ROAD DEATHS IN DEVELOPING COUNTRIES
The challenge of dysfunctional roads
It is accepted wisdom that the sustainable way to relieve poverty and poor health in developing countries is through stimulating economic growth. However, it is also accepted that economic growth in developing countries leads to increased motorisation and increased road deaths. Currently, 90% of the world’s 1.2 million road fatalities per annum are in low and middle-income countries, and by 2020 the number of road fatalities in these countries is expected to grow by 50%. This is an unacceptable situation by any standards, but the question is can we stop it happening? This paper examines what is known about road deaths in developing countries, shows that road deaths do not rise and fall inevitably with growing income, and examines the contribution that tackling dysfunctional roads can make.

Dr. Mumford argues that it is the safety of drivers, of vehicles and of roads that are key. He points out that death rates are high wherever high speed traffic mixes with vulnerable users like pedestrians and cyclists. He suggests that it is exposure to roads that are not fit for function – dysfunctional roads – that is a key factor in explaining national death rates.

This review is part of work for iRAP. We need to estimate what contribution can be made to reducing national casualty totals by targeting the roads on which people are being killed and seriously injured in large numbers. I am grateful to Dr. Mumford for his contribution.

About the author

Dr. John Mumford OBE  became iRAP’s International Director in 2006. Dr. Mumford’s work with the International Road Assessment Programme aims to ensure that international best corporate practice is widely understood and adopted in the drive to make roads safe.
Road casualties and GDP

The conventional view of road fatalities in developing countries is grounded in the World Bank work of Koptis and Cropper (2003). This predicts that road fatalities are zero for countries with less than 200$ GDP per head rising to a peak of 14-16 per 100,000 at around 5-6,000$ GDP per head and then falling to 5 per 100,000 at 30,000$ GDP per head and above. Koptis and Cropper (2005) recognise that this prediction is significantly lower than the WHO (2002) estimate of 1.2m fatalities, the major difference being the statistics assumed for developing countries. Koornstra (2003, as cited in WBCSD Mobility Report, 2004), uses a data base which is consistent with the WHO (2002) estimates and predicts that fatalities start at 5 per 100,000 for zero GDP per head, rising to a peak of 25 per 100,000 at 5,000$. However the important point is that these analyses lead to an assumption that fatalities will start to fall when GDP per head exceeds 5,000$, and attribute this to more people being in cars and thus protected during collisions. Also both analyses assume that fatalities are low at very low levels of GDP. Both of these assumptions warrant examination.

The first point to acknowledge is that road fatality data in low income countries is notoriously difficult to collect. Often there is no formal data collection system and even where there is a system it is open to error. The WHO assessment that typically 50% of hospital beds in developing countries are taken by road accident casualties (2nd UN Stakeholders Forum on Road Safety, 2007) is at odds with the relatively low percentage of fatalities officially reported as road accidents. Also some specific studies of mortuary statistics in developing countries have shown that in some countries as many as 90% of road accident fatalities are misreported as dying from other causes. Even a simple check, taking IRF data and looking only at countries where injury levels are more than 10 times fatality levels (in countries with reliable statistics the ratio is higher still) suggests that the fatality levels can be at least 10 per 100,000 at very low GDP levels. Looking at the WHO (2002) estimates of fatalities suggests that countries with very low GDP can have extremely high fatalities.

The thesis that road fatalities and GDP are closely linked is further undermined by considering evidence from the developed world. Why have France and Belgium suffered twice the fatality rate of UK and Holland? Why does Cyprus have six times the fatality rate of Malta? Why does USA have twice the fatality rate of Australia or Canada? Indeed recent time series analysis of road fatality data by Kavi Bhalla at Harvard has shown that the turning point in fatality trend in developed countries was not correlated to a particular GDP level but to a particular event. This study suggests that the road fatality trend in most developed countries turned in the early 1970’s when these countries adopted a policy of road safety management. The presumption that road fatalities in developing countries will automatically start declining once GDP reaches a certain level is thus almost certainly flawed.

**IRF DATABASE**

**WHO (2002) ESTIMATES**
So what are the key features of road fatalities in developing countries? Given the poor quality of the reported accident statistics base, one has to resort to anecdotes and specific case studies for clues.

The Cambodian RTAVIS (2005) report gives very detailed insights into one low income country. Here the accident rate per vehicle is ten times that of the developed world range and only 15% of road accidents involve cars. The main cause of accidents (41%) is motorcycles colliding with each other. 45% of fatalities are people in the age range 15-29 and the majority are male. The overall fatality rate is reported as 7 per 100,000 (possibly understated) which is about average for developed countries, but unlike developed countries, only 4% of fatalities are car occupants.

The location of the accidents in Cambodia also correlates with the iRAP experience in the pilot road assessments in Malaysia, Chile, Costa Rica and South Africa. Accidents are occurring on straight paved roads (i.e., the roads that facilitate speed) in peri-urban areas. The locations are typified by corridor roads passing through towns and commuting routes on the periphery of cities. The iRAP pilots are taking place in middle income countries so one sees a higher proportion of cars involved in accidents but, even so, some 75% of fatalities are types of road user that we know have a high vulnerability in crashes (motorcyclists, bicyclists, pedestrians and people riding in the back of pick-up trucks or in other informal public transport). Perhaps the most telling statistic of all comes from the WBCSD Mobility Report (2004) which states that fatalities per vehicle in low income countries are 75 times the fatalities per vehicle in high income countries.

Given the substantial difference in the types of road user who are dying, the key question is how much of our learning from the developed world is relevant to the situation in developing countries. There are many features which are familiar and similar. The age profile is the same shape, with people in their teens and early twenties most vulnerable. This also resonates with research that shows people in their first year of driving are three times as likely to have an accident as those who have three years driving experience. The gender balance resonates with more general research that men are three times as likely to have serious road accidents as women. Also the relative vulnerability of motorcycles is seen in the developed world where a motorcyclist is forty times more likely to die than a car driver – very similar to countries like the United Kingdom. We do not have developed world statistics for people riding on the back of pick-up trucks or lorries, but it is reasonable to assume that they are every bit as vulnerable as people on motorcycles.
Dysfunctional roads

Interestingly there are parallels in type of road on which accidents are occurring. EuroRAP shows that across Europe most people die on roads outside built-up areas and national casualty reports typically show a majority of deaths on main regional roads. However we also know from EuroRAP that well protected segregated roads can carry large volumes of high speed traffic with low fatality rates typically one quarter of non-motorways. Detailed spatial studies in UK (Noland and Quiddus, 2003) similarly confirm that casualties were lower in densely populated urban areas and higher in rural areas, and within the urban environment casualties were higher in commercial areas than in residential areas. This study also confirmed that length of ‘B’ class road correlated with increased casualties but that length of better roads did not. Bester (2000) also found that road density correlated with reduced fatalities when viewed over a wide range of countries.

As the WBCSD Mobility report (2004) states the problem area is the urban arterial routes and the lower grade rural routes with high traffic – these types of problem were typical of the UK and other countries during their motorisation in the 1930s. Whilst it is early days to draw too many conclusions from the iRAP work in developing countries, the indications are that these are the types of road where the highest fatalities are occurring. There appears to be an emerging theme that fatalities are concentrated around roads that are no longer fit for their purpose of carrying mixed streams of traffic safely. Busy roads cannot carry a mix of fast moving through traffic safely alongside local service traffic let alone cyclists, pedestrians, and ox-carts.

The inference is that developing countries have dysfunctional roads with all the features that characterize the worstfatality levels in the developed world –

- Roads with traffic volumes and speeds that they were not designed for
- High proportion of young inexperienced drivers
- High proportion of pedestrians, cyclists, motorcyclists and other vulnerable road users in the same road space
Making roads safer

Importantly all these factors can be mitigated by improved infrastructure. Safely designed roads are capable of carrying higher volumes because they segregate users into streams and protect. They collect and gather risky crossing movements where these movements can be carried out safely. Proper signage and road layout helps inexperienced road users read the road better so that they know what is expected – and gives the Police basic traffic law to enforce. Segregated road space protects pedestrians and slower moving vehicles from faster traffic – be it separate lanes or crossing points. There are decades of examples globally showing that relatively inexpensive changes to road layout have cut by 50-90% or even eliminated serious fatalities (although relatively few documented cases of very large scale application although such upgrades take place when national programmes to upgrade engineering standards are implemented).

In the developed world an awareness of the importance of good infrastructure began in the 1950s, mainly in programmes treating hazardous locations or “blackspots” as they were then known. Programmes on rural roads were developed to straighten bends, stagger junctions and change the camber of roads where it was clear that the infrastructure was a direct contributor to crashes and made those that did occur needlessly severe. In urban areas there was increased provision for vulnerable road-users and much research in the 1960s centred, for example, on providing for pedestrians and deciding on warrants for pedestrian crossings.

There was little thought to crash protection – many early national motorways built in western Europe during the 1960s did not have a median barrier; the idea of a forgiving roadside had yet to be established and it was only in the early 1970s that there were successful trials with breakaway lamp columns and poles. By the mid-1980s there was recognition that more effort was required to make the infrastructure forgiving of human error, some countries began retrospectively to provide median barriers even on non-motorway dual carriageways. In urban areas an understanding had developed of the need to reinforce the road hierarchy and provide infrastructure that was appropriate for purpose – there was a greater understanding of the crash risk associated with different types of land-use, road and road-user. Urban safety management and traffic calming were used to good effect. During the 1990s there was widespread introduction of items such as crash cushions and frangible items of street furniture and in urban areas a loosening of legislation that made it difficult for road authorities to experiment with traffic calming. Urban safety management and traffic calming in urban and suburban areas is also effective in reducing injuries (Lynam, Mackie and Davis, 1988; Mackie, Ward and Walker, 1990). Improved data and access to information also led to a greater understanding of what to do to reduce opportunities for road injury. More recently Lynam and Lawson (2005) have shown how reductions in risk and collision numbers can be achieved on non-motorway inter-urban roads and where the biggest investment returns are likely to come in large-scale upgrading of the network.
A safe road system

Understanding of how infrastructure can mitigate road death and applying these principles in the developed world took 50 years. The challenge now is to do the same in the developing world, but it cannot take another 50 years. The conclusion of this paper is that economic growth in developing countries will almost certainly bring increased road fatalities. The causes are rapid urbanisation, increased transit traffic on corridor roads, and increased mobility leading to a rapid increase in inexperienced road users. These mechanisms can occur at any level of GDP. The problem arises because the rate of economic growth outstrips the functionality of the infrastructure, and the combination of large numbers of inexperienced younger drivers on dysfunctional roads is literally lethal. It is also clear that the vast majority of deaths are pedestrians, bicyclists, motorcyclists, and passengers in inappropriate vehicles (e.g., on the back of pick-up trucks). The average fatality rate of this type of road user in low income countries is probably 20 per 100,000, contrasting with 2 per 100,000 in some developed countries. There is a sense that as mobility in lower income countries increases it is the poorer road users, not the car owners, who suffer. Increased mobility is essential for sustainable development and the relief of poverty, but it should not inflict such high fatality rates on the poorer parts of society.

The principles of developing a safe road system in the developing world are no different to the developed world. Action is needed simultaneously on the vehicle, behaviour and the road. A key part of the solution is to assess the road network in developing countries and identify the dysfunctional roads where large numbers are being killed and seriously injured – and then target these roads for safety upgrading with affordable engineering countermeasures.

References


Each year 1.2 million people die and as many as 50 million are injured or permanently disabled in road accidents. The burden attributed to road safety is comparable with malaria and tuberculosis, and costs nearly 3 per cent of world GDP.

More than 85 per cent of road traffic deaths and serious injuries occur in developing countries. Road deaths in high-income countries are expected to fall between 2000 and 2020, but they are likely to increase by more than 80 per cent in the rest of the world.

iRAP is dedicated to saving lives in developing countries by making roads safer. iRAP targets high-risk roads where large numbers are killed and seriously injured, and inspects them to identify where affordable programmes of safety engineering – from pedestrian crossings to safety fences – could reduce deaths and serious injuries significantly. iRAP is working with the World Bank Global Road Safety Facility to create partnerships among those responsible for safe roads. iRAP provides training, manuals and web-tools to build and sustain national capability.