developments in several European countries regarding a default speed limit of 30 km/h, especially for residential areas and school zones. We recommend a 50 km/h speed limit to be considered as a maximum in all Latin American countries. The wide range in Mexico and Argentina is related to specific roads and streets and, if done properly, this can be a safe solution. They should carefully review where speed limits above 50 km/h apply, and consider lowering speed limits to 50 km/h or below to any roads or streets that are not an urban expressway. Chile and Colombia should consider lowering the urban speed limit from 60 to 50 km/h.

Reducing speed limits from 60 km/h to 50 km/h leads to substantial improvements in road safety. Based on available evidence, it can be assumed that a speed limit reduction of 10 km/h will result in practice in a speed reduction of 4 km/h (this comes from several studies in the world), it can be estimated (using the Nilsson Power-model) that this speed limit reduction will result in a 20% reduction in the number of fatalities and a 13% reduction in serious injuries. Table 10.5 estimates the number of lives that could be saved in Chile and Colombia, should a 50 km/h speed limit be introduced (and enforced).

Table 10.5. **Rough estimation of the number of lives that can be saved by lowering the speed limits from 60 to 50 km/h in Colombia and Chile**

Country	Number of road deaths in urban areas in 2013 (speed limit = 60 km/h)	Estimation of the number of lives that could be saved should the speed limit be 50 km/h
Chile	602	120
Colombia	3 902	780

Adopting a lower speed limit (e.g. 30 km/h) in residential areas, near schools or other sensible areas, where there is a dense pedestrian activity (as is already the case in Brazil, Chile, Colombia, Mexico and Paraguay) is also recommended. Casualty reductions of up to 60% have been registered, but the effects can be smaller depending on the physical changes used to achieve this reduction. Elvik et al. (2009) consider 25% to be a more typical average reduction.

Speed limits higher than 50 km/h limits can be acceptable on high quality roads in urban areas with no risk of vulnerable road users coming into conflict with a motor vehicle, and lower operating speeds at intersections, for example through roundabouts or lower speed limits (50 km/h).

Sanctions for speeding

The sanction regime for violations of speed limit applied in the 10 countries is summarised in Table 10.6. All ten countries have designed a penalty system for speed violations. Sanctions can typically take different forms: financial fines, withdrawal of points on the driving license, suspension of driving license, imprisonment (in the most extreme cases). All countries apply a financial fine in case of speeding. The amount of the fine may depend on the severity of the violations. A few countries have higher fines for drivers of buses or trucks.

As seen in Chapter 2, a few countries have a demerit point system in place, for example Cuba and Ecuador. In Argentina, Paraguay and Mexico, it exists in theory, but it is either not implemented or not similarly implemented in various jurisdictions in a country. Regarding speed violations, Argentina, Ecuador and Paraguay have a demerit point scheme. It is not known how effective these systems are in reducing speed violations in these three countries, but a European study (van Schagen and Machata, 2012) concluded that demerit points systems are less effective than their popularity in Europe suggests. Initially, they have a considerable road safety effect, but often don't last as a deterrent. The effectiveness of a demerit point system may be improved by good design, maintaining a high objective and the subjective risk of being caught remain high and including automatically detected offences.

Suspension of the driving license may be applied for severe speed violations; Ecuador and Costa Rica report imprisonment sanctions in the most severe cases. Elvik et al. (2009) found licence suspension to be effective only among drivers whose licence has been suspended, and only while the licence actually

was suspended. It was also found that many drivers with a suspended licence continue driving illegally. Police enforcement is important to prevent illegal driving.

Table 10.6. **Sanction regime for speed limit violations**

Country	Sanctions
Argentina	Fine of 150 to 1 000 Fixed Units (UF)*, equivalent to USD 172–1 144. As of 5 August 2016, 1 UF = 17 Pesos = USD 1.14. Withdrawal of 5 points (out of 20)**
Brazil	Until 20% of the speed limit – Medium infraction: USD 41.5 Between 20% and 50% of the speed limit: Serious infraction: USD 62.2 More than 50% of the speed limit: Very serious infraction: USD 280.4, license suspension.
Chile	Up to 10 km/h above the speed limit: Fine of 0.5 – 1x UTM (U.T.M. - Unidad Tributaria Mensual), approx. USD 34 – 67. Between 10-20 km/h above the speed limit: Fine of 1 – 1.5 UTM, approx. USD 67-100. More than 20 km/h above the speed limit: Fine of 1.5-3 UTM, approx. USD 100-202. License suspension of 5 to 45 days.
Colombia	School bus: Fine of 30 x daily minimum wage, equivalent in 2013 to 589 500 Pesos (approx. USD 315). Other vehicles: Fine of 15 x daily minimum wage equivalent in 2013 to 294 800 Pesos (approx. USD 158).
Costa Rica	Above 25 km/h near schools, health facilities, or other: Fine of USD 85. Above 120 km/h: Fine of USD 505. Above 150 km/h: prison from 1 to 3 years; License suspension from 2 to 5 years.
Cuba	Driving above the speed limit (any amount of km/h): Fine of 3 USD and withdraw of 12 points (out of 36).
Ecuador	Extreme speeding: 3 days of imprisonment. Fine based on the minimum wage unit (USD 366). Withdrawal of 10 points (out of 30). Moderate speeding: Fine corresponding to 30% of the minimum wage unit (USD 110). Withdrawal of 6 points (out of 30).
Mexico	Up to 20 km/h above the speed limit: Fine of USD 350-420 for cars and motorcycles; USD 420-490 for trucks; USD 560-700 for buses. 20 km/h above the speed limit: Fine of USD 420-490 for cars; USD 560-700 for trucks; USD 700-840 for buses.
Paraguay	Exceeding the speed limit is considered as a “serious” offence. Fines of 4 to 10 minimum daily wages, equivalent 280.624-701.560 Pesos, i.e. approx. USD 51-127.5 (as of 10 August 2013, 1 Guaranies = USD 0.182) Withdrawal of points or suspension of driving license, depending of the severity of the violation.
Uruguay	Moderate speeding (grade 4 infraction): Fine of 4 x Reajustable Unit (UR***), approx. USD 125. More than 25% above the speed limit (grade 7 infraction): Fine of 15 UR, approx. USD 468.

Notes: * In Argentina, fixed units (UF) are based on the lower retail price of 1 litre of special naphtha.

** Not yet implemented at the national level, only in Buenos Aires City.

** Uruguay: UR (readjustable unit) is based on the average index wages (IMS). As of 10 August 2016, 1 UR = UYU 907.20 = USD 0.034347.

The sanction systems as described give the impression that the penalties are rather balanced, and perhaps more severe than in other countries in the world. We did not get however information on the actual speed enforcement and application of the sanctions. It would be of interest to learn how penalties are actually applied (violation type, frequency, location, transport mode, consequences in the case of non-payment of the fine, etc.) and how the population perceives the systems. Without this information it is impossible to fairly compare the quality of sanction systems. This is a useful area for further research, perhaps organised continent-wide in conjunction with other behavioural aspects, including the population's perception about police enforcement.

Sanctions are only one element in the “enforcement chain”. The question is how to make police enforcement (including giving penalties) effective in changing behaviour of road users and preventing violations. We have no information from Latin America on this, but the key element of effective enforcement is the subjective risk of being apprehended by the police when violating a speed limit. This subjective risk should be supported by an objective risk of being apprehended that is high enough, otherwise police enforcement loses its credibility. Of course, enforcement only works if a population trusts its police force. If that is the case, the severity of the penalty can affect behaviour, but the influence of the size of the penalty given is modest, and less important than the risk of being apprehended. It is important to emphasise that speed enforcement activities contribute to road crashes reduction. According to Elvik et al. (2009), the use of, for instance, stationary visible enforcement with radar/laser is able to achieve a reduction 17% on road crashes, and fixed (visible) speed cameras are able to reduce up to 39% of fatal crashes.

Speed measurements

Information on speed and speeding behaviour is useful to assess the magnitude of the speeding issue, to understand how driving speeds impact risks and to make a good estimate of the potential of speed management measures to reduce crash risk. Unfortunately, this information was not available. It is recommended to set up a measurement programme for driving speeds. The aim should be to develop a so-called safety performance indicator (SPI) for driving speeds for different road types/speed limits and for different vehicle categories. OISEVI could play a role and support the development of a harmonised instrument. The SPI should be measured on a regular basis (annually or biannually for example) so that comparable, valid, reliable and regular information is available on driving speeds.

To have some insight in driving speeds in the ten countries, the International Road Assessment Programme (iRAP) shared information for five countries, where iRAP is running projects on road assessment: Colombia, Brazil, Chile, Mexico and Uruguay. These data have been collected per segment of road as inspected by iRAP. Methods to assess driving speed are described in Table 10.7 and the actual speed measurements are presented in Table 10.8.

iRAP inspected only a (small) sample of roads per country, and the sampling has not been designed in such a way that the results give a representative picture of driving speeds (and design characteristics) in a certain country. Also the methods for different countries are not necessarily exactly the same. In other words it cannot be claimed that the results could be compared, but the results certainly give a rough impression of speed behaviour.

Table 10.8 shows that in four of the five countries all mean speeds are higher than the speed limits. That is the case for Colombia as well, but only for the lower speed limit classes. If the mean speed is higher than the speed limit, this means that the majority of drivers are driving faster than the speed limit. In other words: we observe a massive speeding problem in these five countries for all speed limit categories. If the speed violation is so massive and so wide spread, it is hard to believe that the situation

is completely different in the other five countries. In other words, speeding is a key road safety issue in Latin America. Speed management should be a key activity of every road safety strategy and has the potential to produce great positive road safety effects.

Table 10.7. **iRAP Operation speed estimation methods**

Country	Operating speed estimation method
Brazil	Estimates based on speed limit data and analysis of other road attributes, and reviewed by local authorities
Chile	Estimates based on speed sampling at fixed locations and analysis of road attributes, and reviewed by local authorities
Colombia	Estimates by local authorities based on speed samples at fixed locations in urban areas and analysis of other road attributes in rural areas
Mexico	Estimates based on moving-vehicle speed sampling and analysis of road attributes, and reviewed by local authorities
Uruguay	Estimates based on speed sampling at fixed locations and analysis of road attributes, and reviewed by local authorities

Source: iRAP.

Table 10.8. **Mean driving speeds for five countries per speed limit category**

Speed limit (in km/h)	Colombia		Brazil		Chile		Mexico		Uruguay	
	Mean speed	Difference	Mean speed	Difference	Mean speed	Difference	Mean speed	Difference	Mean speed	Difference
<30	66	36	63	33	70	40	71	41	76	46
40	68	28	68	28	60	20	73	33		
50	70	20	69	19	95	45	75	25	78	28
60	68	18	80	20	83	23	79	19	85	25
70	71	1	88	18	90	20	83	13	78	8
80	73	-7	91	11	93	113	89	9	99	19
90	73	-17	107	17	90	0	96	6	103	13
100	78	-22	114	14	100	0	105	5		
110			122	12			110	0	115	5
120			130	10			125	5		

Note: Different measurement time between 2009 and 2015.

Source: iRAP.

Tools for managing speed

There are many tools for effective speed management (see WHO, 2008 and OECD/ECMT, 2006). Tools are composed of a similar set of interventions:

- setting appropriate speed limits
- engineering treatments
- enforcing limits by police combined with public information and education campaigns
- applying new technologies (speed-limiting, speed-adaption and section control)
- managing speed for vehicle fleets (by employers).

The WHO manual gives a set of intervention options illustrated with examples. OECD/ECMT (2006) published a state-of-the-art report on speed management interventions. The outputs of the European Project DaCoTA are also another reference for speed management aspects (DaCoTA, 2012). The Safe System approach (ITF, 2016) embraces speed management as one of the principles for road safety. A lot of evaluation results are available, and Latin American countries could develop their own approach to manage speed using international knowledge and experiences.

We were not able to identify “good practices” on speed management in any of the participating countries. This means that the recommendation is not based on LAC-experiences but on experiences from other parts of the world. It is recommended that all countries participating in this project identify speed related risks and speed management to reduce risks as a central element in road safety strategies.

In the framework of this study a few observations can be made. First of all, speed management is extremely important for vulnerable road users, because these groups have hardly any protection in a crash. It is relevant to note that separation of modes (sidewalks and cycle tracks) tries to eliminate these vulnerable road users being exposed to fast driving motorised vehicles. Secondly, we know from studies in other parts of the world that (high) driving speeds of powered two-wheelers is one of the risk factors for this group. Unfortunately, this study has limited information on this issue. Furthermore, we have limited information on successful interventions for this category of road users. Countries with high numbers of powered two-wheelers, such as Colombia and Uruguay, could develop their own approaches to manage driving speeds of powered two-wheelers and the rest of the world can perhaps learn from that.

A third item to mention here is the potential application of new technologies to reduce driving speeds (in-vehicle technology like intelligent speed adaptation) and to increase police enforcement effectiveness and efficiency through average speed enforcement systems. Applications of these technologies are promising, and particularly useful, for example, on rural roads where it is inefficient to introduce sufficient traffic engineering measures to safely manage travel speeds (high costs versus low benefits per kilometre of road length) or direct enforcement by police officers. However, acceptance of the public, political interest and stakeholder support are key ingredients for successful implementation. Countries in Latin America should look for political and public support for introducing new technologies through pilot projects, to inform and shape full-scale implementation.

Conclusions and recommendations

There is abundant evidence that speed and crash risk are very closely related. As a rule of thumb, a 10% increase in average speed leads to a 40% increase in the number of fatal crashes, and a 10%

decrease in average speed leads to a 40% decrease in the number of fatal crashes. Even small changes in mean speed result in significant benefits in terms of crash and injury reduction. Speed management should be at the core of any road safety strategy, and has huge potential in reducing the number of people killed and seriously injured in Latin America.

All countries have speed limits for all roads (urban, rural and motorways). The default urban speed limit should be 50 km/h and 30 km/h zones should be promoted near residential/school areas. Higher speed roads can only be considered where motorised and non-motorised users are provided separate facilities. The urban speed limit of 60 km/h in Argentina, Chile, Colombia and Mexico (in the majority of states) is too high. It is recommended that this limit is reduced to 50 km/h in these countries, from which a 20% reduction in urban fatalities can be expected. Without more information it is impossible to assess if speed limits, on (major) rural roads, are safe. We recommend a further assessment of rural speed limits. Further assessment of motorways is also needed to consider the appropriateness of speed limits for this high-speed environment.

There is not enough data or research to clearly quantify the situation with respect to speeding in the countries included in this study. However, the available data suggests there is a massive speeding problem across all speed limits, but particularly so in urban areas.

Whatever the speed limit, it should be strictly enforced, targeting all vehicles. Ideally, speed enforcement is automated, with well-targeted mobile camera and average speed camera operations (Wilson et al., 2010). However, this requires strong and legislated penalty systems which connect drivers with vehicles, and make owners accountable for those who use their vehicles. An intermediate step towards this is strict, politically mandated, enforcement of the speed limit just above the speed limit.

Particularly given the potential benefits of progress in this area, a sustained speed management study conducted by OISEVI in collaboration with country agencies could be highly beneficial. Such a study could: investigate the quality and quantity of police enforcement practice, and application of sanctions; review prevailing speed limits and make recommendations regarding safe speed limits; monitoring free traffic speeds to focus interventions and track progress over time.

It is recommended that all Countries implement a strong speed management policy, and in particular:

- Apply a default urban speed limit of 50 km/h, promote 30 km/h near residential/school/shopping/recreation areas, and provide for higher speed limits only where motorised and non-motorised users are provided separate facilities.
- Intensify enforcement with the introduction of automatic speed control supported by effective administrative penalty systems.

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Chapter 11. Post-crash response

Importance of post-crash response

Post-crash care is essential to avoiding preventable death and limiting the extent of temporary and long-term disabilities resulting from injuries due to road crashes. The faster the stabilisation and hospitalisation of the injured person, the greater the patient’s potential for survival and full recovery.

According to Mock et al. (2003), improvements in prevention or pre-hospital care are more likely to impact trauma mortality than hospital-based care alone. The proportion of patients who die before reaching hospital in low- and middle-income countries is over twice that in high-income countries (WHO, 2015), suggesting that strengthening pre-hospital systems could have an enormous global impact.

To support countries in elaborating adequate post-crash response programmes, WHO (2016) published a booklet stating that: “A broad and integrated approach to support can mitigate the short and long-term effects of experiencing a crash and can help those affected return to function and independence at home and at work”. This booklet describes the key components of the programmes summarised in Box 11.1 and Figure 11.1. Such programmes should integrate injury care, mental health services, legal support, and legislation with systematic collection of data on crashes and injuries. WHO also published a reference guideline for trauma care (Mock et al., 2004; 2006), which establishes 11 core essential trauma care services and 260 items of human and physical resources that should be implemented in all health facilities.

Box 11.1. Key components of a post-crash response programme

1. Emergency care and rehabilitation for injury. The emergency care of injuries may be considered the core of the post-crash response, since it requires several time-sensitive actions: system activation (response to the emergency call and arrival to the accident scene), care at the scene, transport, and facility-based emergency care. The optimal pre-hospital care is provided by a responsive system that can rapidly dispatch equipped ambulances with trained providers.

Emergency number: The most effective option for a quick first response is the existence of a single nationwide or regional telephone number that is free, easy to remember, linked to a dispatch centre that can rapidly send an equipped ambulance with trained personnel, and able to guarantee the confidentiality of the caller. Nevertheless, in areas where the access to care is limited, other solutions that have been shown to be effective may be considered, like protocols for mobile phone notification of community-based lay responders.

First aid training: One recent addition to the emergency care improvement is the request of first aid training for drivers before issuance of driving licenses, and that all drivers carry basic first aid supplies. First aid programmes have proven effective, in particular when incorporated into existing training programmes for other professionals, such as police and taxi drivers.

Transferring injured people: Transferring the injured has two distinct components: transport and care during transport. It is recommended that ambulances are well-equipped and have trained staff. For countries with no formal pre-hospital care systems, taxis and private vehicles are often used to transport the injured. For these situations, providing basic training for these drivers is a low-cost means of improving safety.

Matching patients to the appropriate trauma centre: Matching injury severity to the right facilities is extremely important, in order to ensure that the necessary equipment and personnel to provide the care are available. A system of centre designation can set standards for injury care and designate certain hospitals as trauma centres. Clear protocols direct pre-hospital providers to take seriously injured persons directly to these higher-level facilities for treatment, while those with minor injuries may be treated at closer, lower-level facilities. This will allow for more effective use of limited resources, reduce delays in life-saving treatments, and has been shown to improve patient outcomes overall (Sasser et al., 2005; Cameron et al., 2008).

Hospital emergency care: Effective emergency care at hospitals should ensure a systematic approach to every injured patient. This can be achieved through a dedicated emergency unit with a specific team and essential equipment for diagnosis and treatment of injuries.

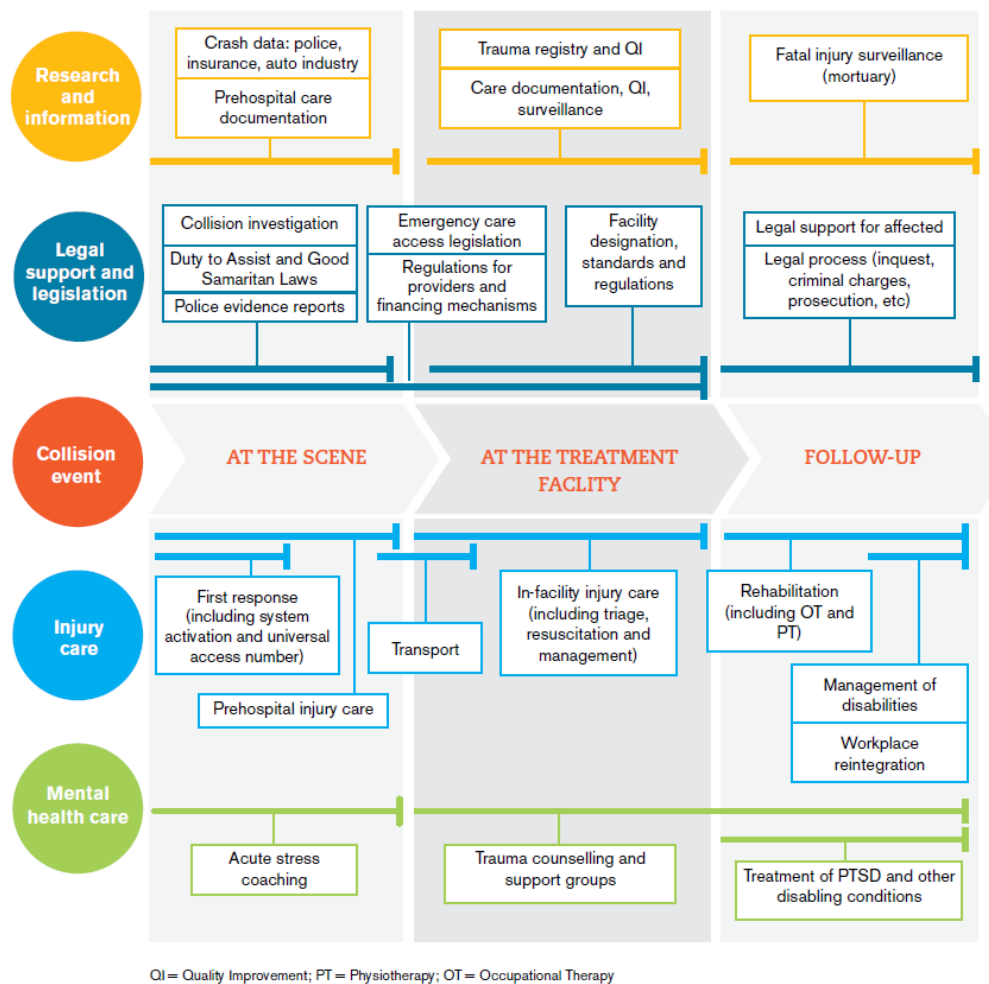
2. Mental health care. The consequences of a crash, either physical or psychological, may be long lasting. The adjustments to long-term physical incapacities can increase the risk of developing psychological disabilities. Post-traumatic stress disorder (PTSD) after a road traffic crash is one of the most common consequences of road traffic incidents (WHO, 2009), but grief, panic and bereavement are also prevalent. If they are not appropriately treated, they may restrict the ability for the injured to proceed normally in life. Rehabilitation can help to alleviate suffering, and also to help in the restoration of independence and reintegration into society.

3. Legal support. Effective post-crash response includes policy and legislation to protect the injured, their families, and bystanders who deliver first aid; to facilitate legal and financial accountability and ensure compensation; and to promote post-injury recovery and reintegration into work and home life. These may include laws that enable access to timely care; laws that ensure adequate crash investigation; laws that mandate adequate liability insurance for drivers; legal protections to facilitate civil and criminal justice processes, including reparations, and legal protections for those with disability resulting from injury.

4. Data on crashes and injuries. The improvement of post-crash services and injury prevention strategies definition should be properly substantiated in data on injuries and crashes. Trauma registries include details on injuries, clinical interventions and health outcomes, which allow the identification of risk factors for injury occurrence or for specific gaps in quality of care.

Source: WHO (2016).

Figure 11.1. Key components of the post-crash response



Source: WHO (2016).

Measuring post-crash care performance

Road trauma recovery involves a very wide scope of actors and procedures, from triggering emergency medical services (EMS), to attending injury treatment and rehabilitation facilities and, ultimately, re-integrating the injured person into their place in the community.

Several types of indicators can be defined to measure the quality of trauma recovery systems that may be used for international comparisons. Box 11.2 presents a list of the core indicators defined within the European project SafetyNet.

Box 11.2. Trauma management safety performance indicators defined within the European Project SafetyNet

A list of nine trauma management safety performance indicators was considered as a core set of the Trauma Management system's performance.

1. The number of EMS stations per area
2. The number of EMS transportation units per road length
3. The number of EMS transportation units per citizens
4. Percentage of physicians and paramedics out of the total EMS staff
5. Percentage of highly-equipped transportation units out of the total
6. The demand for response time
7. Average response time of EMS
8. Percentage of EMS responses meeting the demand
9. The number of trauma care beds per citizens.

Source: Gitelman et al. (2008).

Status of post-crash response in Latin America

In this study, the following data was collected: number of evacuations to trauma centres (by transport mode); number of hospitalisations in intensive care units; time needed for arrival of rescue teams to the crash scenes, for administering first treatments at the scene, and for arrival to the hospital; number of emergency medical stations, vehicles and trauma beds in permanent medical facilities and length of stay in hospitals.

Unfortunately only one country provided data on road injuries disaggregated by mode of transport to trauma centre (self, regular ambulance, mobile intensive care unit and helicopter). In addition there is little data and information readily available on whether evacuation to a trauma centre was due to a road crash or a work-related or other accident.

Emergency response time

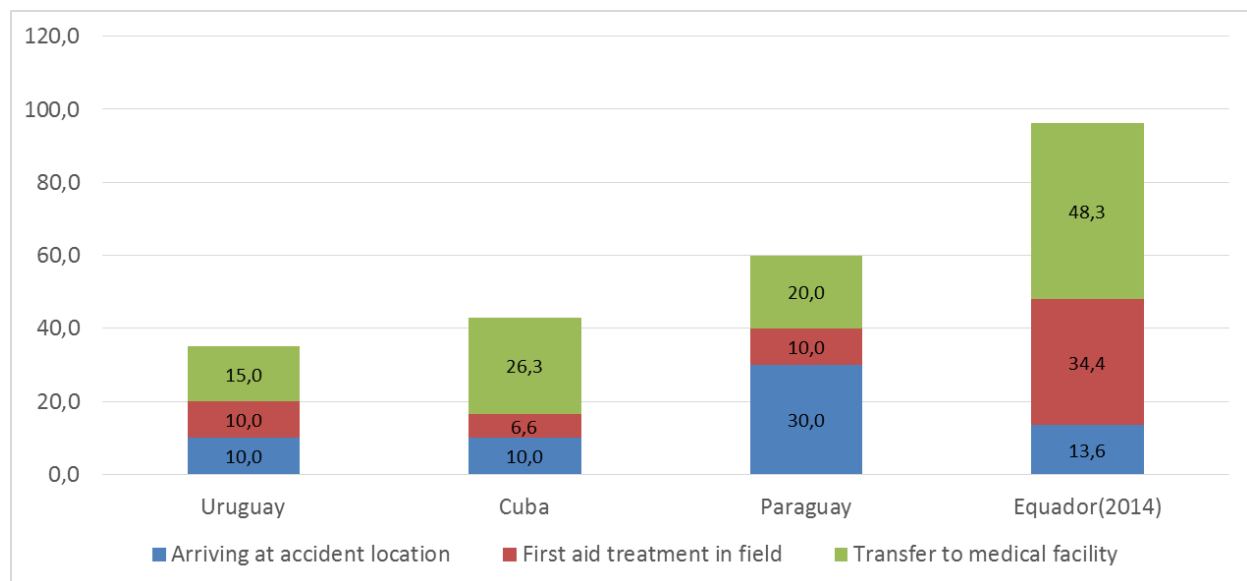
Figure 11.2 presents the average response time between the crash occurrence and the arrival at hospital of the injured casualties, highlighting the three main phases: arrival of emergency services at the scene of the crash; first aid at the scene of the crash and transport from the crash location to the hospital. This information was available for four countries: Cuba, Ecuador, Paraguay and Uruguay. Among these four countries, Ecuador has an average overall response time of 96 minutes, while it is 50 minutes in Paraguay, 42 minutes in Cuba and 35 minutes in Uruguay.

The time required for the emergency service to reach the scene of a crash is a critical element. According to a European study (Gitelman et al., 2008), the response from crash occurrence notification until arrival at the accident scene in regional states of Germany range between 10 and 15 minutes, the actual mean time ranging between 8.1 and 9.5 minutes. Response times in Uruguay, Cuba and Ecuador are within this range. The response time in Paraguay is three times longer than in Uruguay.

There are wide variations on the average reported duration of first aid at the scene of crashes from 6 minutes in Cuba to 34 minutes in Ecuador. We tend to consider that a fast first aid response is better in order to quickly transport injured persons to the hospital. Nevertheless, the quality of the first aid is highly dependent on the injury level, the nature of the team sent to the crash scene (presence or not of a medical doctor equipped to intervene on the spot) and the equipment at their disposal. As this information is not available, it is not possible to draw any conclusions on this matter.

The duration of the transfer of the casualties from the crash scene to the hospital depends mainly on the distance to the nearest hospital, the quality of the road infrastructure and the congestion level. The transfer time is 15 minutes in Uruguay, 20 minutes in Paraguay, 26 minutes in Cuba and 48 minutes in Ecuador. Without further information on the average distance to hospitals, it is difficult to draw conclusions on the effectiveness of the various systems, nevertheless the duration reported in Ecuador is particularly long; and this really deserves attention. Additionally, for Paraguay, it was found that transporting the injured from an accident location to a hospital is considerably shorter than transporting the emergency services to the accident scene, which is not expected, since the journey with injured patients should take longer.

Figure 11.2. Average response time in minutes following a crash (2013)



Emergency access number

WHO recommends that there should be a single nationwide or regional telephone number that is: valid throughout the country, available as a free call from every telephone (landline or mobile), easy to remember and dial (limited to three or four digits), linked to a dispatch centre that can rapidly send an equipped ambulance with trained personnel, and able to guarantee the confidentiality of the caller.

Table 11.1 summarises the current situation regarding the existence of a unique emergency number. All the ten countries have an emergency number system in operation and it is the same number (911) in four countries. In Mexico there are various numbers.

Table 11.1. **Emergency phone numbers**

	Emergency number	Emergency room injury surveillance system
Argentina	Yes, but multiple numbers	Yes
Brazil	Yes, 119	Yes
Chile	Yes, 133	Yes
Colombia	Yes, 123	No
Costa Rica	Yes, 911	Yes
Ecuador	Yes, 911	No
Mexico	Yes, 911 since the second semester of 2017	No
Paraguay	Yes, 911	Yes
Uruguay	Yes, 911	Yes

Source: WHO (2015)/

Post-crash care indicators

Table 11.2 presents relevant post trauma care indicators, where available, per 100 000 inhabitants, per 100 000 vehicles and per 1 000 km of road. They are presented for information and not comparison purposes.

Table 11.2. **Relevant post trauma care indicators**

	Brazil	Cuba	Ecuador	Paraguay	Uruguay
Total number of treatments* due to road crashes per 100 000 inhabitants	86	-	804	-	22
Number of emergency medical service (EMS) stations per 100 000 inhabitants	0.09	0.77	2.87	0.08	1.34
Number of trauma beds in permanent medical facilities per 100 000 inhabitants	25	5	9	2	-
Number of EMS-vehicles per 100 000 inhabitants	1.5	3.7	3	0.6	-
Number of EMS-vehicles per 1 000 km of road	-	5.8	11.1	1.3	-

Note: *Treatments - Medical emergency care.

Selected case studies

As seen in the previous sections, there is not enough comparable information on the post-crash care system collected by the countries. This does not necessarily mean that the post trauma system is malfunctioning. In order to illustrate current practice, the post-crash care system of three countries is described in this section: Cuba, Costa Rica and Mexico.

Post-crash care system in Cuba

The public health system of Cuba has a network of services for emergency care made up of 88 units of intensive care, (including 35 paediatric units). There are also 28 secondary institutions that provide neurosurgical attention located in clinical-surgical hospitals.

The organisation of medical emergency services is regionalised in the 15 provinces and in the Special Municipality of Isla de la Juventud. It guarantees a qualified medical response and has average response times in emergency of 16 minutes. There is a unique free number (116) to request this service throughout the country.

Of the total number of ambulances in the country, 17% have intensive care equipment and provide advanced life support: 28% are available for emergencies, which also include traffic accidents.

In all the municipalities of the country, intensive care is provided through 120 local units. In case of polytrauma patients or traffic crashes, these units provide stabilisation and support before the subsequent transfer to a higher level unit.

Pre-hospital life support courses are offered to all personnel who join the Integrated Medical Emergency System, whether doctors, nurses or paramedics. This course is compulsory for Medical Emergency Mobile staff. Courses are given to military units and rescue schools, with practical exercises being performed together with the fire-fighters and police officers. In the National Ambulances Centre, there is also a faculty providing courses on emergency care.

In each province, a study of risk areas was carried out and was taken into account in the process of reorganisation and regionalisation of the injured transportation.

In each province, there is at least one ambulance base (five in Havana) with medical doctors working either in the co-ordinating centre or in the ambulances depending on the conditions of the patients to be transferred. The presence of a doctor in each base is guaranteed 24 hours a day. They are all equipped with a GPS system and are in permanent connection with the national Centre. All traffic casualties benefit from this service.

Post-crash care system in Costa Rica

Costa Rica has implemented a single emergency number (911) since 1994. In case of a traffic crash, the response system is activated by the call to 911, where the basic information about the event is collected (location, injuries and severity), triggering an alert which is immediately received by the emergency bodies, which dispatches the intervention to the nearest care unit. This process between the call and the dispatch to the emergency units takes less than three minutes.

In practice, it is common that the police arrive first at the site of the crash. The police secure the area around the crash and send a confirmation to 911 about the severity. The Red Cross and fire-fighters arrive on average nine minutes after the event was reported to 911 (average time for main urban centres only).

When the victims are rescued, Red Cross proceeds to stabilise wounds and vital signs, to begin the transfer to the nearest medical centre. At all times the centres are informed of the progress of the actions and the state of the emergency. They inform the 911 number, which monitors the event in real time dispatching alerts to the medical.

When a traffic crash occurs outside the area of hospital coverage, the victims are transferred to the emergency rooms of the nearest local health units, where they are evaluated and their vital signs are stabilised. If the severity of the wounds exceeds the technical capacity of the unit, the victim is transferred to one of the regional hospitals. In cases of extreme gravity, the transfer is direct to the national hospitals and depending on the distance and severity the transfer can be by air.

The transfer time depends on the location of the crash. For crashes in urban areas it takes less than 20 minutes. In rural areas, it may take up to several hours if the victim must be transferred to a class A hospital.

The emergency service has 120 committees of the Red Cross, 97 delegations of the Public Force, 75 stations of Firemen and 30 delegations of the Transit Police. Most Red Cross Committees have advanced support units (trauma care) and all have basic support units, others have rescue units.

All fire stations have fire extinguishers and assistance units, hydraulic equipment for the release of pressed victims, in addition to the equipment and training of personnel for such manoeuvres. Firefighters are dispatched only in case of people trapped inside the vehicles, in case of spillage of fuels or other dangerous substances and in case of rescue due to difficult topography conditions. Some stations have paramedic units that are dispatched in case of a major emergency.

The clinics have an emergency room and specialists who are in attendance 24 hours a day. Its function is to stabilise the victim's vital signs while being transferred to one of the regional hospitals. However, as many road casualties suffer several serious injuries, they are usually transferred to national hospitals.

Post-crash care system in Mexico

In Mexico, in response to the demand of the population for the right to immediate attention by medical emergencies, even outside the premises of the medical care units, the prehospital medical emergency services have historically mainly relied on the civil society, with the participation of private charity institutions and uncoordinated efforts of non-governmental organisations. This organisation led to duplication of care, waste of resources, operational losses, high costs and lack of full and timely coverage. Also, the management of injured people was heterogeneous within the country raising equity issues regarding in the attention given to the inhabitants.

In response to this, STCONAPRA has taken measures to integrate the model of prehospital medical care, with the elaboration of a legal framework and the adoption of a new Mexican standard, the "Regulation of Health Services - Pre-hospital Emergency Medical Care", NOM-034-SSA3-2013. This enables the medical emergency regulatory centres (CRUM) to have a complete co-ordination infrastructure through a solid communications network with the hospitals and ambulances. As of today, CRUM has been implemented in 20 out of the 32 federal entities.

In order to improve the emergency service for road casualties, the following measures have been implemented:

- a unique emergency call number (911), implemented by presidential decree throughout the country as of October 2017
- an improved radio communication network linked to the Hospital Care Services, through the CRUM

- regionalisation of the hospital medical units, based on their capacity, equipment and specialties
- the regulation of ambulances (equipped according to the national standard) by the Federal Commission on protection against health risk (COFEPRIS) according to NOM-034-SSA3-2013
- the presence and professionalisation of staff who provides prehospital medical care services on board ambulance-type mobile units
- training (professional certification of technicians in medical emergencies)
- community participation (first responders in first aid)
- development by STCONAPRA of a Training Program for First Responders aimed at all citizens and which covers the activation of the emergency system and first aid gestures.

Key post-crash care measures

The World Health Organization published in 2017 a road safety technical package detailing evidence-based measures on a wide set of areas, including post-crash care. Measures to significantly improve the treatment of road casualties and their survivability after a crash are summarised in Box 11.2.

Box 11.2. Three priority actions to improve post-crash care

Develop organised and integrated prehospital and facility-based emergency care systems:

- Ensure access to emergency care. Two key aspects to address are: legislating mandatory universal access to emergency care free of payment at the point of care; and explicitly integrating prehospital and facility-based emergency care into national strategic health plans and into national prepayment health funding schemes.
- Ensure key organisational components of prehospital care. Key elements include a single universal access call number, a mechanism for the centrally co-ordinated dispatch of ambulances and providers, and a system of trauma centre designation to ensure the injured are taken directly to a facility with the capacity to meet their treatment needs.
- Establish a basic package of emergency care services for each level of the health system. Establishing basic standards for appropriate emergency care services at all facilities ensures timely recognition, resuscitation and referral of injured patients.
- Establish a lead government agency at the national level (such as a ministry directorate) with the authority to co-ordinate prehospital and facility-based emergency care. Effective emergency care requires a range of organisational, logistical and clinical elements, and an integrated approach ensures the most effective delivery of services within available resources.
- Conduct a standardised national assessment of the emergency care system (e.g. WHO Emergency Care System Assessment, or similar) with action plan development.

Train those who respond to crashes in basic emergency care. Much emergency care around the world is delivered by non-specialist providers. Simple training initiatives (e.g. WHO Basic Emergency Care course) promote a consistent approach to all injured patients and improve early recognition of life-threatening conditions.

Promote community first responder training especially in areas where prehospital services are limited and/or response times are long, systematic training of certain lay groups can greatly expand timely access to simple lifesaving interventions. High-yield target groups include non-medical emergency responders such as police and firefighters, and others whose occupations frequently put them at the scene of road traffic crashes: for example, professional drivers, including taxi drivers and public transport drivers.

Source: WHO (2017).

Conclusions and recommendations

The proportion of patients who die before reaching hospital in low- and middle-income countries is over twice that in high-income countries, suggesting that strengthening prehospital systems could have enormous impact. This chapter focuses on analysis of the quality of post-impact care systems. Several types of indicators can be defined to measure them, but most of them are not collected in the participating countries of this project.

Some relevant post-crash care indicators about the availability of dedicated material resources, such as the number of emergency medical stations, vehicles and trauma beds in permanent medical facilities was presented. However, due to the limited available data on this matter, it was decided to present an overview of post-crash care systems only in three countries.

It is recommended that all countries perform studies to assess their trauma care systems in order to identify major weaknesses and develop intervention plans. Knowledge on effective interventions is available and it is recommended to improve in an integrated way the organisation of post-crash care and to invest in trauma care. The WHO Safe Lives package on Post-Crash Care constitutes a necessary guideline to improve the treatment of road crash casualties.

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Chapter 12. Conclusions and recommendations

The aim of this study is to describe road safety in the ten participating countries, determine the underlying elements and developments in the current strategies and action plans, and explore how these are effective in improving road safety. These insights can be helpful for any individual country that decides to learn from good experiences and results from another country. All ten countries made a start with designing and implementing road safety strategies and several good initiatives and promising developments are identified, but positive results cannot be traced yet in official crash statistics and not one of the ten countries is an outperformer or “best-in-class”.

Argentina, Brazil, Chile, Colombia, Costa Rica, Cuba, Ecuador, Mexico, Paraguay and Uruguay have different levels of safety. Road safety takes different forms in different countries, and there are different factors to consider. Road safety action plans differ in focus according to the size and nature of problems in the ten participating countries, but also according to the level of maturity of road safety capabilities to address the road safety problem. Policy areas targeted are rather similar in all participating countries.

A common denominator for all countries (perhaps with the exception of Cuba until now) is a sharp increase of motorisation (including increasing proportions of motorcycles). Furthermore, young growing populations are significantly increasing exposure to the risk of road traffic injury across all countries. These developments are placing significant demands on the road traffic systems within the ten countries, and those systems are failing to safely cope. This means that we conclude that Latin America has a significant road safety problem and that substantial actions are needed to reduce the road safety toll and to reach the targets as set by the United Nations under the Sustainable Development Goals. This study presents a variety of interventions for the ten countries and for individual countries on how to improve.

Benchmarking

The methodological approach to assess road safety performance relies on a benchmarking process through which participants are evaluated on various aspects of their performance in relation to others, and so helps identify best-in-class practices and performances. Most importantly these ten Latin American countries can use the study results to learn from each other.

Carrying out the study was an excellent way for all participating countries to understand why good road safety data are essential and needed to support policy making. In itself, the study represents progress in road safety co-operation and learning across the ten countries. This reflects the important role that the Ibero-American Road Safety Observatory (OISEVI) has played by encouraging countries to begin collecting road safety data and information.

The benchmarking methodology is data-intensive. Three types of performance indicators are used: final road safety outcomes (the number of people killed in road crashes), intermediate outcomes (also called safety performance indicators indicating the safety quality of system components, such as road user behaviour, roads, vehicles and post-crash care), and road safety management indicators (such as strategies, action plans and programmes, resources, and institutional settings). All these indicators are considered against a background of road transport systems in the ten countries. Unfortunately it was not

possible to include information on traffic injuries in this study due to the lack of good and comparable data on this.

The study began by dividing the ten countries into two groups with some unifying similarities among the countries (ITF, 2016). The idea behind grouping countries is that comparable countries can more easily learn from each other. However, when exploring grouping, it appeared that this was not a feasible and meaningful way forward. After describing and comparing performance across all ten countries, and failing to identify a best-in-class, we decided to compare performance in Latin America with performance in other parts of the world (Europe, North-America, Australasia).

Road safety background

A major burden on the people and the economy

Road traffic injury places a major burden on the human population. The Global Burden of Disease Study (IHME, 2016) reports regularly on the impact of road traffic injury at a national level. The study provides some insight into the relative scale of trauma on the region's roads:

- Road traffic injury is the leading cause of death for children aged 5-14 years in Argentina, Brazil, Chile, Costa Rica, Cuba, Ecuador, Mexico, Paraguay, and Uruguay. It is the second highest cause of death for children aged 5-14 in Colombia.
- Road traffic injury is the leading cause of death for people aged 15-49 years in Argentina, Costa Rica, Ecuador, and Paraguay. It is the second highest cause of death for people aged 15-49 years in Brazil, Chile, Colombia, Mexico and Uruguay, and third highest for this group in Cuba.

Road traffic injury is striking at the heart of the most productive population group across the ten countries, and the population group that will follow them. It is important to recognise the societal impact this has on normalising the trauma for the population as a whole, and for decision makers. Significant change is needed to break out of this cycle of acceptance, this “scandal of tolerance” (Allsop, 2012).

Road traffic injury also places a major burden on the economy with the socio-economic cost of road traffic injury estimated to be between 3-6% of gross domestic product each year. Significant economic benefits are achievable from good quality investment in road safety. At the very least, new investment in road transport should include safety-specific components, and directly support road safety capacity building

Little progress has been made

Some countries have seen large increases in the number of road deaths. In others, the situation appears to have stabilised. However, as evidenced by Global Status Reports on Road Safety published by the World Health Organisation (WHO) in both 2013 and 2015, fatal and non-fatal road traffic injury is under-reported in many countries. There is a high per capita fatality rate in all countries compared to the European Union average, except in Cuba, where motorisation is much lower.

There is no room for complacency in any of these results, and little good news. Across the ten countries, more than 77 000 people were killed on the road in 2013. Unless there is strong policy, investment and leadership, overall fatalities will deteriorate across Latin America over the next decade.

The United Nations Sustainable Development Goals set a 2020 target for road safety to halve the number of deaths and injuries on the road. The available data and trends already suggest that this will not be achieved. This study highlights the need for a major new effort over the next three years just to halt the increase in fatalities in some countries, and significantly reduce fatalities in others.

Systemic trends and issues need to be addressed

Concerted efforts are required to lead the preparation and implementation of major road safety initiatives throughout all countries. Some systemic trends and issues that need to be addressed from a safety perspective are:

A young population

All countries, with the exception of Cuba, have a relatively young population. Due to the higher risk of injury for younger people, whether due to childhood fragility, or much greater risk-taking in relatively loose licensing and enforcement environments, it is important that they are a key safety consideration. Carefully considered controls are needed regarding access to motorcycles which are the least safe form of travel.

An urbanising population

More than 50% of the population lives in urban areas in all countries (more than 90% in Chile, Argentina and Uruguay) and there is a (rapid) rate of urbanisation. This is likely to require greater emphasis on integrating safety within urban transport systems, promoting safe public transport, and safe pedestrian movements – improvements in speed management, infrastructure, and land-use planning will be critical.

A motorising population

The rate of motor vehicles to population has been increasing in all countries at an annual average rate in the range of 4-7%. This is significantly increasing exposure to risk, as is the increasing proportion of motorcycles in national fleets. Some countries are much more highly motorised than others, but there is concern about the validity of vehicle registration data particularly in Paraguay and Ecuador.

Motorcycle safety

Motorcycles represent a particular problem. There is an increasing proportion of motorcycles within the vehicle fleet, and increasing fatalities, in all countries. This is creating significant safety challenges, which have to be addressed. Motorcyclists comprise 44%, 51% and 53% of fatalities in Colombia, Uruguay and Paraguay respectively. In several countries, poor public transport may be resulting in a modal shift from public transport to powered two-wheelers.

Pedestrian safety

Pedestrians are the largest or second-largest group of road deaths across the ten countries, with the exception of Argentina and Uruguay. Pedestrians comprise between 26% and 39% of fatalities in most countries, but 54% in Mexico, where pedestrian-focused safety solutions are clearly imperative. The safety of older pedestrians needs particular attention, within the context of improved urban planning, road design and public transport.

Road safety capacity building

Each country faces its own multiple and complex road safety issues which may include, for example, a modal shift to motorcycling, low levels of road traffic law enforcement, or poor co-ordination and implementation of strategies and plans which have been developed. For most, if not all, countries, this reflects an underlying problem associated with the capacity of governmental institutions to tackle road safety which is a major development issue.

Road safety leadership

Significant improvements in road safety results do not happen by chance. Success has been demonstrated in many different countries in the world through concerted leadership of the issue within society, and Government. While Government faces many demands, the human pain and suffering associated with road trauma provides the political basis to prioritise stronger governance, management and accountability systems and drive better safety results.

Sustainable road safety investment

Given the scale of economic losses and the highly predictable benefits of introducing evidence-based measures, there is a compelling economic case for public and private investment in road safety in each country. The first responsibility for funding activities and investments to improve road safety lies with governments (Wegman, 2015). Funding from international organisations and from the private sector cannot replace funding from governments. Governmental revenue mechanisms in the transport sector can also be used for developing a sustainable funding system, through which further investment can be catalysed.

Conclusions

Road safety management

An analysis of road safety management is a critical window into a country's overall safety performance and opportunities for improvement.

Establishing and strengthening the lead agency

Good practice road safety management at a country level starts with nominating and funding a lead agency to bring all the necessary functions and arms of government into a cohesive national response to road trauma. The role of a lead agency is to:

- vigorously promote road safety within government and wider society
- ensure that sufficient public investment is raised and effectively allocated
- co-ordinate activity between government agencies
- prepare national strategies and lead achievement of associated targets.

The longest standing lead agency is in Costa Rica, formed in 1979, and the most recently established one is in Colombia, which became operational in December 2016. There are lead agencies in Argentina, Brazil, Chile, Colombia, Costa Rica, Ecuador, Mexico, Paraguay and Uruguay, but these agencies are not yet all staffed and empowered to take on a formal leadership role.

It is not enough to establish a lead agency or mandate an existing agency to lead, however. Whatever the form of the lead agency, it needs a clear mandate, adequate budget and resources, and stability in the staff. Keeping skilled and technical staff in road safety positions is a challenge in several countries, and efforts should be made to ensure continuity of the staff working on road safety.

Many road safety interventions are delivered at a local (municipal or provincial) level, such as road improvements or traffic enforcement, which make local road safety management arrangements important. Local road safety initiatives are key components of every effective road safety strategy and need to be empowered from a national/federal level. Some countries have centralised institutions at the local level, as in Argentina, Cuba, Mexico and Uruguay, while others rely on municipalities, as in Chile, Colombia and Paraguay. Co-ordinating road safety across federal structures is a key challenge in Argentina, Brazil and Mexico.

Detailed analysis is required to underpin road safety strategies and plans

All countries have either a national road safety plan or road safety strategy, with the exception of Argentina and Brazil. Argentina is currently in a transition period and a new road safety strategy is being elaborated. In Brazil, although there are several thematic plans, there is not a national road safety strategy. There is scope in all countries for a more systematic development of a national strategy, supported by ambitious and achievable targets (including safety performance indicators), detailed national safety plans, and institutional settings with clear accountabilities and effective implementation systems.

Cuba, Mexico and Uruguay have long-term strategies supplemented by time-bound action plans which provide greater opportunity to encourage long-term analysis and short-term results. In addition, Argentina, Chile, Colombia and Uruguay have specific plans in place for motorcycle safety, which is important given the scale of this problem.

Most countries work with a quantitative target. These targets are not based on good insight into “business-as-usual” combined with information of effectiveness of proposed interventions (as is the case in a couple of European countries). This means that it is not known if these targets are achievable. It is however known that countries with ambitious targets perform better than countries without quantitative targets, or with unambitious targets. Generally, current performance is not improving, and experiences in many countries suggest that significant efforts are required to set road trauma on a downward path.

A comprehensive upgrade in road safety data systems is needed

A consistent theme throughout this study was the need for much better (collection, analysis and use of) data to improve road safety results.

Five countries apply the standard 30-days definition of a fatality: Colombia, Cuba, Ecuador, Paraguay and Uruguay. Chile uses the 30-days definition after applying a correction factor to convert a 24-hour to a 30-day figure. Argentina has adopted the 30-days definition, however, in practice, not all provinces are yet capable of following road casualties within the days that follow the crash; therefore a correction factor may be applied in some provinces. Brazil and Costa Rica register all victims who die from a road crash within 12 months. Brazil continues to monitor the road casualties after this 12-month period. In Mexico, it is still possible to register a road death when it occurs more than 12 months after the crash.

Underreporting is an issue in all countries, meaning that not all road crashes are reported to/by the police and are not included in official national crash statistics. Police data should remain the main source

for road crash statistics, but other data systems such as hospital data are a useful complement to adjust for underreporting and procedures to link police and hospital data should be initiated in Costa Rica, Ecuador and Mexico. Non-fatal injury data is very important, and all countries would benefit from improving the capacity of their crash data system to collect and analyse this type of data.

Crash data should be collated and analysed within a single consolidated national crash data system. This is made very difficult, for example in Argentina and Brazil, where there are different police forms in different jurisdictions throughout the country. Harmonised police traffic crash reporting is important across the police forces in each country.

Beyond specific road crash and injury data, there are other important data sources which need to be developed. For example, there is very limited availability of exposure data in terms of vehicle-kilometres (by type of vehicles) and passenger-kilometres. This prevented the use of this important information as an indicator.

Other critical data needs relate to monitoring and evaluating progress on safety performance indicators through, for example, observational studies on driving speeds on different roads, and use of helmets, seat belts, and drink driving. There is a critical need in all countries to build and sustain capacity and investment into data systems, academic and applied research, and practical studies of how to significantly improve results.

Behavioural law has been enacted and now needs to be enforced

There is a reasonable legal framework for many important legislative measures relating to driver behaviour, with widespread adoption of mandatory requirements relating to the compulsory use of seat belts and of motorcycle helmets, maximum blood alcohol concentration, and more recently use of mobile phones. However, in federal countries, and Mexico in particular, the application of federal legislation is variable across the country.

There is an important distinction between a measure being legislated, and actually enforced. In all countries, for most measures, it seems the level of enforcement is too low, and the number of violations is too high. Quite severe penalties are already in place, and improved compliance with traffic safety law now relies on significantly increasing the perceived likelihood of being detected through increased enforcement.

Sustained traffic enforcement should be publicly and demonstrably supported by Government Ministers and Police Commanders. Visible, regular enforcement targeted at the whole driving population to deter specific and well understood traffic rules – such as speeding, drink driving, non-use of seat belts – is essential, along with penalties and legal processes which reinforce the seriousness of the offending. These operations should be data-driven, and be supported by good quality technologies and mass media education campaigns.

Low levels of police enforcement can reflect a lack of political leadership in road safety, as well as a wider set of institutional issues. Institutionally, it can be difficult for a police force to break out of a focus on personal security and safety, and focus on the prevention of injury on the road. Road safety management capacity is particularly critical in these environments, starting with the top leadership of the organisation.

The most senior levels of command need to have a clear understanding of the principles behind good quality road traffic enforcement, to commit resources to the problem. They need to develop partnerships with other agencies to set and monitor indicators to measure progress in the delivery of

critical enforcement services and user behaviours. Demonstration enforcement projects in cities, regions or states would help identify and promote good practice road traffic enforcement within the Latin American context.

Interventions

While management systems provide the starting point for good practice, they must be transformed into highly effective interventions relating to roads, vehicles, users and trauma care.

More and better information is needed on roads and post-crash management

The safety of road infrastructure is complicated by the fact that the number of crashes and casualties varies to a large extent with the function of a road, driving speeds, traffic volumes, the mix of users, and also with the safety quality of the road as it is designed, maintained and managed. The function and design of a road should be well aligned with safe speed limits so that crashes are either prevented or the consequences of the crash do not include death or serious injury to road users.

A range of options is possible for benchmarking the safety quality of road networks and individual roads. For the purposes of this study, data from road surveys conducted by the International Road Assessment Programme in several countries was assessed, but the results are not necessarily a representative sample of roads. Rather than using this information to arrive at conclusions and recommendations, a specific study in the ten countries could help to develop a safer roads indicator, particularly focused on urban settings and villages. This would allow differences between countries to help explain differences in the number of people killed and injured, and use that to further improve the safety quality of road infrastructure.

Post-crash care is essential to avoiding preventable death and to limiting the extent of temporary and long-term disabilities resulting from injuries due to road crashes. Key components of post-crash response programmes are known and recommended by the WHO: 1) emergency care and injury rehabilitation, 2) mental health care, 3) legal support and 4) data on crashes and injuries. Some information was able to be collected on Cuba, Costa Rica and Mexico to get some notion of post-crash systems, but it was not strong enough to justify recommendations. All countries would benefit from a review of their crash management system to identify major weaknesses.

Vehicle safety is a critical legislative priority

Effort is now urgently required on vehicle safety legislation where there is considerable scope for improvement. The WHO (2015) report on road safety identifies seven United Nations priority vehicle safety regulations that apply to passenger vehicles. All countries should adopt these seven standards. A recent study commissioned by Global NCAP and the Inter-American Development Bank shows that 40 000 lives could be saved in Latin America and 400 000 serious injuries prevented by 2030, if UN vehicle passive safety regulations were applied by Argentina, Chile, Mexico and Brazil following the certification processes of the UN (Working Party 29) 1958 Agreement.

While, as of January 2017, no country had adopted all seven priority standards, there has been some progress. Argentina, Brazil, Chile, Colombia, Ecuador and Uruguay have applied the two seat belt regulations. With the exception of Colombia, they have also applied the frontal impact regulation. All seven regulations have either been applied, are scheduled to be applied, or are under discussion in Brazil and Argentina.

Particular mention is required of the approach taken by Ecuador which has applied five of the seven regulations, and established the United Nations (1958 Agreement) regulations as the exclusive channel for local homologation. Rather than establishing the full list of regulations which have been set in high-income countries, Ecuador simply requires manufacturers to apply for a type approval under the UN 1958 Agreement against the most important safety-relevant UN regulations. This includes regulations on ongoing administrative and production compliance which provide the necessary safety assurance.

Driver licensing reform is likely to pay dividends

Driver licensing systems are the point of entry for drivers into the road traffic system, and can almost always be strengthened to improve road safety results. Based on the findings of the study, all countries are likely to benefit from review and reform of their licensing system, focusing on:

- pre-license curriculum and training standards
- the licensing standards such as age, and graduated exposure to risk
- audit and compliance systems to monitor testing and on-going driver compliance
- systems to enforce suspension or disqualification of the driver licence.

Countries should also assess the situation regarding unlicensed and especially never-licensed drivers and riders. While there are some problems in high-income countries of drivers and riders who have had their licence suspended, the more fundamental problem in many countries is that a licence has never been issued – if this is the case, it needs to be fully addressed. As in many low- and middle-income countries, it seems that the driving license is easy to get in some countries (either through lax standards or lax systems), and hard to lose (despite regular offending).

Pedestrians

Walking is the main transport mode for many citizens, and pedestrian safety needs to be given high priority in all countries under analysis. There has been a gradual decline over time in the proportion of pedestrian fatalities in Chile, Colombia, Costa Rica, Mexico and Paraguay (and further analysis is required to understand whether this is related to a reduced exposure of pedestrians), but little recent progress in reducing annual pedestrian fatalities. For most of the countries pedestrians represent more than a quarter of the registered road fatalities, but reach 39% of fatalities in Chile.

Securing safer access to and around public transport stations/stops should be a priority. In nearly all countries, older pedestrians aged 65 years and above have a higher mortality rate, explained by their higher exposure and frailty. As can be expected, most pedestrian fatalities occur in urban areas, but not in Chile and Ecuador, where pedestrians are also extremely vulnerable when walking along rural roads.

Land-use planning is very important for pedestrian safety. New pedestrian focussed safety interventions are needed to support safe movements across and along major roads through cities, villages, and in high pedestrian area around shops, schools, churches etc. All countries should consider how to apply the WHO recommended interventions: reducing pedestrian exposure to vehicular traffic; reducing vehicle speeds; improving the visibility of pedestrians; improving pedestrian and motorist safety awareness and behaviour; improving vehicle design for pedestrian protection and providing care for injured pedestrians. These interventions should be implemented as part of supporting programmes of road network, mass transit and urban planning improvements.

Motorcyclists

Powered two-wheelers, which include motorcycles and mopeds, are rapidly increasing in number, and playing a growing role in the mobility, particularly in large cities. In Colombia and Uruguay, motorcycles represent more than half of the motorised vehicles. In Chile and Mexico, the fleet is still modest (respectively 3% and 5% of the motor vehicle fleet) but is rapidly increasing and expected to play a bigger role in the years to come. Given the inherent higher risk of motorcyclists compared to other road users, improving the safety of motorcyclists should be seen as an urgent priority in all countries.

The level of motorcyclist safety is deteriorating in all countries, due largely to the explosion in the fleet and consequent use of motorcycles. All countries have seen an increase in the number of motorcyclists killed, in nominal terms and in comparison to other road users (car occupants, cyclists, pedestrians, bus occupants). In most countries, victims are young adults and their premature deaths represent an important economic loss. In most countries, motorcycle safety issues are concentrated in urban areas.

While some of the core mechanics are similar, motorcycle safety issues in Latin American countries are different from safety issues in Europe or Asia. The measures to improve the safety of motorcyclists must be based on the detailed analysis of mobility and safety patterns of motorcyclists in each country. As some countries, such as Colombia has done, specific motorcycle safety plans and projects are needed at a country level.

Motorcycle specific license interventions would play a very valuable role in any national strategy. Pre-license training is particularly important for motorcycle safety, but a car license is sufficient to ride any kind of motorcycle in Costa Rica and in some Mexican jurisdictions, and only a theory test is required in Colombia. Introducing tighter graduated licensing systems, and age restrictions would also be effective.

Mopeds present a particular challenge to address. Although mopeds currently represent only a small share of the powered two-wheelers fleet, low purchase prices and easy access to licenses may induce an increasing trend. It is important that they are systematically registered as a motor vehicle in all countries, so that the safety of this relatively high-risk transport mode can be effectively monitored and regulated.

All countries should have a long-term objective of a 100% helmet wearing (good quality helmets that are well-strapped) rate, building on the good wearing rates for riders in Chile (99%), Colombia (96%), and Uruguay (93%), and confirm that the legislated safety standards of helmets comply with the relevant UN regulation. Motorcycle anti-lock braking systems (ABS) are a highly effective safety technology, although only Brazil has mandated ABS on new motorcycles sold. This is reportedly under consideration in Chile and Uruguay, and it is strongly recommended that all countries consider legislating ABS on new motorcycles sold.

Drink driving

The devastating role of alcohol in the occurrence and severity of road crashes is well known. The risk and severity of crashes increases exponentially with a blood alcohol concentration above 0.5 g/l, and young and novice drivers are more vulnerable than older drivers when under the influence of alcohol. Information and data about drink driving and the prevalence of alcohol in crashes is scarce across the all countries, which impeded analysis of what is a significant road traffic safety issue where alcohol is regularly consumed.

All countries have set a maximum blood alcohol content and have the legal framework for police to enforce these laws, and courts to administer sanctions. However, there seems to be insufficient enforcement in some countries. The maximum legal limit for blood alcohol concentration should not be above 0.5 g/l. This is a particular recommendation for Mexico, which should consider lowering its legal limit from 0.8 g/l to 0.5 g/l. A differentiated limit for young drivers has proven to be an effective safety measure. It is recommended that Argentina, Costa Rica and Mexico adopt a lower legal limit for young and novice drivers such as zero or 0.2 g/l.

There is little comparable information on the prevalence of drivers above the legal limit, the share of alcohol-related crashes and the level of enforcement, however the information collected for this study suggested an underreporting issue. An OISEVI umbrella project could use the same methodologies to get a better picture of the extent of the drink driving problem in Latin America.

Speed

There is abundant evidence that speed and crash risk are very closely related. As a rule of thumb, a 10% increase in average speed leads to a 40% increase in the number of fatal crashes, and a 10% decrease in average speed leads to a 40% decrease in the number of fatal crashes. Speed management should be at the core of any road safety strategy, and has huge potential in reducing the number of people killed and seriously injured in Latin America.

All countries have speed limits for all roads (urban, rural and motorways), but without more information it is impossible to assess if speed limits, especially on (major) rural roads, are adequate – that is, in line with road and traffic conditions. Further assessment of information of motorways is also needed to consider the appropriateness of speed limits for this high-speed environment. The default urban speed limit should be 50 km/h and 30 km/h zones should be promoted near residential/school areas. Higher speed roads can only be considered where motorised and non-motorised users are provided separate facilities. The urban speed limit of 60 km/h in Argentina, Chile, Colombia and Mexico is too high. It is recommended that this limit is reduced to 50 km/h in these countries, from which a 20% reduction in urban fatalities can be expected.

Whatever the speed limit, it should be strictly enforced, targeting all vehicles. Ideally, speed enforcement is automated, with well-targeted mobile camera and average speed camera operations. However, this requires strong and legislated penalty systems which connect drivers with vehicles, and make owners accountable for those who use their vehicles. An intermediate step towards this is strict, politically mandated, enforcement of the speed limit just above the speed limit.

There is not enough data or research to clearly quantify the situation with respect to speeding in the countries included in this study. However, the data that is available suggests there is a massive speeding problem across all speed limits, but particularly so in urban areas. Strict police enforcement is needed in all countries.

Particularly given the potential benefits of progress in this area, a sustained speed management study conducted by OISEVI in collaboration with country agencies could be highly beneficial. Such a study could investigate the quality and quantity of police enforcement practice and the application of sanctions; review prevailing speed limits and make recommendations regarding safe speed limits; monitor free traffic speeds to focus interventions and track progress over time.

Seat belts and child restraints

There is generally adequate legislation on front and rear seat belt wearing, but major differences between countries when it comes to seat belt wearing rates. In general wearing rates are far lower than for the (many) best performing countries in the world where wearing rates are higher than 90%. Brazil, Chile, Colombia, Costa Rica, Cuba and Uruguay have front-seat wearing rates of 65-85%, while Argentina, Ecuador, Mexico and Paraguay have much lower rates of 30-40%. All countries experience very low rear-seat wearing rates (lower than 50%, and almost 0% in Colombia and Ecuador) where only Costa Rica is doing better than 50%.

Current wearing rates are already estimated to have substantially reduced vehicle occupant fatalities by 20%. However, this study estimates that, if a 95% wearing rate had been achieved, a further 4 255 of car occupant fatalities would have been prevented in 2013 in the ten countries under review. Increasing wearing rates to 95% is considered a realistic option, based on the experiences in many other countries in the world, and should be a target set by all ten countries.

The use of child restraint systems (CRS) is remarkably low in all ten countries, and seems to be a neglected topic in all Latin American countries under review. Further research should be conducted in all countries to find out the causes of (extremely) low use of CRS and based on that to come up with additional activities.

All participating countries should make increasing wearing rates of belts and use of CRS a top priority in their strategies. A combined approach is needed to significantly lift wearing rates: legislation on new and imported/second-hand vehicles, legislation and penalties on not using seat belts and CRS, enforcement and publicity campaigns to improve use of both front and rear seat belts and CRS (including specific parental campaigns for CRS, such as information and incentivised supply).

Recommendations for the ten Latin American countries

1. Assess existing lead agencies regarding the scope of their mandate, their co-ordinating role at national and local levels, and the technical and financial resources available to be effective in tackling road safety.
2. Ensure that a national lead agency is nominated in countries where they do not yet exist, strengthened (in terms of road safety leadership mandate, as well as human and financial resources) where they do exist, and complemented by the establishment of national road safety observatory.
3. Develop a national road safety strategy, with ambitious and achievable targets, backed up by short-term action plans and interim targets for key safety performance indicators.
4. Build and sustain capacity and investment in road safety data systems and research, and in particular:
 - adopt a 30-day definition and apply a correction factor when this is not yet feasible
 - develop and/or strengthen a single consolidated national crash data system with harmonised police crash report forms
 - take measures to get information on seriously injured people by a more systematic linking between health and police data system
 - improve understanding of roads and crash locations by classifying road networks at least by type of road (urban roads, rural roads and motorways)

- improve vehicle registration systems by including at least the age and type of the vehicle and allowing better analysis of safety issues
 - collect traffic and travel data to help assess exposure to risk.
5. Define and pursue road safety policies interactively with mobility management policies, public transport and land use planning.
 6. Assess the effectiveness of their traffic enforcement system with the following objectives:
 - better co-ordination of police agencies, including municipal, provincial or state police, highway police and national police forces, which may all be responsible for traffic enforcement
 - development and implementation of demonstration enforcement projects in cities, regions or states to help identify and promote good practice road traffic enforcement
 - intensification of the level of enforcement to create a higher probability of being caught, but not necessarily a higher level of penalties
 - ensuring a sufficient number of well-trained police officers trusted by the population and free of bribery and corruption.
 7. Implement a strong speed management policy, and in particular:
 - apply a default urban speed limit of 50 km/h, promote 30 km/h near residential/school/shopping/recreation areas, and provide for higher speed limits only where motorised and non-motorised users are provided separate facilities
 - intensify enforcement with the introduction of automatic speed control supported by effective administrative penalty systems
 8. Give significant priority to the adoption of all seven key UN vehicle safety standards, as well as administrative and production compliance, and regulations relating to child restraint systems, motorcycle helmets and motorcycle anti-lock braking systems.
 9. Review their licensing system, focusing on pre-license curriculum and training standards, licensing standards such as age, and graduated exposure to risk, audit and compliance systems to monitor testing and on-going driver compliance, and systems to enforce suspension or disqualification of the driver licence.
 10. Seriously address the issue of drink driving, which is largely underestimated in most countries, by:
 - setting the general maximum BAC limit at 0.5 g/l, and 0.2 g/l or zero for young and novice drivers
 - massively intensifying alcohol checks, through random breath tests targeting all vehicles
 - increasing knowledge about the drink driving issue, by systematically testing all participants of an injury crash (either breath test on the roadside for non-injured people or blood test at hospital for injured or killed people).
 11. Implement a combined approach to lift rates of seat belt wearing and CRS through vehicle and behaviour legislation, and enforcement and promotion campaigns and set a target of achieving seat belt wearing rates of 95% for both front seats and back seats.

12. Give priority to improve the safety of motorcycles, in particular by:

- providing safer and affordable public transport to avoid modal shift to a more risky mode of transport
- requiring the registration of all powered two-wheelers, including mopeds
- developing national road safety plans and projects to tackle motorcycle safety, specifically addressing licensing interventions and helmet wearing
- setting a target of achieving a 100% helmet wearing rate, and confirm that the legislated safety standards of helmets comply with the relevant UN regulation
- following Argentina's example in reducing the maximum BAC for motorcyclists riders
- introducing a mandatory motorcycle headlamp-on requirement
- considering legislating antilock braking systems (ABS) on new motorcycles sold.

13. Give significant priority to pedestrian safety needs, using recommended interventions (particularly pedestrian facilities and speed management) as part of supporting programs of road network, mass transit services and access and urban planning improvements.

14. Improve knowledge on infrastructure safety performance by developing a road infrastructure safety indicator, and align the function and design of a road with safe speed limits so that crashes are either prevented or the consequences of the crash do not include death or serious injury to road users.

15. Perform studies in order to identify major weaknesses in post-crash management, and develop intervention plans.

Argentina

It is recommended that Argentina:

1. Assess its road safety lead agency (ANSV) regarding the scope of its mandate, its co-ordinating role at national and local level, and the technical and financial resources available to be effective in tackling road safety.
2. Form a federal country working group with representatives from Brazil and Mexico, and representatives of other federal countries (such as the United States, Germany, Australia) to learn from each other.
3. Pursue efforts to strengthen the National Traffic Safety Agency (ANSV) in terms of road safety leadership mandate, as well as human and financial resources, including training staff and offering incentives for them to stay for several years.
4. Strengthen the co-ordination between the Federal level and the 24 Provinces, in order to harmonise traffic rules, enforcement, licensing systems and other critical safety programmes across the whole country.
5. Urgently prioritise the finalisation of a new road safety strategy based on an ambitious vision, intermediate targets, and safety performance indicators, supported by biannual road safety plans which are the focus of agency delivery, and closely monitored.
6. Incentivise the provinces to develop parallel local road safety plans, consistent with the national plan, while taking into consideration regional priorities.

7. Work towards a single national driver licensing system with harmonised pre-licensing training, licensing standards, audit and compliance, and enforcement systems to tackle unsafe driver behaviour.
8. Sustain capacity and investment into data systems and in particular:
 - pursue the efforts in harmonising police traffic crash forms and data collection procedures, standardise fatality registration and data collection systems across all provinces, aligned with the 30-days definition
 - take measures to get information on seriously injured persons by a more systematic linking between health and police data systems
 - improve vehicle registration systems by including at least the age and type of the vehicle and allowing better analysis of safety issues
 - collect traffic and travel data to help assess exposure to risk
 - improve understanding of roads and crash locations by classifying road networks at least by type of road (urban roads, rural roads and motorways), as only an estimated value of urban road length is available.
9. Define and pursue road safety policies interactively with mobility management policies, public transport and land-use planning.
10. Assess the effectiveness of its traffic enforcement system with the following objectives:
 - better co-ordination of police agencies, including municipal, provincial and federal polices
 - the implementation of a demerit point system, well-co-ordinated with all provinces to achieve a consistent deterrent against unsafe driver behaviour
 - developing and implementing demonstration enforcement projects in cities, regions or states to help identify and promote good practices for road traffic enforcement
 - intensifying the level of enforcement to create a higher probability of being caught, and not necessarily a higher level of penalties
 - ensuring a sufficient number of well-trained police officers.
11. Implement a strong speed management policy and in particular:
 - apply a default urban speed limit of 50 km/h, promote 30 km/h near residential/school/shopping/recreation areas, and provide for higher speed limits only where motorised and non-motorised users are provided separate facilities
 - intensify enforcement with the introduction of automatic speed control supported by effective administrative penalty systems.
12. Pursue current discussion towards the implementation of UN vehicle regulations on electronic stability control and the adoption of the UN regulation on pedestrian protection.
13. Review the licensing system, focusing on pre-license curriculum and training standards; in particular consider strengthening pre-licensing theoretical and practical course requirements, while harmonising the content across provinces.
14. Seriously address the issue of drink driving, in particular by:
 - setting the maximum BAC limit at 0.2 g/l or zero for young and novice drivers

- massively intensifying alcohol checks, through random breath testing targeting all vehicles (including motorcycles)
 - increasing knowledge about the drink driving issue, by systematically testing all participants of an injury crash (either breath test on the roadside for non-injured people or blood test at hospital for injured or killed people).
15. Increase seat belt and child restraint usage which is critically low in Argentina (estimated to be around 37% in front seats, 26% in rear seats and 34% for CRS) by:
- implementing vehicle and behaviour legislation, and enforcement and promotional campaigns
 - setting a target of achieving seat belt wearing rates of 95% within the next five years, and annually monitoring progress towards this target.
16. Give immediate priority to improve the safety of motorcycles, in particular by:
- providing safer and affordable public transport to avoid modal shift to a more risky mode of transport
 - monitoring the results of the current motorcycle strategic action plan for 2012-17 and preparing a new plan starting in 2018, with targets for motorcycle-specific safety performance indicators
 - setting a target of achieving a 100% helmet wearing rate for drivers and passengers within the next five years (current level is respectively of 68% and 46%), and working towards adoption of the UNECE helmet standard
 - requiring the registration of all powered two-wheelers, including mopeds
 - applying the mandatory motorcycle headlamp-on requirement
 - legislating antilock braking system (ABS) on new motorcycles sold.
17. Give significant priority to pedestrian safety needs, using recommended interventions (particularly pedestrian facilities and speed management) as part of supporting programs of road network, mass transit services and access, and urban planning improvements, as well as:
- improving the data on pedestrian crashes
 - developing and implementing specific measures to address pedestrian crashes on urban roads.
18. Improve knowledge on infrastructure safety performance by developing a road infrastructure safety indicator, and align the function and design of a road with safe speed limits so that crashes are either prevented or the consequences of the crash do not include death or serious injury to road users.
19. Perform studies in order to identify major weaknesses in post-crash management, and develop intervention plans.

Brazil

1. Form a federal country working group with representatives from Argentina and Mexico, and representatives of other federal countries (such as the United States, Germany, Australia) to learn from each other.
2. Address the fragmented road safety management framework, using the recommendations of the recent World Bank Capacity Review in Brazil as the basis for this.

3. Create a strong road safety lead agency, with effective inter-ministerial governance support, to co-ordinate the efforts made by different agencies at federal and state level.
4. Develop a road safety observatory within the newly established lead agency.
5. Develop a national road safety strategy, with ambitious and achievable targets, backed up by short-term action plans and interim targets for key safety performance indicators.
6. Sustain capacity and investment into its data systems and in particular:
 - encourage States to adopt a uniform police traffic crash form and data collection procedure
 - consider the implementation of a national crash data system, as other federal countries have done, to improve the accuracy and detail of statistical data at a national level
 - take measures to get information on seriously injured persons by a more systematic linking between health and police data system
 - improve vehicle registration systems by including at least the age and type of the vehicle and allowing better analysis of safety issues
 - collect traffic and travel data to help assess exposure to risk
 - improve understanding of roads and crash locations by classifying road networks at least by type of road (urban roads, rural roads and motorways), as for the moment there is no information on urban or rural length of Brazilian roads.
7. Define and pursue road safety policies interactively with mobility management policies, public transport and land-use planning.
8. Assess the effectiveness of its traffic enforcement system with the following objectives:
 - better co-ordination of police agencies, including municipal, provincial or federal polices
 - developing and implementing demonstration enforcement projects in cities, regions or states to help identify and promote good practice road traffic enforcement
 - intensifying the level of enforcement to create a higher probability of being caught, and not necessarily a higher level of penalties.
 - ensuring a sufficient number of well-trained police officers.
9. Implement a strong speed management policy and in particular:
 - apply a default urban speed limit of 50 km/h and promote 30 km/h for residential/school/shopping/recreation areas, and provide for higher speed limits only where motorised and non-motorised users are provided separate facilities
 - intensify enforcement with the introduction of automatic speed control supported by effective administrative penalty systems.
10. Continue to pursue adoption of UN vehicle safety regulations, in particular regarding electronic stability control, lateral collision standards and pedestrian protection.
11. Review the licensing system, focusing on pre-license curriculum and training standards, licensing standards such as age, and graduated exposure to risk, audit and compliance systems to monitor testing and on-going driver compliance, and systems to enforce suspension or disqualification of the driving licence.

12. Seriously address the issue of drink driving, which is underestimated, in particular by:
- strictly enforcing the legal BAC limit of zero
 - massively intensifying alcohol checks, through random breath testing targeting all vehicles
 - increasing knowledge about the drink driving issue, by systematically testing all participants of an injury crash (either breath test on the roadside for non-injured people or blood test at hospital for injured or killed people).
13. Today seat belt wearing rate is about 79% in front seats and 50% in rear seats; and about half of children are seated in a dedicated child restraint system. Brazil should aim to achieve front and rear seat belt wearing rates and child restraint use rates of 95% within the next five years through vehicle and behaviour legislation, and enforcement and promotional campaigns.
14. Give priority to improve the safety of motorcycles, in particular by:
- providing safer and affordable public transport to avoid modal shift to a more risky mode of transport
 - developing national road safety plans and projects to tackle motorcycle safety, specifically addressing licensing interventions and helmet wearing
 - setting a target of achieving a 100% helmet wearing rate, and confirm that the legislated safety standards of helmets comply with the relevant UN regulations
 - develop and implement a graduated motorcycle licensing approach, which takes into account the power of the vehicles
 - Pursue the introduction of advanced braking systems on new motorcycles sold, with the objective that all new motorcycles sold in 2019 should be equipped with antilock braking system (ABS) or combined braking system (CBS).
15. Give significant priority to pedestrian safety needs, using recommended interventions (particularly pedestrian facilities and speed management) as part of supporting programmes of road network, mass transit services and access, and urban planning improvements.
16. Improve knowledge on infrastructure safety performance, by developing a road infrastructure safety indicator, and align the function and design of a road with safe speed limits so that crashes are either prevented or the consequences of the crash do not include death or serious injury to road users.
17. Perform studies in order to identify major weaknesses in post-crash management, and develop intervention plans.

Chile

1. Assess the road safety lead agency (CONASET) regarding the scope of its mandate, its co-ordinating role at national and local level, and the technical and financial resources available to be effective in tackling road safety.
2. Give significant priority to finalising the new road safety strategy, including ambitious and achievable targets regarding the number of road deaths and key safety performance indicators. Develop biennial national road safety plans to define and support implementation of the national road safety strategy specifying the measures that will be taken, the agency responsible, and the level of funding agreed.

3. Strengthen its data systems, and in particular:
 - link police and health information systems to ensure road traffic casualties admitted to hospitals or health centres are recorded in the national crash database, along with hospitalised patients who die within 30 days of a road crash
 - improve vehicle registration systems by including at least the age and type of the vehicle and allowing better analysis of safety issues
 - improve understanding of roads and crash locations by classifying road networks at least by type of road (urban roads, rural roads and motorways), as only a jurisdictional classification of roads (state/regional/municipal roads) exists
 - collect traffic and travel data to help assess exposure to risk.
4. Define and pursue road safety policies interactively with mobility management policies, public transport and land-use planning.
5. Assess the effectiveness of its traffic enforcement system with the following objectives:
 - develop and implement demonstration enforcement projects in cities, regions or states to help identify and promote good practice road traffic enforcement
 - intensify the level of enforcement to create a higher probability of being caught, and not necessarily a higher level of penalties
 - ensure a sufficient number of well-trained police officers.
6. Implement a strong speed management policy and in particular:
 - urgently reduce the default urban speed limit from 60 km/h to 50 km/h, from which a 20% reduction in urban fatalities can be expected
 - promote 30 km/h near residential/school/shopping/recreation areas, and provide for higher speed limits in urban areas only where motorised and non-motorised users are provided separate facilities
 - intensify enforcement with the introduction of automatic speed control supported by effective administrative penalty systems.
7. Pursue current discussion towards the implementation of UN vehicle regulations on electronic stability control and the adoption of the UN regulation of pedestrian protection.
8. Review its licensing system, focusing on pre-license curriculum and training standards (particularly introducing compulsory theoretical and practical courses), licensing standards such as age, and graduated exposure to risk, audit and compliance systems to monitor testing and on-going driver compliance, and systems to enforce suspension or disqualification of the driving licence.
9. Seriously address the issue of drink driving, which is probably largely underestimated, by:
 - massively intensifying alcohol checks, through random breath testing targeting all vehicles at all times
 - increasing knowledge about the drink driving issue, by systematically testing all participants of an injury crash (either breath tests on the roadside for non-injured people or blood tests at hospital for injured or killed people).

10. Take urgent actions to substantially increase the use of seat belts in rear seats, and in particular:
 - implement a combined approach through vehicle and behaviour legislation, and enforcement and promotion campaigns
 - set a target of achieving seat belt wearing rates of 95%, in both front and rear seats
 - start monitoring the use of child restraint systems and aim at near 100% usage rate.
11. Give priority to improve the safety of motorcycles, in particular by:
 - providing safer and affordable public transport to avoid modal shift to a more risky mode of transport
 - facilitating registration of all powered two-wheelers, including mopeds
 - monitoring the results of the current motorcycle safety plans; in particular towards the main safety performance indicators
 - maintaining the high helmet usage by riders and passengers (of respective 99% and 97%) by sustained enforcement and campaigns, and confirm that the legislated safety standards of helmets comply with the relevant UN regulation
 - legislating antilock braking systems (ABS) on new motorcycles sold
 - developing and implementing a graduated motorcycle licensing approach based on the power of the vehicle
 - introducing compulsory training before the motorcycle licence is issued.
12. Give significant priority to pedestrian safety needs, and in particular:
 - use recommended interventions (particularly pedestrian facilities, better lighting in urban areas and speed management) as part of supporting programmes of road network, mass transit services and access, and urban planning improvements
 - increase knowledge on pedestrian safety and configuration of crashes involving pedestrians in particular outside built-up areas.
13. Improve knowledge on infrastructure safety performance by developing a road infrastructure safety indicator, and align the function and design of a road with safe speed limits so that crashes are either prevented or the consequences of the crash do not include death or serious injury to road users.
14. Perform studies in order to identify major weaknesses in post-crash management and develop intervention plans.

Colombia

1. Strengthen the new lead agency in terms of road safety leadership mandate (providing the required autonomy lead the national road safety effort), as well as human and financial resources, particularly in recruiting and training staff.
2. Establish a national road safety observatory within the lead agency that will be responsible for monitoring road safety performance and regularly publishing results.
3. Develop and carefully monitor safety performance indicators, as well as delivery of the national road safety strategy and achievement of associated targets.

4. Build and sustain capacity and investment in road safety data systems and research, and in particular:
 - strengthen the consolidated national crash data system with harmonised police crash report forms
 - take measures to get information on seriously injured persons by a more systematic linking between health and police data system
 - improve fleet data by including at least the age and type of the vehicle
 - collect traffic and travel data to help assess exposure to risk.
5. Define and pursue road safety policies interactively with mobility management policies, public transport and land-use planning.
6. Assess the effectiveness of its traffic enforcement system with the following objectives:
 - introducing a demerit point system to achieve better compliance with traffic rules
 - developing and implementing demonstration enforcement projects in cities, regions or states to help identify and promote good practices for road traffic enforcement
 - intensifying the level of enforcement to create a higher probability of being caught, and not necessarily a higher level of penalties
 - ensuring a sufficient number of well-trained police officers.
7. Implement a strong speed management policy and in particular:
 - apply a default urban speed limit of 50 km/h, promote 30 km/h near residential/school/shopping/recreation areas, and provide for higher speed limits only where motorised and non-motorised users are provided separate facilities
 - intensify enforcement with the introduction of automatic speed control supported by effective administrative penalty systems.
8. Give significant priority to the adoption of all seven key UN vehicle safety standards, as well as administrative and production compliance, and regulations relating to child restraint systems, motorcycle helmets and motorcycle anti-lock braking systems.
9. Review the licensing system, focusing on pre-license curriculum and training standards and licensing standards, and in particular:
 - ensure that the new driver licensing system incorporates a nationally consistent practical and theoretical test which has been developed based on experience in best performing countries
 - conduct a study to assess the potential benefits of raising the minimum age for getting a licence to 18 years.
10. Seriously address the issue of drink driving, which is likely to be largely underestimated:
 - massively intensify alcohol checks, through random breath testing targeting all vehicles
 - increase knowledge about the drink driving issue, by systematically testing all participants of an injury crash (either breath tests on the roadside for non-injured people or blood tests at hospital for injured or killed people).

11. Take urgent action to substantially increase the use of seat belts in rear seats, especially in rear seats where it is dramatically low (estimated at 2%), in particular:
 - implement vehicle and behaviour legislation, and enforcement and promotion campaigns
 - set a target of achieving seat belt wearing rates of 95% within the next five years in both front and rear seats
 - start monitoring the use of CRS and aim at near 100% usage rate
 - consider options for providing financial incentives to parents in order to acquire a CRS.
12. Give significant priority to the growing percentage of motorcyclist fatalities, and develop and implement measures to significantly reduce the number of motorcyclist fatalities, and pedestrian fatalities involving motorcycles, in particular:
 - provide safer and affordable public transport to avoid modal shift to a more risky mode of transport
 - require the registration of all powered two-wheelers, including mopeds
 - monitor the results of the motorcycle safety national plan and prepare the development of the new plan
 - set a target of achieving a 100% helmet wearing rate, and ensure that helmets are properly adjusted and fastened and that the legislated safety standards of helmets that comply with the relevant UN regulation
 - introduce a mandatory motorcycle headlamp-on requirement
 - review the content of motorcyclist pre-licensing training, to include more on safe attitudes
 - legislate antilock braking system (ABS) on new motorcycles sold
 - develop and implement a graduated motorcycle licensing approach based on the power of the vehicle
13. Give significant priority to pedestrian safety needs, using recommended interventions (particularly pedestrian facilities and speed management) as part of supporting programmes of road network, mass transit services and access, and urban planning improvements.
14. Develop and implement measures to improve the safety of the elderly population, including a review of current practices regarding infrastructure (e.g. junction in urban areas).
15. Improve knowledge on infrastructure safety performance, by developing a road infrastructure safety indicator, and align the function and design of a road with safe speed limits so that crashes are either prevented or the consequences of the crash do not include death or serious injury to road users.
16. Perform studies in order to identify major weaknesses in post-crash management, and develop intervention plans.

Costa Rica

1. Assess the road safety lead agency (COSEVI) regarding the scope of its mandate, its co-ordinating role at national and local level, and the technical and financial resources available to be effective in tackling road safety.
2. Establish a national road safety observatory within the lead agency, responsible to monitor and regularly report on progress in implementing the road safety strategy.

3. Develop biennial road safety plans to support implementation of the national road safety strategy (2015-20, specifying the measures that will be taken, the agency responsible, and the level of agreed funding).
4. Build and sustain capacity and investment into road safety data systems and research, and in particular:
 - link police and health information systems to ensure road traffic casualties admitted to hospitals or health centres are captured in the national crash database, along with hospitalised patients who die within 30 days of a road crash
 - classify road networks at least by type of road (urban roads, rural roads and motorways)
 - improve vehicle registration systems by including at least the age and type of the vehicle, and allowing better analysis of safety issues
 - collect traffic and travel data to help assess exposure to risk
 - improve understanding of roads and crash locations by classifying road networks at least by type of road (urban roads, rural roads and motorways), as information is only available for national roads.
5. Define and pursue road safety policies interactively with mobility management policies, public transport and land use planning.
6. Assess the effectiveness of its traffic enforcement system with the following objectives:
 - introduce a demerit point system with better management of license sanctions and fines to help improve compliance with road traffic law
 - develop and implement demonstration enforcement projects in cities, regions or states to help identify and promote good practices for road traffic enforcement
 - intensify the level of enforcement to create a higher probability of being caught, and not necessarily a higher level of penalties
 - ensure a sufficient number of well-trained police officers.
7. Implement a strong speed management policy and in particular:
 - promote 30 km/h near residential/school/shopping/recreation areas, and provide for higher speed limits than the default 50 km/h limit only where motorised and non-motorised users are provided separate facilities
 - intensify enforcement with the introduction of automatic speed control supported by effective administrative penalty systems.
8. Give significant priority to the adoption of all seven key UN vehicle safety standards, as well as administrative and production compliance, and regulations relating to child restraint systems, motorcycle helmets and motorcycle anti-lock braking systems.
9. Review the licensing system, focusing on pre-license curriculum and training standards (including a minimum number of compulsory training hours), licensing standards such as age, and graduated exposure to risk, audit and compliance systems to monitor testing and on-going driver compliance, and systems to enforce suspension or disqualification of the driver licence.
10. Seriously address the issue of drink driving, which is probably largely underestimated:
 - massively intensify alcohol checks, through random breath testing targeting all vehicles

- increase knowledge about the drink driving issue, by systematically testing all participants of an injury crash (either breath tests on the roadside for non-injured people or blood tests at hospital for injured or killed people).
11. Seat belt use can substantially be improved especially in rear seats:
- implement a combined approach through vehicle and behaviour legislation, and enforcement and promotional campaigns
 - set a target of achieving seat belt wearing rates of 95%, in both and front seats within the next five years
 - start monitoring the use of child restraint use and aim at near 100% usage rate.
12. Give priority to improve the safety of motorcycles, in particular by:
- providing safer and affordable public transport to avoid modal shift to a more risky mode of transport
 - implementing a dedicated motorcycle license system (to prevent the possibility to ride a motorcycle with a car licence only)
 - developing and implementing a graduated motorcycle licensing approach based on the power of the vehicle
 - requiring the registration of all powered two-wheelers, including mopeds
 - developing national road safety plans and projects to tackle motorcycle safety, specifically addressing licensing interventions and helmet wearing
 - setting a target of achieving a 100% helmet wearing rate, and confirm that the legislated safety standards of helmets comply with the relevant UN regulations
 - conducting surveys on helmets usage
 - legislating antilock braking system (ABS) on new motorcycles sold.
13. Give significant priority to pedestrian safety needs, using recommended interventions (particularly pedestrian facilities and speed management) as part of supporting programmes of road network, mass transit services and access and urban planning improvements, in particular:
- introduce legislative changes in order to give right of way to pedestrians at zebra crossings.
14. Develop and implement measures to improve the safety of the elderly population, including a review of current practices regarding infrastructure (e.g. junction in urban areas), licensing and driver training.
15. Improve knowledge on infrastructure safety performance, by developing a road infrastructure safety indicator, and align the function and design of a road with safe speed limits so that crashes are either prevented or the consequences of the crash do not include death or serious injury to road users.
16. Perform studies in order to identify major weaknesses in post-crash management, and develop intervention plans.

Cuba

1. Assess the national road safety commission regarding the scope of its mandate, its co-ordinating role at national and local level, and the technical and financial resources available to be effective in tackling road safety.

2. Establish a national road safety lead agency, supported by a national road safety observatory in charge of monitoring road safety performance and regularly reporting results.
3. Develop a set of safety performance indicators to monitor progress in the implementation of the national road safety strategy (2009-24), and regularly publish results.
4. Conduct a significant analysis into the impact of public transport systems on road safety, including investigating whether a lack of coverage may be contributing to the increases in motorcycle use, how to increase public transport patronage, and prevent unsafe vehicle operations in both formal and informal public transport.
5. Build and sustain capacity and investment into road safety data systems and research, and in particular:
 - take measures to get information on seriously injured persons by a more systematic linking between health and police data systems and ensure that new data systems disaggregate non-fatal injuries by minor and serious ones
 - improve vehicle registration systems by including at least the age and type of the vehicle and allowing better analysis of safety issues
 - collecting traffic and travel data to help assess exposure to risk.
6. Define and pursue road safety polices interactively with mobility management policies, public transport and land-use planning.
7. Assess the effectiveness of its traffic enforcement system with the following objectives:
 - developing and implementing demonstration enforcement projects in cities, regions or states to help identify and promote good practices for road traffic enforcement
 - intensifying the level of enforcement through a higher probability of being caught and not necessarily a higher level of penalties
 - ensuring a sufficient number of well-trained police officers.
8. Implement a strong speed management policy and in particular:
 - promote 30 km/h near residential/school/shopping/recreation areas, and provide for higher speed limits than the default limit of 50 km/h only where motorised and non-motorised users are provided separate facilities
 - intensify enforcement with the introduction of automatic speed control supported by effective administrative penalty systems.
9. Consider adhering to the UN Road Traffic Conventions and prioritise adopting UN vehicle regulations.
10. Review the licensing system, focusing on pre-license curriculum and training standards, licensing standards such as age, and graduated exposure to risk, audit and compliance systems to monitor testing and on-going driver compliance, and systems to enforce suspension or disqualification of the driver licence. Specifically for motorcyclists, it is recommended to develop and implement a graduated licensing approach.
11. Seriously address the issue of drink driving, which is likely largely underestimated:
 - massively intensify alcohol checks, through random breath testing targeting all vehicles

- increase knowledge about the drink driving issue, by systematically testing all participants of an injury crash (either breath tests on the roadside for non-injured people or blood tests at hospital for injured or killed people).
12. Take actions in order to make the installation of seat belts in rear seats mandatory in all vehicles.
 13. Implement a combined approach to lift rates of seat belt wearing and CRS through vehicle and behaviour legislation, and enforcement and promotion campaigns and set a target of achieving seat belt wearing rates of 95%.
 14. Give priority to improve the safety of motorcycles, in particular by:
 - providing safer and affordable public transport to avoid modal shift to a more risky mode of transport
 - developing national road safety plans and projects to tackle motorcycle safety, specifically addressing licensing interventions and helmet wearing
 - setting a target of achieving a 100% helmet wearing rate, and confirm that the legislated safety standards of helmets comply with the relevant UN regulations
 - considering legislating antilock braking systems (ABS) on new motorcycles sold
 - requiring registration of all powered two-wheelers, including mopeds
 - introducing a mandatory motorcycle headlamp-on requirement
 - considering introducing a minimum compulsory theoretical and practical training classes.
 15. Give significant priority to pedestrian safety needs, and research the trend of pedestrian fatalities which are increasing at a higher pace when compared with other road users. It is suggested to use the WHO recommended interventions as part of supporting programmes of road network, mass transit services and access, and urban planning improvements.
 16. Improve knowledge on infrastructure safety performance, by developing a road infrastructure safety indicator and aligning the function and design of a road with safe speed limits so that crashes are either prevented or the consequences of the crash do not include death or serious injury to road users.
 17. Perform studies in order to identify major weaknesses in post-crash management and develop intervention plans.

Ecuador

1. Assess the road safety agency (ANT) regarding the scope of its mandate, its co-ordinating role at national and local level, and the technical and financial resources available to be effective in tackling road safety.
2. As part of ANT, create a national road safety observatory in charge of monitoring road safety performance and regularly reporting results.
3. Monitor the progress of the current national road safety strategy (2015-20) and progress towards the national target of reducing by 40% the number of road deaths. Set up targets for a range of safety performance indicators and monitor progress towards them.
4. Develop biennial national road safety plans to define and support implementation of the national road safety strategy, specifying the measures that will be taken, the agency responsible and the level of funding agreed.

5. Build and sustain capacity and investment into road safety data systems and research, and in particular:
 - pursue the remarkable work in improving the national crash database, which was initiated recently
 - improve understanding of roads and crash locations by classifying road networks at least by type of road (urban roads, rural roads and motorways), and not just the jurisdictional classification of the roads which currently exists
 - radically improve the vehicle registration system to address the significant number of non-registered vehicles, and provide a more effective means of regulating vehicles and analysing safety issues
 - improve the current linking process of police and health information systems to ensure road traffic casualties admitted to hospitals or health centres are recorded in the national crash database, along with hospitalised patients who die within 30 days of a road crash
 - collect traffic and travel data to help assess exposure to risk.
6. Define and pursue road safety policies interactively with mobility management policies, public transport and land-use planning.
7. Assess the effectiveness of its traffic enforcement system with the following objectives:
 - conduct a road safety capacity and performance assessment of the traffic police, led by an experienced road traffic enforcement expert, to address current enforcement processes and make recommendations on how to make them more effective
 - develop and implement demonstration enforcement projects in cities, regions or states to help identify and promote good practices for road traffic enforcement
 - intensify the level of enforcement through a higher probability of being caught and not necessarily a higher level of penalties
 - ensure a sufficient number of well-trained police officers.
8. Implement a strong speed management policy at the core of the road safety strategy, in particular:
 - promote 30 km/h near residential/school/shopping/recreation areas, and provide for higher speed limits than the default limit of 50 km/h only where motorised and non-motorised users are provided separate facilities
 - intensify enforcement with the introduction of automatic speed control supported by effective administrative penalty systems.
9. Review the licensing system, focusing on pre-license curriculum and training standards, licensing standards such as age, and graduated exposure to risk, audit and compliance systems to monitor testing and on-going driver compliance, and systems to enforce suspension or disqualification of the driver licence. Specifically for motorcyclists, it is recommended to develop and implement a graduated licensing approach.
10. Urgently address the issue of drink driving, as it is estimated that up to 60% of fatal crashes are alcohol related:
 - the 0.3. g/l maximum BAC needs to be strictly enforced
 - massively intensify alcohol checks, through random breath testing targeting all vehicles

- increase knowledge about the drink driving issue, by systematically testing all participants of an injury crash (either breath tests on the roadside for non-injured people or blood tests at hospital for injured or killed people).
11. Take urgent actions to increase seat belt which is much too low (39% in front seats and as low as 3% in rear seats), and the usage of child restraint systems through:
 - vehicle and behaviour legislation, and enforcement and promotion campaigns
 - setting a target of achieving seat belt wearing rates of 95% in both front and rear seats within the next five years
 - considering options for providing parents incentives to acquire CRS for their children
 - regularly monitoring seat belt and child restraint use.
 12. Give priority to improve the safety of motorcycles in particular by:
 - providing safer and affordable public transport to avoid modal shift to a more risky mode of transport
 - developing national road safety plans and projects to tackle motorcycle safety, specifically addressing licensing interventions and helmet wearing
 - setting a target of achieving a 100% helmet wearing rate, and confirm that the legislated safety standards of helmets comply with the relevant UN regulations
 - considering legislating antilock braking systems (ABS) on new motorcycles sold
 - introducing a mandatory motorcycle headlamp-on requirement
 - requiring the registration of all powered two-wheelers, including mopeds
 - developing and implementing a graduated motorcycle licensing approach based on the power of the vehicle.
 13. Give significant priority to pedestrian safety needs in order to deal with the recent increase in pedestrian fatalities, including the safety of younger pedestrians and pedestrians on rural roads. This can be made by using WHO-recommended interventions as part of supporting programmes of road network, mass transit services and access, and urban planning improvements.
 14. Improve knowledge on infrastructure safety performance, by developing a road infrastructure safety indicator, and align the function and design of a road with safe speed limits so that crashes are either prevented or the consequences of the crash do not include death or serious injury to road users.
 15. Perform studies in order to identify major weaknesses in post-crash management and develop intervention plans.

Mexico

1. Assess the scope and mandate of the main agencies in charge of road safety, their co-ordinating roles at national and local level, and the technical and financial resources available to be effective in tackling road safety.
2. Form a federal country working group with representatives from Argentina and Brazil, and representatives of other federal countries (such as the United States, Germany, Australia) to learn from each other.

3. Establish, mandate and fund a strong lead agency to strengthen national co-ordination of the work of the various agencies involved in road safety at the national level and the work of the 32 State Councils including, for example, harmonising driving licence systems, harmonising police traffic crash forms and data collection procedures, and strengthening traffic enforcement practices across the variety of police forces.
4. Create a national road safety observatory within the lead agency to monitor the progress in the implementation of the road safety strategy and regularly publish results.
5. Closely monitor the progress with the implementation of the 2013-18 strategic action plan and prepare for a major new road safety strategy to follow it.
6. Encourage the development and implementation of state-focused road safety plans, based on the national strategy, plans, and targets.
7. Build and sustain capacity and investment into road safety data systems and research and in particular:
 - pursue the work of INEGI and STCONAPRA in developing and maintaining a national crash data system, as other federal countries have done, to improve the accuracy and detail of statistical data at a national level
 - implement a single consolidated national crash data system and a harmonised police form
 - pursue the initiatives to link police and health information systems to strengthen analysis of national road traffic casualties
 - improve vehicle registration systems by including at least the age and type of the vehicle and allowing better analysis of safety issues
 - collect traffic and travel data to help assess exposure to risk.
8. While Mexico records road fatalities for an unlimited time after a road crash, it is recommended that it also publishes data on road deaths based on the 30-days definition, as recommended by the World Health Organization, the International Transport Forum and the European Commission. This would facilitate international comparisons and allow having a set of data that does not need a permanent update.
9. Define and pursue road safety policies interactively with mobility management policies, public transport and land-use planning.
10. Strengthen road traffic enforcement by:
 - better co-ordination of police agencies, including municipal, provincial or state police, highway police, and national police forces
 - developing and implementing demonstration enforcement projects in cities, regions or states to help identify and promote good practices for road traffic enforcement
 - intensifying the level of enforcement through a higher probability of being caught and not necessarily a higher level of penalties
 - ensuring a sufficient number of well-trained police officers.
11. Implement a strong speed management policy and in particular:
 - urgently reduce the default urban speed limit from 60 km/h to 50 km/h, from which a 20% reduction in urban fatalities can be expected

- promote 30 km/h near residential/school/shopping/recreation areas, and provide for higher speed limits only where motorised and non-motorised users are provided separate facilities
 - intensify enforcement with the introduction of automatic speed control, supported by effective administrative penalty systems.
12. Give significant priority to the adoption of all seven key UN vehicle safety standards, as well as administrative and production compliance, and regulations relating to child restraint systems and motorcycle anti-lock braking systems. Finalise the procedure of adoption of the motorcycle helmet standard adopted in April 2017.
 13. Review the licensing system, focusing on pre-license curriculum and training standards (including minimum compulsory theoretical and practical training), licensing standards such as age, and graduated exposure to risk, audit and compliance systems to monitor testing and on-going driver compliance, systems to enforce suspension or disqualification of the driver licence, and a graduated motorcycle licensing approach.
 14. Seriously address the issue of drink driving, which is likely to be largely underestimated and in particular:
 - reduce the legal blood alcohol concentration limit from 0.8 g/l to 0.5 g/l, and to zero or 0.2g/l for young and novice drivers
 - increase knowledge about the drink driving issue, by systematically testing all participants of an injury crash (either breath tests on the roadside for non-injured people or blood tests at hospital for injured or killed people) (SISVEA already collects information on blood alcohol concentration on a share of fatal victims).
 15. Take urgent action to significantly increase the seat belt usage which is very low (36% in front seats and 13% in rear seats) and the use of dedicated child restraint system through:
 - vehicle and behaviour legislation, and enforcement and promotion campaigns
 - setting a target of achieving seat belt wearing rates of 95% in the front seats within the next five years
 - considering options for offering parents incentives to acquire CRS for their children.
 16. Give priority to improve the safety of motorcycles, which will become a growing issue, in particular by:
 - providing safer and affordable public transport to avoid modal shift to a more risky mode of transport
 - developing and implementing a graduated motorcycle licensing approach including compulsory training, as well as theoretical and practical tests, and motorcycle power to address the ability in most jurisdictions for anyone above 18 years of age to ride the most powerful motorbikes without dedicated training and licensing
 - monitor the progress with the implementation of the national motorcycle plan approved by CONAPRA, in particular regarding licensing interventions and helmet wearing
 - setting a target of achieving a 100% helmet wearing rate pursue work towards legislating safety standards for helmets that comply with the relevant UN regulations
 - considering legislating ABS on new motorcycles sold
 - requiring registration of all powered two-wheelers, including mopeds

- applying the mandatory motorcycle headlamp-on requirement across roads of all jurisdictions.
17. Address the very high proportion of pedestrian fatalities in Mexico by giving significant priority to pedestrian safety needs, using recommended interventions (particularly pedestrian facilities and speed management) as part of supporting programmes of road network, mass transit services and access, and urban planning improvements. The initiatives of the cities of Mexico, Xalapa, Veracruz y Guadalajara and Jalisco could usefully inspire other jurisdictions.
 18. Develop a road safety audit and infrastructure inspection system, including accreditation and adequate training of auditors and inspectors, and set up an implementation programme.
 19. Improve knowledge on infrastructure safety performance by developing a road infrastructure safety indicator, and align the function and design of a road with safe speed limits so that crashes are either prevented or the consequences of the crash do not include death or serious injury to road users.
 20. Perform studies in order to identify major weaknesses in post-crash management, and develop intervention plans.

Paraguay

1. Assess the road safety lead agency regarding the scope of its mandate, its co-ordinating role at national and local level, and the technical and financial resources available to be effective in tackling road safety.
2. Strengthen the national road safety lead agency, with skilled technical staff, a well-defined mandate and adequate budget.
3. As part of the lead agency, create a national road safety observatory in charge of monitoring road safety performance and regularly reporting results.
4. Start preparation of a new road safety strategy for 2018, including ambitious vision and achievable targets based on a detailed analysis of planned interventions and their expected effects.
5. Develop biennial national road safety plans to define and support implementation of the national road safety strategy, specifying the measures that will be taken, the agency responsible, and the level of agreed funding.
6. Conduct a significant analysis into the impact of public transport systems on road safety, including investigating whether a lack of coverage may be contributing to increases in motorcycle use, and how to increase public transport patronage.
7. Define and pursue road safety policies interactively with mobility management policies, public transport and land-use planning.
8. Build and sustain capacity and investment in road safety data systems and research, and in particular:
 - evaluate recent improvements to the vehicle registration system to address significant numbers of non-registered vehicles
 - improve vehicle registration systems by including at least the age and type of the vehicle and allowing better analysis of safety issues
 - improve the national safety database to include information on crashes and not only on victims

- collect traffic and travel data to help assess exposure to risk.
9. Assess the effectiveness of the traffic enforcement system with the following objectives:
 - undertake a road safety capacity and performance assessment of traffic enforcement, led by an experienced road traffic enforcement expert, to address current enforcement processes, and make recommendations on how to make them more effective and equitable
 - investigate what is needed to fully implement the demerit point system, and implement the necessary changes
 - develop and implement demonstration enforcement projects in cities, regions or states to help identify and promote good practices for road traffic enforcement
 - intensify the level of enforcement to create a higher probability of being caught, and not necessarily a higher level of penalties
 - ensure a sufficient number of well-trained police officers.
 10. Implement a strong speed management policy and in particular:
 - promote 30 km/h near residential/school/shopping/recreation areas, and provide for higher speed limits than the default limit of 50 km/h only where motorised and non-motorised users are provided separate facilities
 - intensify enforcement with the introduction of automatic speed control supported by effective administrative penalty systems.
 11. Give significant priority to the adoption of all seven key UN vehicle safety standards, as well as administrative and production compliance, and regulations relating to child restraint systems, motorcycle helmets and motorcycle anti-lock braking systems.
 12. Review its licensing system, focusing on pre-license curriculum and training standards, licensing standards such as age, and graduated exposure to risk, audit and compliance systems to monitor testing and on-going driver compliance, and systems to enforce suspension or disqualification of the driver licence, in particular:
 - consider introducing compulsory pre-licensing courses
 - analyse, make recommendations and changes regarding the safety of young drivers (15 to 19-years old) who present a high risk in Paraguay.
 13. Seriously address the issue of drink driving, which is likely to be largely underestimated:
 - strictly enforce the legal BAC limit of zero
 - massively intensify alcohol checks, through random breath testing targeting all vehicles
 - increase knowledge about the drink driving issue, by systematically testing all participants of an injury crash (either breath tests on the roadside for non-injured people or blood tests at the hospital for injured or killed people).
 14. Take actions to increase seat belt usage, which is very low (29% in front seats and 13% in rear seats), and of dedicated child restraint systems (which are nearly non-existent), in particular:
 - implement a combined vehicle and behaviour legislation, and enforcement and promotion campaigns
 - set a target of achieving seat belt wearing rates of 95% for front seats for the next five years

- consider options to provide parents incentives for the purchase of child restraint systems.
15. Give priority to improve the safety of motorcycles in particular by:
 - providing safer and affordable public transport to avoid modal shift to a more risky mode of transport
 - requiring the registration of all powered two-wheelers, including mopeds
 - developing national road safety plans and projects to tackle motorcycle safety, specifically addressing licensing interventions and helmet wearing
 - taking urgent actions to increase the helmet use, which is currently very low (38% for drivers and 19% for the first passenger)
 - setting a target of achieving a 100% helmet wearing rate, and pursue current work to require safety standards of helmets that comply with the relevant UN regulations
 - introduce a mandatory motorcycle headlamp-on requirement
 - considering legislating antilock braking systems (ABS) on new motorcycles sold
 - developing and implementing a graduated motorcycle licensing approach based on the power of the vehicle and introducing compulsory pre-licensing training.
 16. Promote a safer road environment for pedestrians by improving design standards, and also to perform audit checks (at the design stage) and safety inspections (post construction), develop and implement measures to reduce the high percentage of pedestrian fatalities on urban roads and the incidence of pedestrian fatalities occurring in night periods through better lighting, for example.
 17. Improve knowledge on infrastructure safety performance, by developing a road infrastructure safety indicator, and align the function and design of a road with safe speed limits so that crashes are either prevented or the consequences of the crash do not include death or serious injury to road users.
 18. Perform studies in order to identify major weaknesses in post-crash management and develop intervention plans.

Uruguay

1. Assess the road safety lead agency (UNASEV) regarding the scope of its mandate, its co-ordinating role at the national and local level, and the technical and financial resources available to be effective in tackling road safety.
2. Conduct an assessment of the implementation of the national road safety strategy and national road safety plans and achievement of targets; identify improvements to the specification of safety measures, implementation of these measures and monitoring of results against the targets.
3. Build and sustain capacity and investment into road safety data systems and research and in particular:
 - take measures to get information on seriously injured persons by a more systematic linking between health and police data systems
 - improve vehicle registration systems by including at least the age and type of the vehicle and allowing better analysis of safety issues
 - collect traffic and travel data to help assess exposure to risk

- improve understanding of roads and crash locations by classifying road networks at least by type of road (urban roads, rural roads and motorways), as no information of urban road length is available.
4. Define and pursue road safety policies interactively with mobility management policies, public transport and land-use planning.
 5. Assess the effectiveness of their traffic enforcement system with the following objectives:
 - introducing a demerit point system to help improve compliance with traffic rules
 - developing and implementing demonstration enforcement projects in cities, regions or states to help identify and promote good practice road traffic enforcement
 - intensifying the level of enforcement to create a higher probability of being caught, and not necessarily higher level of penalties
 - ensuring a sufficient number of well-trained police officers.
 6. Implement a strong speed management policy and in particular:
 - promote 30 km/h near residential/school/shopping/recreation areas, and provide for higher speed limits than the default limit of 50 km/h only where motorised and non-motorised users are provided separate facilities
 - intensify enforcement with the introduction of automatic speed control supported by effective administrative penalty systems.
 7. Consider adoption the UN vehicle safety standards regarding lateral collision, electronic stability control and pedestrian protection.
 8. Review the licensing system and in particular consider introducing compulsory pre-licensing training.
 9. Carefully analyse the safety of young people (15 to 19-years old) who present a high risk in Uruguay.
 10. Continue to address the issue of drink driving by:
 - massively intensifying alcohol checks, through random breath testing targeting all vehicles
 - increasing knowledge about the drink driving issue, by systematically testing all participants of an injury crash (either breath tests on the roadside for non-injured people or blood tests at the hospital for injured or killed people), as there is no data today on the share of road deaths due to alcohol.
 11. Take action to increase seat belt usage which is too low (63% in front seats and only 27% in rear seats), as well as the use of dedicated child restraint system in particular:
 - implement vehicle and behaviour legislation, and enforcement and promotional campaigns
 - set a target of achieving seat belt wearing rates of 95% in both front and rear seats, within the next five years
 - consider options to provide parents incentives to purchase CRS for their children.

12. Give significant priority to the development and implementation of measures to address the safety of motorcyclists who constitute more than half of the road deaths in Uruguay:
 - provide safer and affordable public transport to avoid modal shift to a more risky mode of transport
 - monitor the results of the 2013-15 motorcycle plan, and based on these develop a new motorcycle plan with targets regarding key performance indicators
 - set a target of achieving a 100% helmet wearing rate and confirm that the legislated safety standards of helmets comply with the relevant UN regulations
 - pursue the current discussion to mandate antilock braking systems (ABS) on new motorcycles sold, possibly as of 2018
 - require the registration of all powered two-wheelers, including mopeds.
13. Give significant priority to pedestrian safety needs in particular by:
 - further analysing pedestrian crash scenarios
 - implementing recommended interventions (particularly pedestrian facilities and speed management) as part of supporting programs of road network, mass transit services and access, and urban planning improvements.
14. Conduct a thorough analysis to identify the factors behind the high rate of fatalities in urban areas, particularly focusing on vulnerable road users.
15. Improve knowledge on infrastructure safety performance, by developing a road infrastructure safety indicator, and align the function and design of a road with safe speed limits so that crashes are either prevented or the consequences of the crash do not include death or serious injury to road users.
16. Perform studies in order to identify major weaknesses in post-crash management and develop intervention plans.

OISEVI

OISEVI has achieved remarkable work since its inception in 2012, by fostering safety data collection, sharing information and promoting best practices among its member countries. A benchmarking study such as this one would not have been possible without the action of OISEVI; as data and information used to be scarce and hardly comparable.

Nevertheless, there is still much for OISEVI to do to assist its member countries in improving their knowledge on their mobility and safety issues. There would be particular value in OISEVI developing and promoting common methodologies to collect information on behavioural and mobility issues.

It is recommended that OISEVI considers the following:

1. Continue encouraging countries to improve and share their road safety data, and consider playing a quality assurance role in the road safety data systems of its member countries.
2. Initiate thorough reviews in its member countries of their driving licensing systems, to support evidence-based graduated licensing systems and licence-based sanctions systems.

3. Develop a common methodology through which travel surveys can be undertaken in all countries. This would support comparable data and information on mobility patterns in Latin America, which is critically needed to assist crash data analysis.
4. Initiate regular surveys on the issue of drink driving in Latin America. This would involve developing a methodology to assess the extent of drink driving (by categories such as road user types, location and time of day), and of drink driving enforcement about which there is currently very little information.
5. Give priority to a sustained speed management research and development study, in collaboration with country agencies, including speed limits, legislation, enforcement practices and monitoring programs. This would include the development of:
 - a common methodology to measure speed inside and outside urban areas
 - guidance to review speed limits on the whole road network, taking into account traffic characteristics, road function and designs, to ensure that speed limits are adequate.
6. Undertake a study across the ten countries to develop a safer-roads indicator, particularly focused on urban settings and villages, in order to help explain differences in the number of people killed and injured, and use that to further improve the safety quality of road infrastructure.
7. Undertake a study on enforcement practices in Latin America, including a detailed description of police agencies in charge of enforcement, enforcement methods and sanction regimes.
8. Encourage all countries to undertake regular (for example every four years) surveys on seat belt, child restraint and helmet use, using the methodology already developed.

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Benchmarking Road Safety in Latin America

Road safety is a major issue in Latin America and substantial actions are needed to reduce the number of road deaths and injuries. This report describes and benchmarks road safety management and performance in ten Latin American countries: Argentina, Brazil, Chile, Colombia, Costa Rica, Cuba, Ecuador, Mexico, Paraguay and Uruguay. The comparisons in this study allow identifying similarities and differences between countries' road safety performance. It will be useful to policy makers in assessing weaknesses and strengths, and designing effective road safety policies that make use of the experiences in other countries.

This report is part of the International Transport Forum's Case-Specific Policy Analysis series. These are topical studies on specific issues carried out by the ITF in agreement with local institutions.

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