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The future of road safety: A worldwide perspective☆

Fred Wegman

Delft University of Technology, The Netherlands

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ABSTRACT

Estimates by the World Health Organization suggest that, on a yearly basis, road crashes kill 1.25 million people—nearly 3400 road fatalities per day—and injure up to 50 million. Traffic injuries are not equally spread over the world, however; some countries are hit harder than others, and the chance of being killed in a road crash depends on where one lives. Almost 90% of all traffic casualties occur in low- and middle-income countries (LMIC). Globally, the number of fatalities per 100,000 population (mortality rate) ranges from less than 3 to almost 40. The rate is less than 9 in high-income countries (HIC) but averages around 20 in LMIC, with the African region demonstrating the highest rate (26.6). While road safety trends have been positive in HIC over the last few decades, trends in LMIC are not telling a positive story: road fatalities are expected to increase to almost 2 million road fatalities per year by 2020.

The United Nations has adopted several resolutions on road safety and proposes actions to tackle the global road safety crisis. Considering the current level of road safety to be unacceptable, the UN has taken several initiatives. One effort, the Decade of Action for Road Safety 2011–2020, has generated substantial activity around the world over the last couple of years. Furthermore, it is very encouraging that the UN included road safety in the Sustainable Development Goals that it laid out in September 2015. Road safety is part of the public health agenda and the urban development agenda. Measured in "real actions," however, the responses so far from the overall global community and individual countries do not suggest that we are already on the right track to bringing down the death toll on roads.

The future of road safety is uncertain and definitely not the same for all regions of the world. Countries with a mature road safety approach and an ambition to make further progress are expected to move in the direction of a pro-active approach: a Safe System approach. It is reported that many LMIC, meanwhile, are on the brink of designing road safety strategies and implementing action plans. The international community is willing to support LMIC, but LMIC cannot simply copy successful HIC strategies because local circumstances differ. The principles of successful HIC strategies are applicable, but the priorities and action plans should take root in and align with local conditions.

Contents

1. Measuring (progress in) road safety

Measuring road safety is not as simple as measuring temperature. There are various ways to define road safety. When measuring road safety, therefore, it is of the utmost importance to make clear which elements are included in a definition and which are not. The most common measures to define road safety are the number of road crashes,

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the number of road casualties, and the associated negative consequences [1]. However, this definition is not universal in its scope of use. Problems related to the use of different definitions are part of the reason why making international comparisons is so difficult. Issues like poor data collection methods, data incompleteness, and problematic data availability also complicate the comparison process [2]. The United Nations (UN ECE) has taken the lead in working to standardize the various international definitions. In almost all countries, police forces register information on crashes. For several reasons, these registrations are always incomplete. This is called underreporting. Further complicating the matter is the phenomenon of biased underreporting, which results in certain crash types not figuring into official statistics. For example, cycle crashes are notoriously underreported; these types of crashes are victim to underreporting far more often than crashes with motorized vehicles are. Moreover, the consequences associated with road crashes (at an individual level and a societal level) are known only to a limited extent. Fortunately, many countries in the world are aware of problems in the quality of their road safety data and working to make improvements.

It has long been a tradition in road safety to analyze road safety data to understand why crashes occur, which factors influence risks, and what determines crash severity, and based on this understanding, to arrive at reliable conclusions on how to prevent them most effectively and efficiently. We call this a data-driven approach [3] or "going fishing where the fish are." In this approach, we derive priorities by using crash data, background data, exposure data, and data of safety performance indicators.

Fig. 1 shows an example of this approach. Risks for males and females (serious injuries per kilometer traveled) are presented for different age groups. We observe relatively high risks for young drivers, especially young males, and for elderly drivers. Naturally, we want to find an explanation for these spikes in the distribution and subsequently an answer to the question of how to reduce the high risks. In order to establish a good understanding of the situation, it would be worthwhile to identify the conditions and circumstances under which high-risk crashes occur: time of day/night, alcohol involvement, and road type, etc. Generally speaking, however, we cannot derive a fully satisfactory answer through crash data alone. We also need to incorporate exposure data, data on safety performance indicators [4], and, of course, scientific literature that might guide further analysis.

The basic idea behind this *go-fishing-where-the-fish-are* approach is the general assumption that it would be easier (and more effective and efficient) to reduce higher risks than it would be to reduce lower risks. This is the same type of reasoning as used to address safety problems in locations with high numbers of crashes: improving intersections with numerous of crashes is easier than improving those with low numbers of crashes.

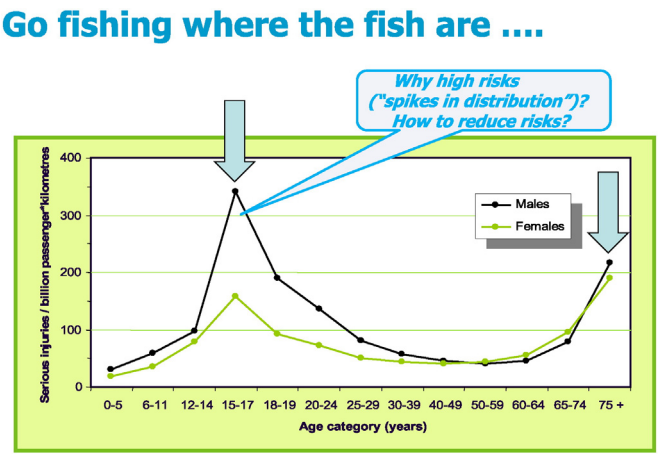

Fig. 1. Relationship between age category and injury risk (serious injuries per billion passenger kilometers) among males and females.

It can also be helpful to learn from others by comparing one's own performance with that of others. For example, one could compare the reduction in the number of fatalities in a country with reductions in others (Fig. 2).

For instance, one might look at Fig. 2 and think about what kinds of action plans Spain implemented to achieve a 70.9% reduction (2000–2013)—a result that makes Spain an "outperformer" and a country to learn from [2]. One could also investigate matters the other way around: how has Spain been inspired by the achievements of other countries, such as the positive results in France? If we study the international literature to understand how countries have improved their safety performance over the years, we find a multitude of potential explanations. Researchers have developed benchmarking methodologies to learn from international comparisons (see, for example, [5,6]). Designing meaningful benchmarking and identifying "working ingredients" are rather complicated tasks, considering that countries often implement a variety of road safety interventions over a single period. Moreover, other developments have an impact on road risks (which researchers call "confounding factors"). It is, to the best of our knowledge, fair to say that no country has a full explanation of the progress made. However, it is also fair to say that our knowledge and understanding of why countries made progress has increased significantly over the last few decades.

Traditional road safety areas are tackled with rather well-known interventions:

- Improving human behavior (speed, alcohol, seat belts, and helmets) through legislation, enforcement, and campaigns;
- Safer infrastructure through planning and design; and
- Safer vehicles through better crashworthiness, active vehicle safety, and vehicle inspections.

The Handbook of Road Safety Measures [7] gives a comprehensive overview and illustration of how various interventions impact road safety. Almost all the research in the Handbook comes from studies in high-income countries (HIC) or highly-motorized countries. However, simply transferring this knowledge to other regions of the world is not a valid approach; the transferability of research results relies first and foremost on the extent to which the reported safety effects of interventions depend on the circumstances in which the research was carried out [8]. Still, it is an encouraging development to see how low- and middle-income countries (LMIC) try to improve their road safety records by learning from HIC [9]. Furthermore, it has become rather popular to produce "best or good practice manuals" that provide a foundation for learning. In the United States, for example, one manual identifies 23 key emphasis areas that affect highway safety. Each of the 23 emphasis areas (such as speed, head-on collisions, novice drivers, collisions with utility poles, distraction, aggressive driving, and unsignalized intersections, etc.) includes strategies and outlines of the requirements for implementing each strategy (http://www.trb.org/Main/Blurbs/152868.aspx). Experts in Europe carried out the "Supreme" project, resulting in a report called "Best Practices in Road Safety: Handbook for Measures at the Country Level" (2007). The final report of the Supreme project consists of 14 volumes (http://ec.europa.eu/transport/roadsafety_library/publications/supreme). The European Road Safety Observatory ERSO has an interesting knowledge base of "fact sheets," and the World Health Organization prepares "how-to" road safety manuals for LMIC (http://www.who.int/roadsafety/publications/en/). As I stated before, however, local experts have to assess if and how results from these studies can be transferred to their own settings.

When trying to explain why Spain made such an enormous progress, for instance, the fact that Spain was not the only country with a massive

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