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## **Disability Due to Road Traffic Crashes and the Management of Road Safety in Developing Countries**

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# **Disability Due to Road Traffic Crashes and the Management of Road Safety in Developing Countries**

## **Abstract**

Injury as a result of road traffic crashes is one of the most significant public health problems in developing countries. It intersects with disability as a development issue because a substantial proportion of people injured in road traffic crashes experience disability, both short term and long term. While there have been significant steps towards better management of road safety globally, especially in developing countries, the implications for road safety policy and practice of disability due road traffic crashes is not fully appreciated. In particular, qualitative information on the lived experience people with a long term disability as a result of a road traffic crash can inform better road safety policy and practice, as demonstrated in a case study from Thailand. The benefits of better policies and practices are likely to accrue to a wide range of road users, and to contribute to the achievement of sustainable development.

**Keywords:** Disability, road safety, developing countries, management, lived experience, road traffic crash

## **Introduction**

Prior to 2000, the global public health community had paid limited attention to road safety as among other public health issues (WHO, 2004). This situation changed in 2000 with a series of WHO initiatives that included publication in 2004 of the World Report on Road Traffic Injury Prevention (WHO, 2004), which provided a comparative picture of the contribution of road traffic crashes to the global burden of disease. This global focus on road safety has been sustained, with the 2013 Global Status Report (WHO, 2013) which cites estimates that about 1.24 million people are killed each year in road traffic crashes, while a further 20-50 million are injured. It was noted that 90% of the road traffic

fatalities occur in developing countries, in spite of their lower levels of motorization. The Global Burden of Disease projections (WHO, nd) are that death as a result of road injury will be ranked 9th highest for 2015, rising to 7th in 2030, with the ranks being highest in developing countries. The population rate of death from road injury is also expected to increase, from 20 per 100,000 in 2015 to 22 per 100,000 in 2030.

In recent years there has been a new momentum behind efforts to highlight disability as a global issue. The World Report on Disability was released in 2011 (WHO, 2011b) and included updated estimates from the Global Burden of Disease study that 15.3% of the world's population in 2004 had moderate or severe disability. Developing countries had higher rates in all age groupings, and about 80% of people with disabilities live in developing countries (WHO, 2006) where disability is considered to be a significant barrier to development (WHO, 2011b).

The World Report also notes the contribution of road traffic crashes to disability, though it states that there is a lack of documentation about the scale and nature of the links between road traffic crashes and disability. It is the purpose of this paper to articulate how a better qualitative understanding of the long term disability impacts of road traffic crashes can contribute to better management of road safety. In order to this, the way that road safety management is approached requires explanation.

### **The public health approach to road safety expressed in the UN Global Plan for the Decade of Action for Road Safety**

“Road safety” (meaning the safety of all aspects of road use, not just the safety of the road itself) has been evolving as an expression over several decades. It can be interpreted as an objective (making road use safe), as an area of policy and strategy, as a field of practice, as a field of applied research, and as a description of program activities and behaviours (both organizational and individual). A unifying characteristic

of these diverse usages is a focus on the public health approaches of primary and secondary prevention: preventing the occurrence of road traffic crashes; and mitigating the resulting harm when they do occur. These approaches are broad in scope, being effectively directed at all drivers, all roads, all vehicles. Post crash factors are not neglected, but their role is limited. There is an emphasis on retrieval and emergency treatment to reduce the chances of death or more serious complications as a result of the injuries received in the crash; and aggregate information on the long term social and economic costs of road crashes are sometimes calculated (and more often estimated) to convey the scale of the problem.

While both long and short term disability can result from road traffic crashes, road safety researchers are typically interested in the patterns of injury rather than in the disability impact itself. Long term disability is not ignored, but tends to be allocated a limited role, a characteristic shared with other areas of public health approaches (Debas et al., 2006).

In May 2011 the UN released its Global Plan for the Decade of Action for Road Safety (WHO, 2011a). The Plan is intended to contribute to achieving the goal of the Decade of Action: "stabilizing and then reducing the forecasted level of road traffic fatalities around the world by increasing activities conducted at national, regional and global levels" (p. 7). Consistent with a public health approach, the main emphasis of the Plan is on prevention of road crashes, with limited attention to post-crash factors. The Plan takes a "safe system" approach that views road crashes as being inevitable because human error will always occur, but sees road use as taking place in a system whose features can be designed or changed to minimize the incidence of human error and the consequences of a crash when it does occur. The consequences of the crash are often expressed in terms of energy exchange, since it is the exchange of energy in a crash that determines the level of injury. The intention is to manipulate the parameters of the system to reduce both the incidence of crashes (by eliminating the "system failure" aspects as much as possible) and the energy exchanged in the crash.

The Global Plan conceptualises the safe system as structured around five “pillars”: Road safety management; Safer roads and mobility; Safer vehicles; Safer road users; and Post-crash response (WHO, 2011a). The document depicts them in a kind of sequence (Figure 1), with Pillar 1 being the overarching road safety management structures and operations that should make the system safe (legislation, data systems, budgets, agencies), Pillars 2, 3 and 4 describing the standard categories of factors contributing to crashes (roads, vehicles and road users), and Pillar 5 dealing with the response once a crash has occurred (ambulance, immediate treatment).

<b>Pillar 1</b>	<b>Pillar 2</b>	<b>Pillar 3</b>	<b>Pillar 4</b>	<b>Pillar 5</b>
<b>Road safety management</b>	<b>Safer roads and mobility</b>	<b>Safer vehicles</b>	<b>Safer road users</b>	<b>Post-crash response</b>

*Figure 1: The five pillars of the Global Plan safe system (WHO, 2011a)*

These five pillars are not universal. The Australian safe system framework (ATC, 2011) features only four elements: Safe Roads, Safe Speeds, Safe Vehicles and Safe People. The Cambodia National Road Safety Action Plan includes the five pillars above and adds three more: law enforcement, vulnerable road users and driving licenses (Sann et al., 2013). However the five pillars in the Global Plan draw significance from their role in shaping the policies, plans and activities of countries around the world.

The first four Pillars have a strong focus on prevention of road traffic crashes and mitigation of energy exchange when a crash occurs. They are aimed at broad changes – influencing road safety management across all road safety domains, making all road infrastructure more conducive to safe travel, improving crashworthiness of all vehicles, improving behaviour of all road users. This is consistent with a public health approach, which focuses on prevention first and foremost, then on mitigation. Prevention

approaches in road safety deal with all road users, who are all potentially at risk of being involved in a crash. The aim is to reduce the probability that a crash will occur by addressing risk factors such as behaviour (speeding, drink driving), road conditions (slippery surface, lack of road shoulders, poor visibility) and vehicle factors (brake maintenance, stability). Mitigation approaches deal with the subset of road users in the process of experiencing a crash, in order to reduce the probability of injury and/or the likely severity of injury. They usually address road factors (clearance of roadside obstacles, guardrails, frangible poles) or vehicle factors (airbags, ESC, restraints) though behavioural factors are involved as well (restraint use, helmet wearing).

The fifth pillar – post-crash response – appears in contrast to be far more specific, focusing only on crash victims in the event of a safe system failure: the crash has occurred, and the mitigating factors during the crash have played their role. The text of the Plan mentions both “emergency treatment and longer term rehabilitation”. Most of the activities listed for countries to pursue deal with emergency response and immediate post-crash care, as might be expected. The two activities that deal indirectly with longer term disability concern the establishment of financial support for rehabilitation and creation of job opportunities.

There is a subtle but important issue here: the investigation of the crash is mentioned in terms of legal proceedings and settlements, but there appears to be no focus on collecting data on crash victims beyond the crash circumstances and their immediate treatment. In other words, the victims appear to be relevant to the first pillar (and by implication the second, third and fourth) only insofar as their numbers can be used to develop and evaluate the success of road safety programs and identify target groups and contributing factors.

### **Disability due to road traffic crashes and relationship to development**

Few studies have been conducted on long term disability after road traffic crashes, with the focus mostly being on short term impacts. For example, a cohort of French road traffic crash victims was split according to severity and followed up after a year (Hours et al., 2013). Even in the less severe category (MAIS <3), 44% reported some functional disability, while two-thirds of those in the higher severity category reported some functional disability. An important issue noted by the authors was that families were affected, not just the individuals themselves, more so in severe cases. Similarly, in a study conducted in Nigeria (Juillard et al., 2010), about one third of people who had been injured in a traffic crash in the previous year reported that it had led to a disability, with two-thirds of these people reporting that the disability left them unable to perform some activities of daily living, some losing their jobs and most suffering some income loss.

The Global Burden of Disease project (WHO, nd) takes another approach, using the concept of disability-adjusted life years (DALYs). Because they take long term disability into account, DALYs are a potentially useful way of appreciating the burden of long term disability, although there have been criticisms of the approach (WHO, 2011b). A detailed study in Thailand addressed some of these issues and found that the estimated years lost to disability as a result of non-fatal road traffic injuries was double that of the GBD estimates (Ditsuwan et al., 2011). Of the DALYs lost due to non-fatal road traffic injuries in this study, 95% were due to the long term impacts. Using earlier data and the related concept of years lost through disability, a comparative study was undertaken in the Netherlands, Thailand and South Africa (Haagsma et al., 2012). Only 1-2% of injuries resulted in lifelong impairment (likely to be an underestimate – WHO, 2011b), but this accounted for 68-76% of all years lived with a disability.

The disabling impacts of road traffic crashes are significant for development progress as well (WHO, 2011b). A detailed study of 100 households (542 people) randomly sampled from road traffic crashes in a district near Phnom Penh, Cambodia (Ericson and Kim,

2011) reached the following conclusions about the impact on the Millennium

Development Goals (MDGs):

- MDG1 (poverty): 21% income loss for the households overall, greater for the poorest households and where the injury was serious;
- MDG2 (education): drop-out rates were eight times the average for the province;
- MDG3 (gender): income gap became 28% worse, women in the household took up the additional burden of care in 88% of cases;
- MDG4 (child health): there was a 31% deterioration in child health;
- MDG5 (maternal health): there was a 24% deterioration in maternal health;
- MDG6 (priority diseases): rates twice the national average;
- MDG7 (environment): increased wood fuel use, and no improvement in access to water;
- MDG8 (global partnership): none to address the negative welfare impacts of injury.

Clearly, the long term impacts of road traffic crashes are important, and are likely to be greatest in developing countries. While this is enough to justify a greater appreciation of the scale of the impacts of road traffic crashes, it will be argued that a case can also be made for the relevance of the experience of long term disability to road safety management.

### **How disability due to road traffic crashes can inform road safety management**

Figure 2 presents schematic representations of information flows that inform the first pillar of the UN Decade of Action, road safety management (J. King et al., 2012).

Typically post-crash response to address retrieval and treatment generates hospital data that is considered along other sources of data. The extent to which the impact of long

term disability contributes to this information is quite variable, and often limited (WHO, 2011b). It was noted above that there has been some research quantifying the disability impacts of road traffic crashes, although there remain significant gaps. It is argued below that there is also an important role for research into the lived experience of disability following a road traffic crash.

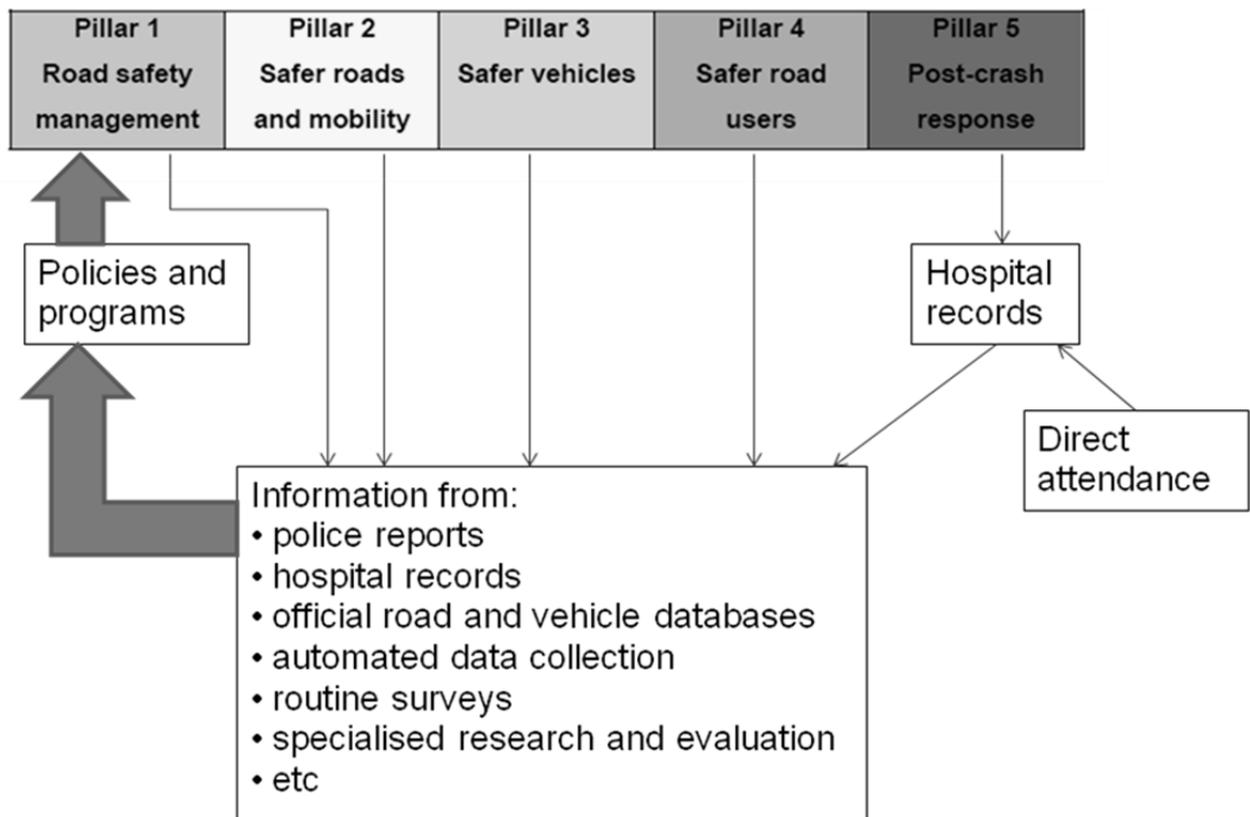


Figure 2: Current information flows to inform road safety management (J. King et al., 2012)

### How the lived experience of disability following a road traffic crash can inform road safety management

Medical anthropological research has been conducted into long term disability in Thailand which illustrates how information from the experience of long term disability can contribute to road safety management (J. King and M. King, 2014). While a range of different types of participant were involved, the main focus was on men with a spinal injury as the results of a road traffic crash, who had previously been a breadwinner for their family. Qualitative research was conducted in Northeast Thailand, with the assistance of Khon Kaen University, Khon Kaen Hospital and Srinakirin Hospital, and the cooperation of staff in health centres in the region. The findings directly relevant to transport and road safety are summarized below.

*Contrast in transport costs:* As with most countries with low levels of motorization, the local transport options are generally buses or converted utilities (pickups) that rely on high volumes of passengers since the fares are low. At the time, a standard fare was 10Bt in Khon Kaen, which was only \$US0.25 (although to put it in context, a labourer earned only 100Bt per day, or \$US2.50). However, men with quadriplegia or paraplegia could not use these forms of transport as ordinary passengers, but had to hire the whole vehicle for an extended period, for a cost of 1,000Bt, i.e. about 10 full days' pay for a labourer. The same fee applied in a case where the village had a communal vehicle. It is clearly impossible for many of these trips to be made in a year, so that many people with long term disability simply stop attending health services and eventually disappear from their records.

*Unfriendly road environment:* Several participants had been given wheelchairs by charitable organizations. In most cases these were of very little use. Traditional Thai houses are raised, with a space underneath, and in many cases the surface is bare ground which is prone to rutting and saturation. Even when the space under the house is paved or enclosed, the area around is not. Adjoining roads often do not have footpaths, and if they do the surface is often uneven, broken or obstructed. There is a tendency at the policy level to neglect footpaths in favour of road construction, and to

deal with road crossing needs by building overbridges which are completely inaccessible to people with disabilities.

*Attribution of crashes to kam (karma):* The interpretation of Buddhism shared by almost all non-biomedical participants (the men, their families, villagers, etc.) and some of the biomedical informants meant that severely injured victims of road crashes were at fault by definition: the scale of their injury meant that they must have done something very bad in a previous life. This means that road safety messages about safe road use behaviours were not given much credibility, since there was a sense of predetermination. Since some people had crashes while doing the right thing, and most people had experiences of travelling without incident while doing the wrong thing, their experience was consistent with this form of attribution.

*Lack of connection between ordinary people and experts:* The research included interviews with injury experts (especially doctors) who knew about local beliefs relating to kam (karma) as well as other animistic beliefs, but were certain that such beliefs were only found among older and uneducated people. The research found the opposite, that such beliefs were a common way of understanding road crashes and incidents of everyday life. This suggests that the understanding of Thai road user motivations and attitudes among experts is likely to be out of touch with the beliefs shared by ordinary Thais.

The Thai study has implications that can inform road safety management. First, the transport environment has shortcomings in accessibility that need to be addressed. It is acknowledged that the number of people with spinal injury in Thailand is not large, however there would be many other people with mobility restrictions (especially as the population ages) who would benefit from more accessible and affordable transport alternatives.

Second, the accessibility and safety of built environment for non-motorised road users needs to be addressed. In this case the problems experienced by the participants (unpaved roads, lack of footpaths, broken and blocked footpaths) are shared by all pedestrians. While they are directly relevant to accessibility, their safety implications are also clear: pedestrians are forced to walk on the road, and the lack of convenient crossings encourages illegal and unsafe crossings. Addressing the needs of people with disability in this way is an example of the "iceberg principle", where road safety measures introduced to meet the needs of a relatively small group with special needs can have knock-on effects that benefit a much wider range of road users (M. King, 2000).

Third, the credibility of messages about road safety, in particular the behaviours which will contribute to safer road use, is challenged by culturally-based attributions. This needs to be acknowledged and addressed. Fourth, the lack of concordance between the attitudes and motivations of ordinary Thais and experts indicates a need for decision makers and program developers to be informed by sound research that gives them a better understanding.

## **Discussion**

The case study above provides an illustration of how information from long term disability can better inform road safety management. It is worth noting that the Thai research was not designed for this purpose: it was designed as an exploration of the lived experience of disability in a cultural context. The fact that it still provides useful insights to transport and road safety management implies that more focused research into the long term impacts of road crashes can contribute even more useful information. Notably, similar research in Cambodia is revealing a very similar picture (Socheata Sann, 2014, personal communication).

In addition, the mobility constraints experienced by people with long term disability can point to systemic issues that might otherwise go unnoticed, for example low numbers of health service attendances by long term disabled crash victims may be interpreted as being due to good community care or recovery, but may in fact reflect an expensive and inadequate transport system. A better understanding of the lived experience of long term disability from traffic crashes therefore has the potential to provide a feedback loop from the impact of road traffic crashes to the management of road safety and transport, as demonstrated in Figure 3.

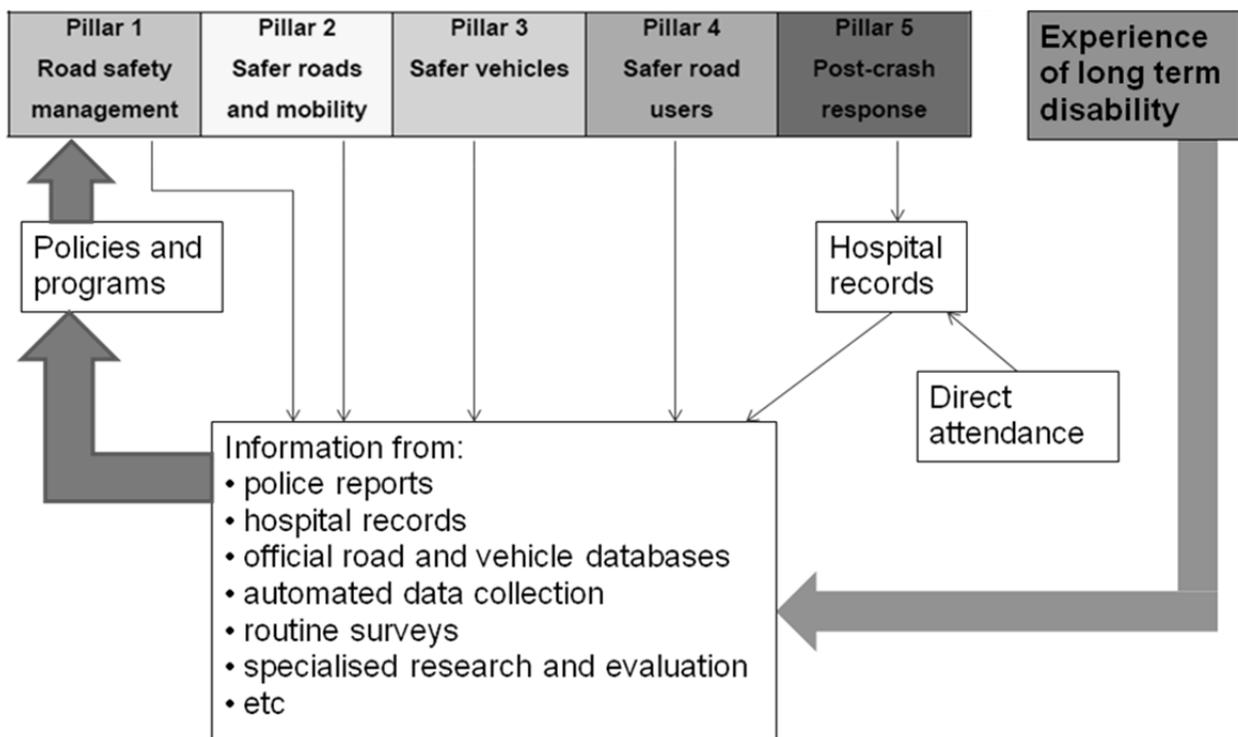


Figure 3: How experience of long term disability can contribute to information flows to inform road safety management (J. King et al., 2012)

This paper demonstrates the need for further exploration of the application of research on long term impacts of road crashes to road safety management, in particular the non-economic impacts. In terms of the years of life spent with a disability as the result of a road crash, people with a long term disability, though relatively few in number, account

for a large majority of this experience. Addressing the issues that they have with the transport system and road safety management will also provide benefits to a much wider range of road users.

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