21. Traffic safety in low- and middle-income countries

Introduction

More than 90% of traffic fatalities occur in low- and middle-income countries (LMICs). Most traffic safety knowledge, however, has been generated in the high-income countries (HICs). While the theoretical foundations of the Safe System are universal, and it is likely that many of the known countermeasures from HICs would be effective in LMICs, customisation to the local context is necessary. It is important to understand the most urgent traffic safety problems and their causes (which are quite different from those in HICs), but also to adjust the safety measure toolbox to the existing governance structure, state of the road network and vehicle fleet, local road user behaviour and attitudes, as well as the general traffic safety culture in the society.

Learning outcomes

After completing this module, the students should be able to:

- recall the absolute numbers and relative shares of traffic casualties in HICs and LMICs
- understand the reasons (beyond income level) for differences in traffic safety performance between HICs and LMICs
- understand similarities and differences in traffic safety challenges in HICs and LMICs
- understand what traffic safety measures are likely to be universally efficient, and which require adjustments to the local context.

Key messages to learners

To be integrated into module 1 'Traffic safety—problem scope':

- Low- and middle-income countries (LMICs) bear the greatest burden of traffic-related casualties. Although they account for only about 10% of the world's paved roads and 70% of its motor vehicles, LMICs are responsible for more than 90% of all traffic fatalities.
- There is a clear pattern: lower GDP (gross domestic product) is associated with higher traffic fatality rates. However, there is considerable variation in traffic safety records within each income category, with both 'good' and 'bad' performers present. Viewed globally, traffic safety performance forms a continuum, with most countries situated somewhere in the middle. The polarised world of the mid-twentieth century, characterised by a pronounced divide between 'rich' and 'poor' countries, no longer exists.
- There is a marked difference in trends between HICs and LMICs. While the vehicle fleet in HICs is relatively saturated and traffic fatalities are generally decreasing, the situation in many LMICs is the opposite: the number of motor vehicles is growing exponentially, and traffic fatalities are rising accordingly. Societal views on motorisation also differ. In HICs, motorisation is often regarded as a burden—associated with pollution, congestion, collisions, and other negative externalities—whereas in LMICs it is frequently welcomed as a symbol of progress, economic development, and personal freedom. In addition, vehicle fleet growth in LMICs is often driven not by private cars, as is typical in HICs, but by three- and two-wheeled vehicles.
- The traffic safety conditions in LMICs are characterised by:
  - Significant gaps in basic road infrastructure: much essential infrastructure still needs to be constructed or upgraded (for example, pedestrian footways and paved rural roads).

- An ageing and poorly regulated vehicle fleet: vehicles are typically more than 20 years old; most are imported after extended use in HICs; inspections at import and during subsequent use are inadequate; safety features are frequently removed or not properly repaired.
- Insufficient knowledge of traffic rules and safe behaviour: many road users lack a proper understanding of traffic regulations and safety practices; fatalistic attitudes towards traffic accidents, along with local beliefs and superstitions about their causes, hinder safety promotion.
- Under-resourced post-crash care systems: ambulance services and trained medical practitioners are often insufficient; as a result, lay responders play a significantly more important role in saving the lives of accident victims.
- Limited understanding of the importance of safe speeds: both practitioners and road users often underestimate the role of speed in accident risk and severity of consequences; driving at high speed or ignoring speed limits is perceived as a sign of being a 'good driver'; speed limits are frequently absent or inappropriate for the local context.
- Low public trust in government initiatives: corruption and weak institutions reduce confidence in official programmes; top-down reforms are difficult to implement, and much traffic safety work is therefore carried out at the grassroots level by non-governmental initiatives.

To be integrated into module 3 'Safe System approach':

- The theoretical foundations of the Safe System are universal and apply equally to LMICs: human biomechanical tolerance does not vary between countries, and the principle that no one should be killed or severely injured in traffic holds regardless of income level. However, the starting point for implementation differs fundamentally. Whereas HICs have been able to build the Safe System on top of functioning basic infrastructure, established vehicle safety standards, and strong institutional capacity, most LMICs must first address foundational gaps—such as construction of basic pedestrian infrastructure, regulation of vehicle import and inspections, and systematic approach to the speed management including road classification, installation of appropriate speed limits, and their enforcement—before higher-level Safe System measures can be effective.
- The Safe System principle of shared responsibility poses particular challenges in LMICs. System designers (such as road authorities, vehicle regulators, and urban planners) often lack the resources, mandate, or institutional strength to fulfil their responsibilities. In practice, the burden of responsibility therefore falls disproportionately on road users, many of whom lack proper training, walk or cycle out of necessity, and navigate environments that are not designed for safety. Implementing the Safe System in LMICs thus requires not only technical measures but also institutional strengthening, efforts to build public trust, and careful adaptation of both the pace and the sequencing of implementation to local conditions.

To be integrated into module 5 'Traffic safety data':

- Reliable data on traffic casualties in LMICs remains scarce. In most LMICs, the traffic fatality figures reported by the World Health Organisation (WHO) are based on estimates rather than official statistics. The discrepancy between official and estimated numbers (under-reporting) may be as high as 60%–80%. Accessing official accident records is also often difficult, both due to bureaucratic obstacles and practical constraints, such as when records exist only as paper files stored in numerous local police offices.
- While the long-term goal must be to establish a proper system for traffic accident reporting, in the short term it is often more practical to make use of data sources other than official accident reports. Safety performance indicators (SPIs), traffic-conflict studies, behavioural observations, and other 'indirect' methods of measuring traffic safety are particularly valuable in LMIC contexts.
- LMICs have also contributed several innovative methods of collecting traffic-safety data that have not been widely considered in HICs. Examples include analysing social-media posts about traffic accidents or employing journalists and laypeople to report accidents to unofficial databases, many of which are operated by non-governmental organisations.

To be integrated into module 9 'Traffic safety measures:

- Most evaluation studies of traffic-safety measures originate from HICs. While one may expect that measures addressing the physics and biomechanics of traffic accidents—such as seat belts, road lighting, separation barriers, and roadside treatments—are likely to be effective in LMICs as well, the magnitude of their effects is unlikely to be 'transferable'. More accurate estimations require locally conducted research.
- Measures directed at road users may perform very differently, influenced by the local cultures and contextual factors. For example, the safety effects of enforcement depend heavily on whether it is carried out in a fair and objective manner or is characterised by frequent corruption, whereby offenders can buy their way out of sanctions and continue behaving in an unsafe way.

To be integrated into module 11 'Traffic safety management':

- While Safety System and an integrated approach to traffic safety are highly relevant in LMICs, there remains a need to 'fill in' the lower levels of the safety-maturity ladder. In particular, substantial work is required to ensure the basic functioning of all traffic-safety pillars, such as providing essential road infrastructure for all types of road users, maintaining minimum safety standards for the vehicle fleet, and ensuring that road users possess basic safety knowledge. Tools such as https://safesystemtool.itf-oecd.org can help create a roadmap and determine the appropriate sequence in which the various components should be addressed.
- For many traffic-safety challenges, 'immediate solutions' may not be effective in the long term, whereas 'system-level' solutions, though slower to implement, can deliver sustainable results. Examples include:
  - Motorcycle safety: should authorities focus on enforcing or educating the rapidly growing motorcycle-rider population, or consider developing more efficient and safer public-transport options that could reduce reliance on motorcycles?
  - Vehicle-quality control: should efforts concentrate on identifying vehicles in poor technical condition already on the road, or on establishing stronger vehicle-import controls to prevent the entry of excessively old or faulty vehicles in the first place?
  - Unsafe competition for passenger among bus drivers: should interventions emphasise enforcing safer behaviour, or should financial schemes be redesigned—such as payment per completed route rather than per passenger ticket sold—to discourage competition that compromises safety?
- There is an urgent need for more traffic-safety research in LMIC contexts. At present, the bulk of scientific publications originates from HICs and is based on HIC conditions. This imbalance reflects both a general shortage of well-trained researchers in LMICs and insufficient funding to conduct the necessary research.
- Governmental institutions must be strengthened and must build trust with road users in order to improve the efficiency of traffic-safety management.
- Full implementation of the Safe System in LMICs requires a major societal transformation: the strengthening and streamlining of government institutions, the elimination of corruption, and the provision of adequate data and resources. To avoid apathy and inaction while awaiting such large-scale reforms, the 'small wins framework' may offer a meaningful strategy by activating cumulative mechanisms of change. Through modest, localised efforts to improve traffic safety, societies can accumulate examples of effective solutions, learn from both successes and failures, build trust and coalitions between citizens and local authorities, and gradually develop new norms and expectations around safety.

To be integrated into module 12 'Safe speed':

- Many roads in LMICs lack or have inadequate speed limits. Revision of the speed limits on all roads, as well as their enforcement, is 'a low-hanging fruit' that effectively improves traffic safety.

- Public attitudes to speeding as a marker of 'good driving' must change.
- Particularly in urban areas, low-speed areas (30 km/h) must be introduced on a larger scale (and secured with traffic calming measures) to ensure the safety of vulnerable road users..

To be integrated into module 13 'Safe road users':

- Generally, knowledge of traffic rules and basic traffic safety principles is low in LMIC populations. Particularly in driver education, more emphasis should be placed on 'safe driving' rather than 'efficient driving' (often interpre.
- Public campaigns are frequently used in LMICs; however, their effectiveness is generally low due to unclear messages ('Drive safely!'), poorly defined target groups, lack of credibility of the 'senders', lack of evaluation, and therefore no feedback on what to improve.
- Road user education and campaigns are most effective when combined with enforcement. However, enforcement becomes inefficient when police officers are corrupt. Other areas heavily impacted by corruption include driver licensing, periodic vehicle inspections, and more.
- Fatalistic and local beliefs ('it does not matter how you behave in traffic if your fate is to die in an accident', 'witchcraft causes accidents'), attitudes towards speeding as a way of demonstrating mastery over traffic, and projections of social hierarchies onto traffic behaviour and attitudes ('walkers/cyclists are poor unimportant people, therefore cars always go first') seriously influence the local traffic safety cultures and can undermine safety initiatives that do not consider them.

To be integrated into module 14 'Safe vehicles':

- Vehicle fleets in many LMICs are dominated by second- and third-hand vehicles that are very old and in too poor condition to be used in HICs. Lack of proper import control regulations in many LMICs results in vehicles lacking basic safety features (functional brakes, lamps, seat belts, etc.) entering the market. Moreover, some features, such as airbags, can be deliberately removed by car dealers to make their vehicles more attractive to buyers.
- In the case of new vehicles, it is well known that global vehicle producers often release cheaper, less safe models for LMIC markets. To ensure the basic safety level of the vehicles sold, it is strongly recommended that each country adopt international vehicle safety standards (e.g. developed by the UN), or develop its own standards (as done in China, India, etc.).
- Vehicle standards ensure that only the minimum safety requirements are met for new vehicles sold in a country. Consumer test programmes 'push' the producers to raise the bar even higher, by implementing the latest safety technologies that are not yet legally required. Independent consumer test programmes, such as Global NCAP, perform crash tests of the new vehicle models on the market and set safety ratings ('stars') for each of them. In the HICs, the NCAP tests have had a significant impact on the overall vehicle safety level, making it virtually impossible to earn money by selling new vehicle models that do not have the highest possible safety rating. For the LMICs, it is important to both expand the NCAP testing to cover more models and to increase consumer awareness of the NCAP. This will help the buyers in the LMICs to choose their new vehicles based not only on preferred colour or stereo system's sound quality, but also on their safety characteristics.

To be integrated into module 15 'Safe infrastructure':

- In many LMICs, the road standards are inherited from older versions of the standards used in some of HICs (USA's 'Highway Capacity Manual', British or German standards, etc.). Such standards fail to: (*i*) take into account the local traffic peculiarities (e.g. high share of motorcycles and auto-rickshas, lack of respect for lane markings): (*ii*) account sufficiently for the presence of the vulnerable road users.
- A major traffic safety challenge is that rural road design (high speeds, limited pedestrian and cyclist facilities) is widely applied to urban streets. This creates a network of highways in densely populated areas that become major barriers and sources of danger for residents.

- Clear classification of roads and streets by their surrounding environment and the functions they perform is necessary. For urban areas, the streets must accommodate (and promote) the unmotorized traffic, with the speed levels secured at 30 km/h. For rural areas, high-speed roads should accommodate the best-practice safety solutions, such as median separation, safe roadsides, roundabouts at intersections, etc.

To be integrated into module 16 'Post crash care':

- When emergency vehicles and trained personnel are limited, it may take a long time for accident victims to reach a medical facility. During this critical 'golden hour', it is essential that first aid is administered by lay responders. Especially along high-risk corridors, establishing a network of individuals trained in basic life-saving skills is crucial to extend victims' survival time until they can receive professional help. Basic first aid training should be an integral part of driver education.
- The legislation should ensure both the duty to assist accident victims and protection for helpers from legal charges later on (the 'good Samaritan law').
- Post-crash care should include not only immediate first aid but also rehabilitation, psychological and legal support, as well as aid with reintegration—especially when the accident's effects have substantially changed the victim's life circumstances.

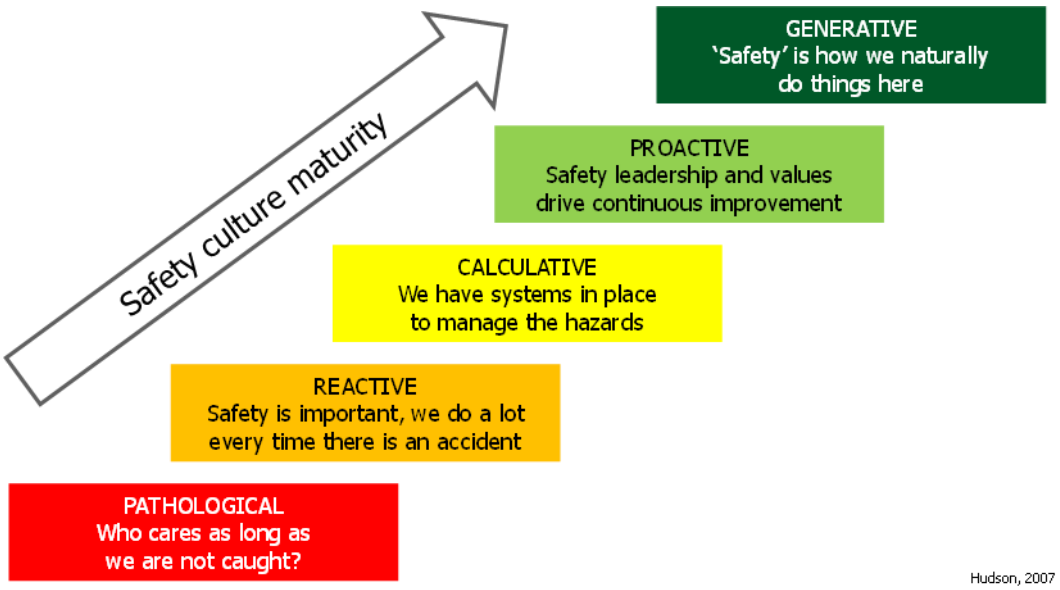
To be integrated into module 18 'Meeting preconditions of various groups in traffic':

- Children, older adults, and people with functional limitations face compounded vulnerability in LMIC traffic environments. Unlike in HICs, where dedicated infrastructure (school zones, accessible crossings, protected cycle lanes) provides a baseline of safety for these groups, most LMIC road systems offer no such provisions. Children in LMICs often walk long distances to school along roads with no sidewalks, high vehicle speeds, and heavy mixed traffic. Their still-developing cognitive and perceptual abilities make them unable to judge traffic gaps or vehicle speeds accurately, a vulnerability made far more dangerous in environments with no forgiving design.
- Older adults and people with disabilities are often entirely excluded from mobility in LMICs. Public transport vehicles frequently lack accessible boarding, pedestrian infrastructure is absent or poorly maintained (uneven surfaces, missing curb ramps, no lighting), and mobility aids such as wheelchairs or walking frames are difficult to use on unpaved or obstructed paths. The capability approach, which emphasises designing environments that enhance people's abilities rather than merely minimising risk, is highly relevant here: it shifts the focus from what these groups cannot do to what the system fails to provide.
- Addressing the needs of these groups in LMICs requires practical, context-sensitive measures: safe routes to school programmes with speed reduction and crossing facilities; child restraint regulations adapted to local vehicle types (including motorcycles and minibuses); age-friendly pedestrian infrastructure with adequate crossing times, tactile surfaces, and lighting; and inclusive public transport design. These interventions should be informed by community engagement to ensure they reflect actual movement patterns and needs, rather than imported standards that may not fit the local context.

Learning activities

Exercise 1

Using the safety culture ladder by Belin (2021) (based on Hudson, 2007), discuss at which stage you find your country when it comes to the six pillars of traffic safety (safe infrastructure, safe vehicles, safe road users, safe speeds, post-crash care, safety management). Why? What is needed to move further up?



Exercise 2

Explore another tool for measuring the 'maturity' of traffic safety system at https://safesystemtool.itf-oecd.org. Though the stages are named differently (emerging, developing, mature), the basic idea is quite similar.

What areas does the tool recommend focusing on for each traffic safety pillar in your country, depending on the maturity stage that has been reached?

Assessment quiz

The assessment quiz can be used as a part of the examination, or as another form of learning activities.

Question 1

What are the approximate LMIC shares of paved roads and traffic fatalities in the global context:

- roads: 50%; fatalities: 50% (incorrect)
- roads: 12%; fatalities: 92% (correct)
- roads: 70%; fatalities: 25% (incorrect)

Comment (shown after the answer has been given): LMICs carry unproportionally high burden of traffic casualties. Representing only 84% of global population and 72% or vehicle fleet, the LMICs stand for 92% of traffic fatalities.

Question 2

What characterizes traffic safety situation in LMICs:

- Low level of motorization in many LMICs results in relatively low number of traffic accidents. (incorrect)
- Vehicle fleet is generally old and of poor safety standard. (correct)
- Fatalism and local believes often negatively affect traffic safety ('It does not matter how you behave in traffic, accidents are caused by evil spirits or written in your destiny'). (correct)
- Massive education in traffic safety for school children resulted in a growing generation of road users that behave safely and respectfully in traffic. (incorrect)
- Vehicle fleet in LMICs is generally old and of poor safety standard. (correct)

- Many safety initiatives are undermined by the lack of trust by the road users towards the state due to its inefficiency and corruption. (correct)
- Since walking has been and remains the major mode of transport in many LMICs, there is a strong culture of respecting and giving space for walkers in the road transport system. (incorrect)

Question 3

A country is considering two strategies to reduce motorcycle fatalities: (A) large-scale helmet enforcement campaigns, or (B) investing in affordable public transport to reduce motorcycle dependency. Which statement best reflects Safe System thinking in an LMIC context?

- Strategy A is always more effective because it directly targets the most common injury. (incorrect)
- Strategy B is always better because it eliminates the problem entirely. (incorrect)
- Both strategies have merit, but Strategy A may be undermined by corruption in enforcement, while Strategy B addresses the systemic root cause and may yield more sustainable long-term results. (correct)
- Neither strategy is relevant because motorcycle fatalities are not a major problem in LMICs. (incorrect)

Comment (shown after the answer has been given): This question illustrates the difference between 'immediate solutions' and 'system-level solutions' in LMICs. Helmet enforcement (Strategy A) is a valid short-term measure but is often undermined by corrupt enforcement practices, where offenders pay bribes rather than comply. Investing in safer public transport (Strategy B) addresses the root cause by reducing exposure to motorcycle risk altogether, while also contributing to broader goals such as reduced emissions and improved equity. In practice, both approaches can be pursued in parallel, but Safe System thinking prioritises systemic interventions that reduce the need for individual compliance.

Question 4

Why might a traffic safety measure that is highly effective in a high-income country produce different results when applied in an LMIC?

- Because traffic physics work differently in LMICs. (incorrect)
- Because measures addressing physics and biomechanics (e.g. seatbelts, barriers) are likely to transfer, but measures relying on road user behaviour, enforcement quality, or institutional capacity may perform very differently due to local cultures, corruption, and different traffic compositions. (correct)
- Because LMICs have too few vehicles for any traffic safety measure to be relevant. (incorrect)
- Because all HIC research is irrelevant to LMICs and should be disregarded entirely. (incorrect)

Comment (shown after the answer has been given): Measures grounded in physics and biomechanics (seatbelts, separation barriers, road lighting) are likely to be effective in any context, because the laws of physics are universal. However, the size of the effect may differ and requires local research. Measures that depend on road user behaviour, such as enforcement campaigns or speed limit compliance, may perform very differently in LMICs due to corruption (offenders buying themselves free), different traffic compositions (high share of motorcycles, pedestrians, and informal transit), fatalistic beliefs that undermine compliance, and institutional weakness. This is why most evaluation studies from HICs cannot simply be transferred to LMICs without local validation, and why there is an urgent need for more traffic safety research conducted in LMIC contexts.

Recommended reading and resources for students

- GRSP & World Bank. (2021). *Guide for road safety interventions: evidence of what works and what does not work*. https://openknowledge.worldbank.org/entities/publication/16d7b276-09b1-58f8-94d6-112064b8af5f
- ITF. (2025). *Road safety in action: The Safe System tool*. International Transport Forum. https://safesystemtool.itf-oecd.org

Recommended (additional) reading for teacher

- Belin, M.-Å. (2021). The Swedish Vision Zero—an advanced safety culture phenomenon. In G. Tiwari & D. Mohan (Eds.), *Transport and safety: systems, approaches, and implementation*. Springer Nature. https://doi.org/10.1007/978-981-16-1115-5_1
- Boateng, F. G. (2021). Why Africa cannot prosecute (or even educate) its way out of road accidents: insights from Ghana. *Humanities and Social Sciences Communications*, 8, 13. https://doi.org/10.1057/s41599-020-00695-5
- Godthelp, H., & Ksentini, A. (2024). Specific road safety issues in low- and middle-income countries (LMICs): an overview and some illustrative examples. *Traffic Safety Research*, 8, e000068. https://doi.org/10.55329/sdtu9515
- Heydari, S., Hickford, A., McIlroy, R., Turner, J., & Bachani, A. M. (2019). Road safety in low-income countries: state of knowledge and future directions. *Sustainability*, 11(22). https://doi.org/10.3390/su11226249
- Nævestad, T.-O., … (2026) Can the Safe System model realistically be transferred to LMIC contexts with lower Safe System readiness—and if not, what then? *submitted*
- PIARC. (2023). Road safety in LMICs: identification and analysis of specific issues (2023R07EN). World Road Association Technical Committee 3.1 Road Safety. https://www.piarc.org/ressources/publications/source/1/eedcc4c-41078-2023R07EN-Road-Safety-in-LMICs-Identification-and-Analysis-of-Specific-Issues-A-PIARC-Literature-Review.pdf
- PIARC. (2023). Road safety issues for LMICs: illustrative examples (2023R13EN). World Road Association Technical Committee 3.1 Road Safety. https://www.piarc.org/ressources/publications/source/1/f5a2f5a-41827-2023R13EN-Specific-Road-Safety-Issues-for-LMICs-Illustrative-Examples-A-PIARC-Collection-of-Case-Studies.pdf
- Wegman, F. (2017). The future of road safety: a worldwide perspective. *IATSS Research*, 40(2), 66–71. https://doi.org/10.1016/j.iatssr.2016.05.003
- WHO. (2023). Global status report on road safety. https://iris.who.int/bitstream/handle/10665/375016/9789240086517-eng.pdf

Prepared by experts

In case you have specific questions, need a discussion partner, or just want feedback on your lecture materials, you may reach out the author(s) of this module. Please, put ‘AfroSAFE curriculum’ in the email subject.

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