

ROAD TRAFFIC INJURIES IN DEVELOPING COUNTRIES: STRATEGIES FOR PREVENTION AND CONTROL

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Introduction

It is now just over 100 years since a motor vehicle crash/accident claimed its first life, a pedestrian, in 1896, and a driver two years later (World Disaster Report, 1998). Motor vehicle crashes have since become a leading cause of death and disability worldwide. From the 1998 database of the World Health Organization (Krug, 1999), injuries caused by motor vehicle crashes³ were ranked 10th among leading causes of death worldwide and 9th among the leading causes of disability. Each year, over 20 million people are injured or crippled, and 1.17 million killed, due to road traffic crashes. Developing countries⁴ account for over 85% of the deaths, and close to 90% of the disability caused by road traffic crashes globally (World Health Report, 1999).

In this paper we discuss the burden of road traffic injuries in low-and middle-income countries, based on the experience in the developed world, to explore how multiple policy initiatives could produce a decline in deaths associated with road traffic injuries. In short, the rising carnage experienced by the developing countries can be controlled. However, the approaches used in high-income countries need careful, critical evaluation before their application in the poor countries. In poor countries, the traffic mix is different, and so are the vulnerable population groups of road users. Moreover, the social, political, policy and economic context is different from that of high-income countries, and within the grouping of low-and middle-income countries, there are also individual country variations. Furthermore, even within a single country, there can be major differences between regions and between urban and rural settings that critically influence the design of interventions. These issues need to be addressed through a global agenda on road traffic injuries.

Global Perspectives

In all regions of the world, all age groups are affected by road traffic injuries. However, children and young adults bear a disproportionate burden. Among children aged 0-4 years, road traffic injuries (RTIs) are ranked 14th among the leading causes of death and 15th as cause of disability (Krug, 1999). For school-age children, 5-14 years, RTIs are the 3rd leading cause of death, just behind malaria and acute lower respiratory tract infections, and 2nd leading cause of disabilities, after trauma due to falls. Amongst young adults, age 15-44, RTIs are ranked 2nd globally, superceded only by HIV/AIDS, and they are 3rd leading cause of disability in this age group, after HIV/AIDS and unipolar major depression. The high-ranking order of road traffic injuries is summarized in Table 1.

³ A motor vehicle crash is an event occurring on the a street, road or highway, in which at least one motor vehicle in motion is involved by collision or losing control, and which causes physical injury or damage to property.

⁴ Developing country: A country with an annual per capita GNP less than US\$ 7911 based on the 1991 figures from the World Bank (1993). This includes all countries of low-and middle-income economies in Africa, Asia, Islands of Indian and Pacific Oceans, Middle East, Central and South America, and the Caribbean.

The social and economic costs of road traffic injuries are enormous. The annual loss to developing country economies, due to road traffic injuries, is estimated at US\$ 100 million. This figure is about twice the total official development aid and loans these countries receive (World Bank, 1993). These cost estimates do not include social and psychological costs associated with death and disability from road traffic injuries, regardless of where they may occur. In developing countries in particular, however, where most people are employed in the informal sector as peasants, casual laborers, and artisans, and have no health or life insurance and no social security, involvement in a road traffic accident by a family member can have profound consequences for the affected household. Loss of a family breadwinner, the high cost of prolonged medical care without health insurance, and loss of household income due to disability can precipitate poverty in the affected household. The ripples are often felt in the extended family and the informal community social support systems that are called upon to make financial and material contributions from their otherwise meager resources towards medical bills and care for the bereaved family.

The Burden and Trends of Road Traffic Injuries in Developing Countries

Road traffic injuries are a critical public health problem in low-and middle-income countries. In 1998 they accounted for more than 85% of all deaths due to road traffic injuries worldwide (Krug, 1999). The number of children killed in traffic crashes in developing countries, estimated at 240,000 a year, exceeds by a factor of 24 the number killed in high-income countries, estimated at 10,000 (UNICEF, 2001). However, the data on traffic crashes, injuries, and deaths, mostly derived from police reports, do not provide the complete picture of the burden of road traffic injuries in developing countries. The burden is underestimated, as injury surveillance in many developing countries is not well established.

The fatalities and injuries due to road traffic crashes in developing countries are rising, fueled by rapid growth in motor vehicle numbers. In India, for instance, four-wheel motor vehicles increased by 23 per cent to 4.5 million between 1990 and 1993, and it has been forecasted that by 2050, the four-wheel vehicles on India's roads may rise to 267 million (World Disaster Report, 1998). The impact of rapid vehicle increase can be seen in the case of Vietnam, where between 1995 and 1996 the number of cars and motorcycles rose by 17 %, while road traffic crashes increased by 22.7%, with increased fatalities (3.8%) and injuries (26.5%). In these countries bicycles and tricycles also increased.

The trend of deaths from RTIs for different regions of the world is shown in Figure 1. The data show that high-income countries recorded 25% or more gain in reducing the fatalities due to RTIs in a 30-year period from 1968 to 1998. The developing countries, on the other hand, experienced a rapid rise ranging from 340% in Africa, 200% in Asia and the Middle East to about 30% for countries in Latin America in the same period (Ross et al., 1991).

Even though the volume of motor vehicles in developing countries is rising rapidly, most of these countries are still in the early stages of vehicle ownership. While in industrialized countries there are 500 cars for every 1,000 people, in the low-income countries it is still low, estimated at 30 per 1,000 people (UNDP, 1994). So the rising number of vehicles in developing countries does not by itself explain why developing countries which together own around 32% of the world's motor vehicles

(Global Road Safety Partnership database) account for more than 85% of all the deaths due to motor vehicle injuries. By comparison, the Organization for Economic Cooperation and Development (OECD) countries, which together own 60% of the world's total volume of vehicles, account for less than 15% of all deaths (Figure 2).

These discrepancies in the global distribution of motor vehicles and fatalities would suggest that the number of people killed or injured per motor vehicle crash differ between developed and developing countries. The average rate of fatalities and injuries per 10,000 motor vehicle crashes for some developing countries is given in Figure 3, comparing them to the situation in the United States as an example of high-income countries. The results reveal that more people are killed or injured per crash in the selected countries, compared to the situation in the United States. While 66 people are killed per 10,000 motor vehicle crashes in the United States, the rate for Vietnam is 3,181, and 1,786 for Kenya. The proportion of people injured or crippled is also much higher in Vietnam and Kenya, compared to the United States. These differences are illustrated in Figure 3.

Why the Higher Carnage in Developing Countries?

The striking difference in number of people killed or injured per crash between developed and developing countries has many explanations. First is the difference in the nature of vehicles involved in traffic crashes. The traffic crashes in high-income countries involve predominantly privately owned cars, with the driver as the main vehicle occupant injured or killed. In the United States, for instance, 58% of people killed and 69% of those injured in road traffic crashes in 1999 were traveling in private cars (NHTSA Annual Report File, 1999). Less than 8% of the people killed and 2.6% of those injured were traveling in buses. The picture for developing countries is quite different. Passenger-ferrying buses, minibuses and trucks are frequently involved in crashes, with several people killed or injured in a single crash. In Delhi, India, two-thirds of the crashes involve buses and trucks (Mohan and Tiwari, 1998). This picture is similar to the situation in Kenya where 60 % of the crashes involve buses, minibuses and lorries. The recent BBC World Service's series of feature articles on transport problems in Africa describes cases where for instance in Kenya up to 74 people died when two passenger buses moving in opposite directions collided.

In developing countries the main system for passenger transport involves privately owned, poorly regulated and accident-prone vehicles of various types. These include conventional buses, mini-buses, and covered pick-up trucks and midi-buses. They include the *matatus* in Kenya, the light buses of Hong Kong, and the mini-buses of Singapore, the *Jeepneys* of Manila, *Colt* of Jakarta, the *Dolmus-minibus* of Istanbul, and the *Dala Dala* of Tanzania. The *Tro-Tro* of Ghana, the *Kamunye* of Uganda, the *Tap-Tap* of Haiti, the taxis of South Africa and the *Molue* and *Danfo* of Nigeria belong to the same family. This transport mode falls between the private mode and the conventional bus transport system described by Rao (1978) as an "intermediate transport mode," the main features being the convenience of stopping anywhere to pick or drop passengers, unfixed time schedules, overloading, aggressive acceleration, and others. In Nigeria, for instance, the regular involvement of buses in crashes has made commuters label the *Molue* as "moving morgues" and the *Danfo* as "flying coffins."

A second explanation is the high attention paid to vehicle safety provisions in high-income countries such as the provision of safety belts, airbags, and other interior safety provisions to safeguard the vehicle occupant, primarily the driver, during a crash. With liberalization of trade, developing countries have imported secondhand vehicles, without these provisions. Moreover, even though these safety provisions are of significant benefit to the driver, they are not applicable to the majority of vulnerable road users in developing countries: pedestrians, cyclists and passengers in buses, minibuses, and trucks.

A third explanation is the difference in “vulnerability” of the population groups involved in RTIs. In developing countries pedestrians, passengers of privately owned buses and minibuses, and bicyclists together form greater than 90% of fatalities due to road traffic injuries. In the unfair encounter with a moving vehicle, the health outcome for the pedestrian or cyclist is bleak. As for passengers in the over speeding and overloaded “flying coffins” and “moving morgues,” crashes leave little chance of survival for the vehicle occupants. The buses, minibuses, and trucks used to ferry passengers have no safety belts. Moreover, the heavy metal works used to construct passenger seats for open trucks are a grave safety risk to the passengers in a crash. The probability of sustaining severe injury or death in these vehicles in a crash is thus quite high.

In developing countries vulnerable road users typically come from a low economic status. In a study carried out by Kapila *et al* (1982) on the choice of mode of transport by Nairobi residents, 27% of commuters who had never been to school commuted on foot, 55% usually used public transport and 9% used a private car. On the other hand, those who had achieved more than secondary/high school level education usually traveled in private cars (81%), none walked and 19% used public transport. A major factor influencing choice of mode of transport is income. Those with least formal education belong to the lower socioeconomic groups who would use the lowest affordable means of transport (walking or boarding accident-prone buses and minibuses). Says Ojo Iwensenyen, a regular commuter on accident-prone Lagos buses in Nigeria *“Many of us know most of the buses are death traps but since we can’t afford the expensive taxis fares, we have no choice but to use the buses”* (BBC World Service Feature Series, 2001).

A fourth explanation relates to the inadequate post-crash trauma care in developing countries, due to the poor public health infrastructure. Unlike developed countries, injury victims in many low-income countries are evacuated from the crash site by passers-by, both motorists and non-motorists, who have no training in pre-hospital care for the crash victims. For instance, a study carried out in Kenya (Nantulya, Musiime and Omurwa, 1999-unpublished observations) revealed that it is the general public that evacuates victims from the crash scene, using whatever means of transport available to them. The expected means of evacuation (police and hospital ambulances) evacuated only 5.5% and 2.9% of the victims in Kenya, respectively. Although the Good Samaritan action on the part of the public is commendable, it is also clear that these heroic volunteers do not have the necessary skills or materials in pre-hospital care, and can unintentionally exacerbate the victim's injuries during the process of evacuation. There are also considerable delays in getting the patient to a facility with the appropriate level of health care. Studies have shown a strong correlation between time taken to

receive treatment and likelihood of adverse immediate health outcomes as well as long-term disability. This is well documented in the developed world (Trunkey, 1990) and has also been demonstrated in developing countries (Elechi and Etawo, 1990).

Apart from the absence of emergency evacuation service, the poor public health infrastructure does not guarantee appropriate outpatient and inpatient services due to poor medical and surgical supplies. In the Kenya study, the level of preparedness of health facilities to treat traffic injuries was assessed through interviews with hospital administrators regarding perceived capacity of their facilities to handle more than 10 injured persons simultaneously. Only 40% of the facilities were reported to be well prepared, with 74% of the health facilities that were least prepared being public health facilities, the facilities that poor people most frequently use. The reported institutional capacity and preparedness of various health facilities in Kenya to handle traffic injuries was verified through interviews with hospital administrators concerning availability of essential items used in emergency care for road traffic injuries. The study revealed that availability of essential items for emergency care of injuries such as oxygen supply, plaster of Paris, blood units, dressings, antiseptics, local and general anaesthetic drugs, intravenous fluids, Boyle's anaesthetic machine, and the blood pressure machine was not consistent. The hospitals reporting complete unavailability of these items were all public facilities, while all these items were more-or-less always available at the mission and private hospitals. The most vulnerable groups often cannot afford the cost of health care at the better-equipped private health facilities. In a study carried out in Ghana, for instance, overall hospital use was found to be very low, with only 27% of all injured persons using hospital services. Among those with severe injuries, 60% of urban and only 38% of rural injured, received hospital care (Mock et al, 1997). The most common reason cited for not seeking health care was lack of money. Given the increasing poverty levels in these countries, and introduction of user fees at public health facilities, their access to trauma care may get worse.

Vulnerable Groups in Different Regions of the World.

There are distinct differences in the age structure of the people killed in road traffic injuries in different regions of the world. Taking the fatality per capita index, a good measure of the burden of road traffic injuries as a public health problem (Mohan and Tiwari, 1998), Figures 4 and 5 show that child death due to RTIs is a major problem in developing countries. The fatality per capita index shows that child loss in India and other low-income countries in South-east Asia and the West Pacific region (Figure 4) is 4 to 7 times that in the developed world, among children aged 0-4 years. This difference implies that either the infants are simply being run over in housing estates and settlements around major roads, or that they are killed as they travel with their parents, usually the mothers who carry them. Curiously, among the low-income regions, Africa does not feature, while in the high-income regions the East Mediterranean countries do not record high deaths among children in this age group either. One possible explanation is that infants are left at home under the care of somebody else, such as the grandmother, when the mothers travel, or that the physical set up of households serves to protect infants from vehicle traffic.

The picture for school-age children, age 5-14 years, is remarkably different, with Africa as the unchallenged leader (Figure 5) with a fatality per capita index that surpasses all other regions, and is 6

times that of the developed countries. Overall, the developing countries have higher indices compared to the high-income countries. Amongst the high-income regions, however, countries in the East Mediterranean region have indices twice those of Europe, North America and the high-income West Pacific countries (see Figure 5). The implication is that the older children are now run over while playing or working outside the confines of their homesteads or during travel to or from school.

The fatality per capita index for young adults (age 15-44) shows that in this age group RTIs are a major cause of death in all regions of the world (Figure 6). This is the median age group and accounts for up to 70% of the years lost due to road traffic crashes globally. These are the “young, economically active and productive working years” and the victims tend to have young families.

The profile of vulnerable road users also differs strikingly from that of the developed countries. Figure 7 illustrates this difference using data from Ethiopia, Kenya, and Malawi, comparing these countries to the United States. Whereas in the United States the most vulnerable road user is the driver, accounting for more than 60 % of the fatalities, in Kenya, Ethiopia or Malawi, drivers represent only a small proportion of people killed. Instead, it is pedestrians, passengers in informal, privately owned buses and minibuses, and bicyclists that constitute the vast majority of road users killed in these countries. The high vulnerability of drivers in the United States makes enforcement of airbags and seat belts an appropriate injury prevention strategy. In the situation obtaining in Malawi, Kenya or Ethiopia, this would not be effective, as majority of the victims is pedestrians, followed by passengers on buses, minibuses and trucks, and bicyclists.

Within a single country, the epidemiology of traffic crashes and profile of vulnerable road users can vary from region to region (Hijar, 1999) and also between rural and urban areas. Most traffic crashes, for instance, occur in urban areas in both low and high-income countries. Globally 30-70% of traffic crashes occurs on roads in urban areas (World Bank, 2001). Perhaps even more striking is the distinct difference in profiles of vulnerable road users in rural and urban areas (Nantulya, Musiime and Omurwa, 1999-unpublished observations). The urban victims are mostly pedestrians. They constitute up to 70% of deaths. In the rural areas it is the passengers in buses and minibuses who constitute a majority of the victims. These are followed by pedestrians whose daily life is disrupted by the highways that cut through their villages without provision for their safe use of the roads. The third group is the cyclists. Figure 8 illustrates these differences, using the example of two different provinces in Kenya: an urban one and a rural one.

Strategies for Prevention and Control

The strategies for injury prevention and control in developing countries should seek to protect pedestrians, passengers who ride the crash-prone buses and minibuses, and bicyclists, as these together constitute over 90% of vulnerable road users. Serious consideration should also be given to preventive strategies for reducing the rate of traffic crashes.

Pedestrians: First, in major cities and townships, where a majority of pedestrians is knocked down, separating them from vehicles through provision of pedestrian walkways, and safe pedestrian crossings is an effective, affordable and sustainable strategy. This can then be supplemented with designation of one-way streets, good street lighting, and traffic calming measures in high-risk areas. In rural areas the trading centers and human settlements along major roads should have clear provisions for traffic calming, and safe pedestrian crossings and bus stops. However these and other measures should integrate components of public awareness raising, and should be participatory, involving the local residents, schools and schoolteacher and the local leaders. This will avoid placing pedestrian crossings in locations that are not convenient for the intended user, or erecting barriers to "keep away" pedestrians from the road without providing them with suitable alternatives for their need to cross the road. Involvement of local residents can have a major impact in reducing injuries and deaths alongside other measures as shown by the Nova Dutra experience in Brazil. Through imaginative measures to separate access for pedestrians from vehicle lanes, and re-location of bus stops, with overpasses for pedestrians, plus participatory and targeted public educational programs, a 40% and 42.6% reduction in the number of pedestrian injuries and pedestrian deaths, respectively, was achieved within 3 years (Dutra Project, 2000). The Nova Dutra experience won the Volvo Safety Award for 2000 amongst others and serves to show the potential gains from well-coordinated interventions.

Passengers: Second, passengers who ride on accident-prone buses, minibuses, and trucks can be protected by regulating the industry and integrating it into a safe and organized part of the transport system for use by the public. This will remove the factors that drive the system towards high risk of traffic crashes. Some of these factors include the remuneration system used by the private owners of buses, which rewards a driver that arrives earlier than the scheduled time at the destinations. This system paves the way for over speeding. The other system that carries high risk of traffic crash is the type applied to minibuses (Nantulya and Musiime, 2001). In this system a driver is assigned the minibus on condition that he remits daily to the owner a target sum of money per day. As his income then, the driver takes any collections above the target. The driver also meets the cost of fuel and other incidentals like court fines for breach of traffic rules or paying bribes to law enforcement agents to avoid arrest and prosecution. Both systems create immense pressure and risk-taking behavior on the part of the driver in his effort to increase his take-home package in this insecure job. Passenger safety can be enhanced through protection of the labour rights of bus and minibus drivers to job security and by regulating the working hours for the drivers of buses and minibuses, and by speed regulation through the use of speed governors. The issue of speed governors is a contentious one. The operators will fight it tooth and nail if their own needs are not recognized and addressed through participatory research, and transparent implementation of agreed regulations.

Bicyclists: Third, bicyclists can be protected by separating them from motor vehicles, through the provision of bicycle paths and lanes in major cities and townships, use of helmets, and high visibility measures. Educational programs can be linked to these other measures and regulations.

Apart from the substantive policies above, broad policies benefiting all road users are necessary. These include:

Vehicles: One important strategy is setting vehicle standards. The unregulated nature of the passenger-ferrying buses and minibuses means that the standards of these vehicles are also largely unregulated. In some countries the buses and minibuses are not roadworthy, exacerbating the carnage. With their body works battered, tires completely worn-out, and black smoke puffing out of the silencers these buses speed on with barely functioning brakes. This poses risk to all road users. Furthermore the conversion of open trucks into passenger-ferrying buses and trucks needs to be regulated as to the number of seats, and the materials used, to provide safety to the passengers. Even minibuses are often modified locally to increase seating capacity.

Drivers: Second is legislating against drunken driving and setting speed limits. This problem needs to be addressed in many different ways. Certainly it is not a matter for the police alone. Involvement of civil society has given excellent results. For instance, the *Mothers against Drunken Driving* (MADD) campaign in the United States defied the prevailing wisdom in the traffic safety community that driver behaviors are highly resistant to change. The campaign achieved a 10-25% reduction in alcohol-related fatalities compared to the number that might have occurred without the concerted campaign to discourage drunken driving (Zobek et al, 1991). Setting speed limits for all motorists is an effective strategy that protects all road users. The main player is the police, but others including the public can make effective contributions if adequately empowered as reported by Nantulya and Musiime (2001).

Enforcement: A third broad strategy that is critical to control is enforcement of regulations and policies. This is critical for all the policy interventions mentioned above, and yet a very difficult area in many countries. An officer with the Lagos State Inspection Unit in Nigeria has this to say; “*You wonder how most of the buses secured road worthiness certificates in the first place. And when you ban the buses from the roads, they still find their way of returning to the roads*” (BBC World Service feature series, 2001). However, hidden behind this feeling of helplessness in a law enforcement agent is the issue of corruption that affects transport safety. It involves the police and licensing bodies that include motor vehicle and driver licensure. The BBC reporter was able to buy a driving license in one country, but this is also true elsewhere (Villafana, 2000). In studies described by Nantulya and Musiime (2001), there was a triangle of accusations and counter-accusations as to who was responsible for bribe taking: the police blamed the drivers and the public; the public blamed both the drivers and the police; the drivers blamed the police. The solution, however, does not lie in finding out who is right or wrong. All parties need to work together to place the value of human life above these accusations as the enforcement of traffic regulations is a major area for intervention that can give immense returns. This is possible through a public health approach. Furthermore, an institutional structure with sufficient legislative authority is essential for enforcing traffic regulations.

Policy Responses: The fourth broad strategy concerns policy response processes. In Kenya and South Africa, moved by a recent spate of horrific crashes and life loss, and public outcry, the two Governments moved into action. The South Africa Minister of Transport announced a commission of inquiry would be set up to probe the cause of the well publicized Lydenburg bus crash that claimed the lives of 26 British tourists. He immediately announced a number of policy measures to regulate the industry, including vehicle fitness testing, lower speed limits for buses, regulating maximum driving

hours, and mandatory advanced courses for long distance drivers. In Kenya, the Head of State ordered police to set up roadblocks to control public transport vehicles. It is of vital importance to enlist political support for road traffic injury prevention and control, in order to reverse the present trends in injuries and deaths from traffic crashes in developing countries. The higher the political level of engagement the better chances of focussing attention on this problem. At the same time, political leaders need well-analyzed data to help formulate evidence-based policies. For this an efficient national injury surveillance system is crucial. Policy-making processes also need to give a voice to all stakeholders, including the public, in order to assure acceptance and implementation.

A public health problem of this magnitude requires a global agenda to reduce the road carnage in poor countries. Road traffic injuries have been conspicuous for their absence from the international development agenda. The time is ripe for this important public health problem to be placed on the agenda.

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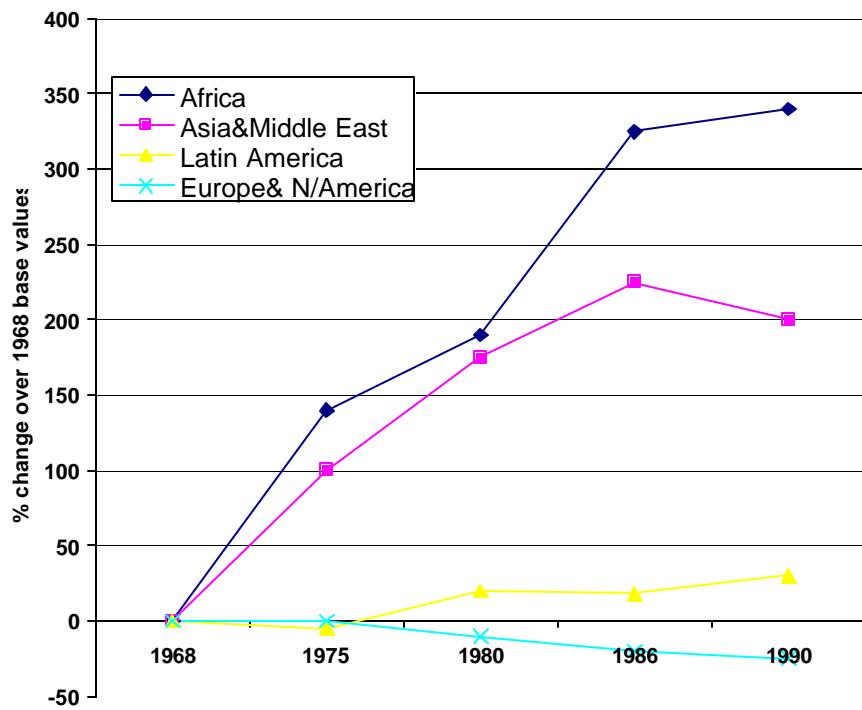
Table 1: Relative Position of Road Traffic Accidents among Leading Causes of Death and Disability, 1998.

Regional Grouping	0-4 years	5-14 years	15-44 years	45-59 years
	Disability Death	Disability Death	Disability Death	Disability Death
High Income Countries				
The Americas	4	3	1	14
				8

Europe	7	5	1	1	3	1	14	8
W/Pacific	6	5	2	1	3	1	14	8
E/ Mediterranean	<15	<15	3	4	3	2	14	9
Low & Middle Income								
Africa-sub Sahara	<15	<15	5	5	7	5	13	9
Asia (India)	12	10	3	3	4	3	8	6
Asia (other countries)	11	9	2	4	2	2	12	7
W/Pacific (China)	<15	12	4	2	5	2	14	12
W/ Pacific (others)	11	9	2	4	2	1	12	7
The Americas	13	10	1	1	4	2	7	5
E/Mediterranean (others)	<15	<15	3	3	5	3	<15	10
Europe	<15	14	1	3	2	1	10	7
Globally	15	14	2	3	3	2	12	11

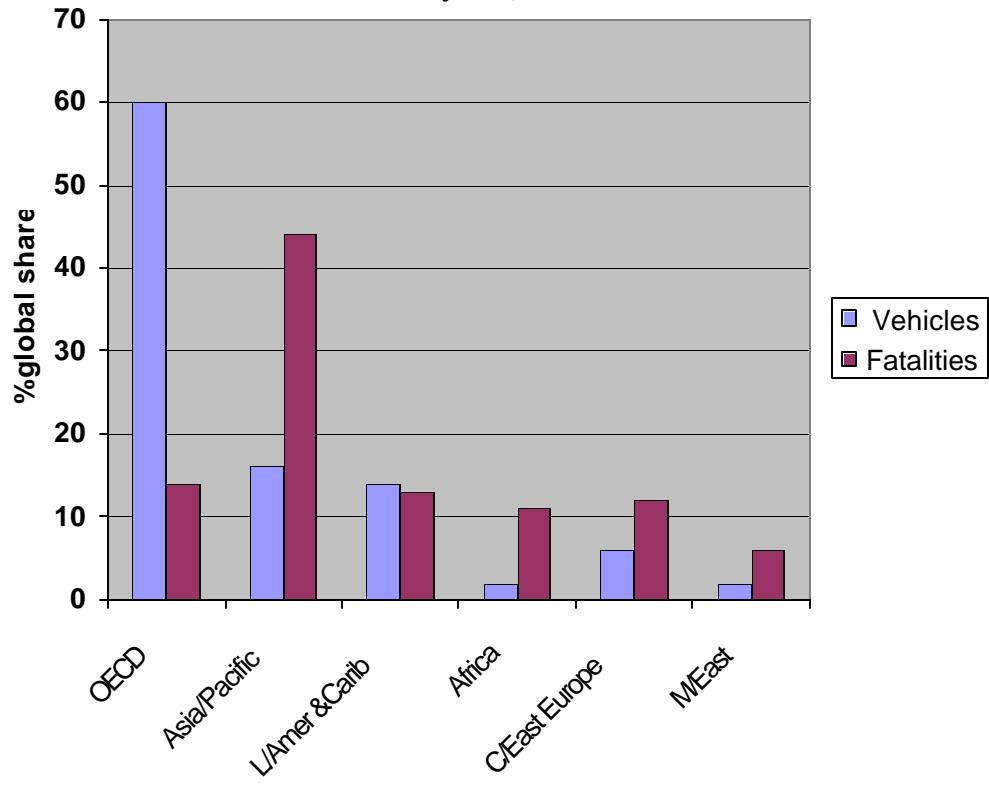
Source: World Health Report 1999 Database (Krug ,1999).

**Fig. 1: Trends in Fatalities from Traffic Injuries for Different Regions of the World
1968 - 1992**



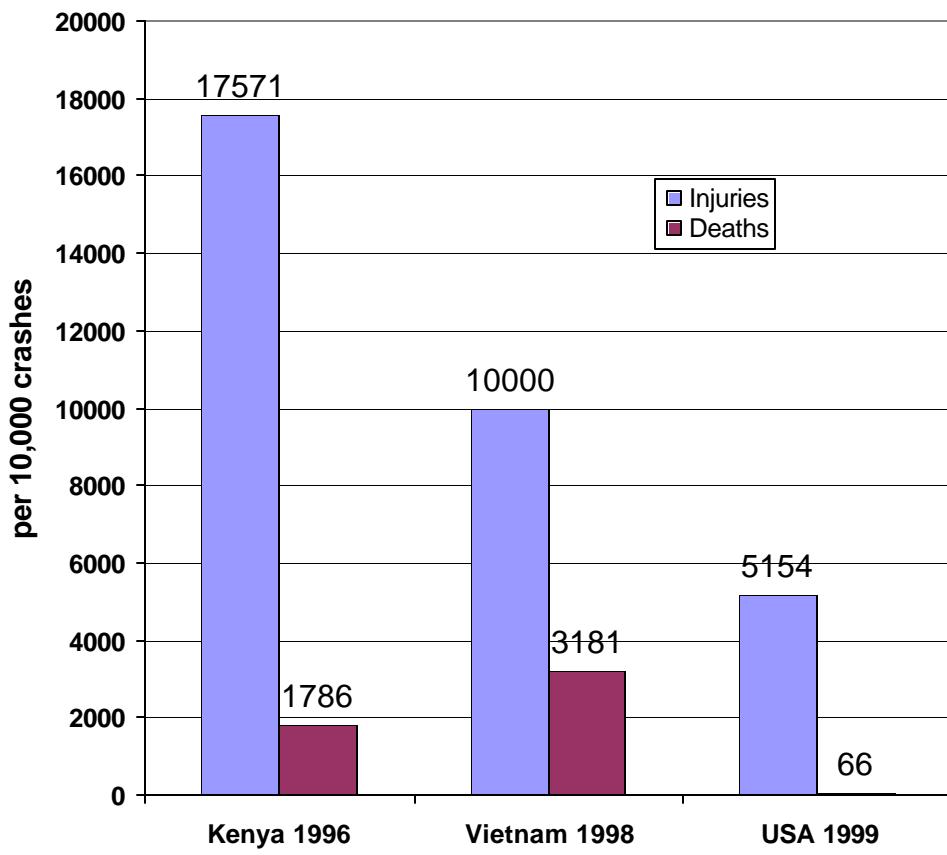
Source: A. Ross et al., 1991

Fig.2: Global Distribution of Motor Vehicles and Fatalities due to Road Traffic Injuries, 1999.



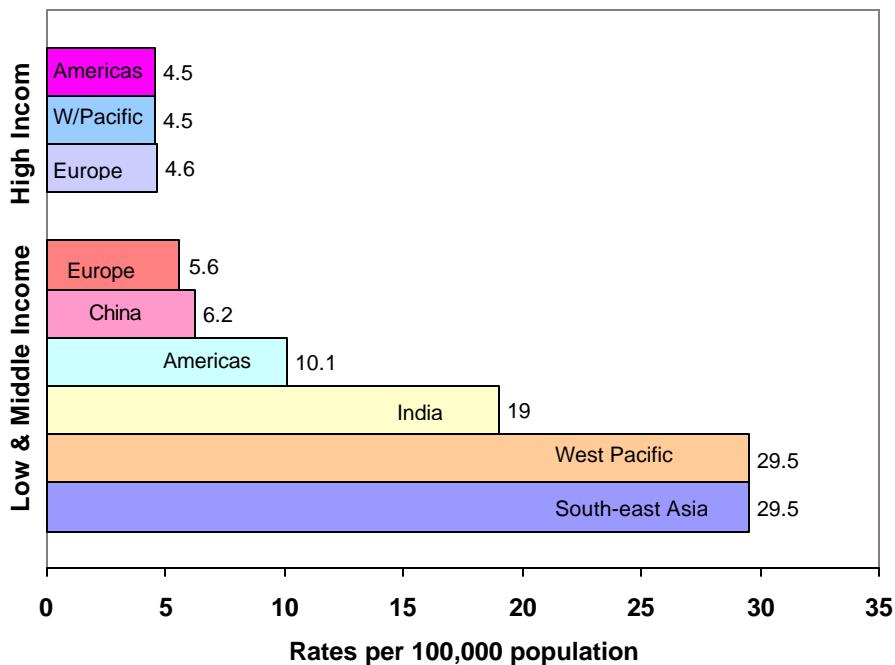
Source: Transport Research Laboratory, UK (2000)

Fig.3: Fatalities and Injuries per Motor Vehicle Crash in Different Regions



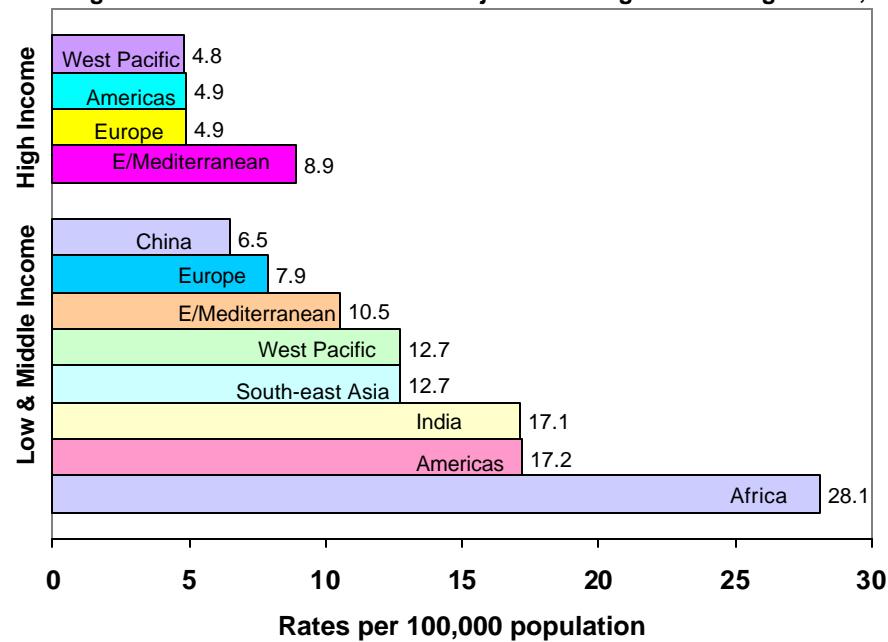
Source: Nantulya, Musiime and Omurwa, 1999 (unpublished data)-Kenya data; World Disaster Report, 1998-Vietnam data; US data, NHTSA Report, 1999.

Fig 4: Deaths due to Road Traffic Injuries in Children Aged 0-4 years, 1998.



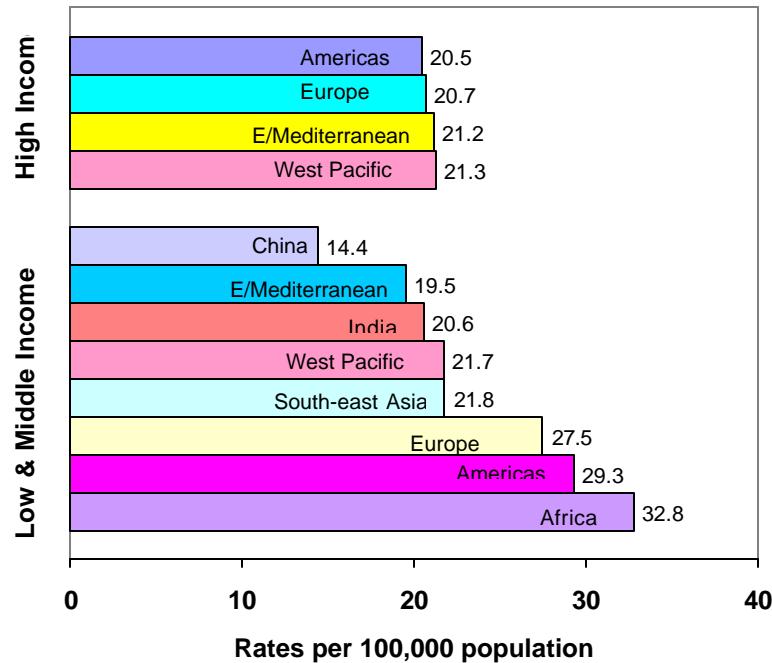
Source: World Health Report 1999 Database (Krug ,1999).

Fig. 5: Deaths due to Road Traffic Injuries Among Children Aged 5-14,1998.



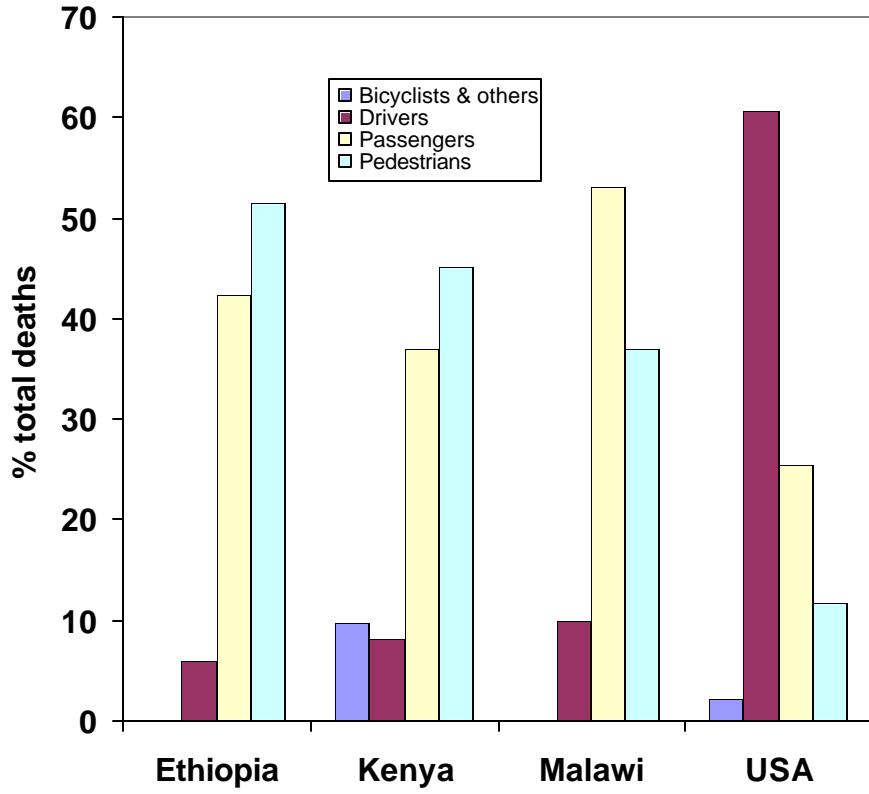
Source: World Health Report 1999 Database (Krug ,1999).

Fig. 6: Deaths due to Road Traffic Injuries in the 15-44 Year Age Group, 1998.



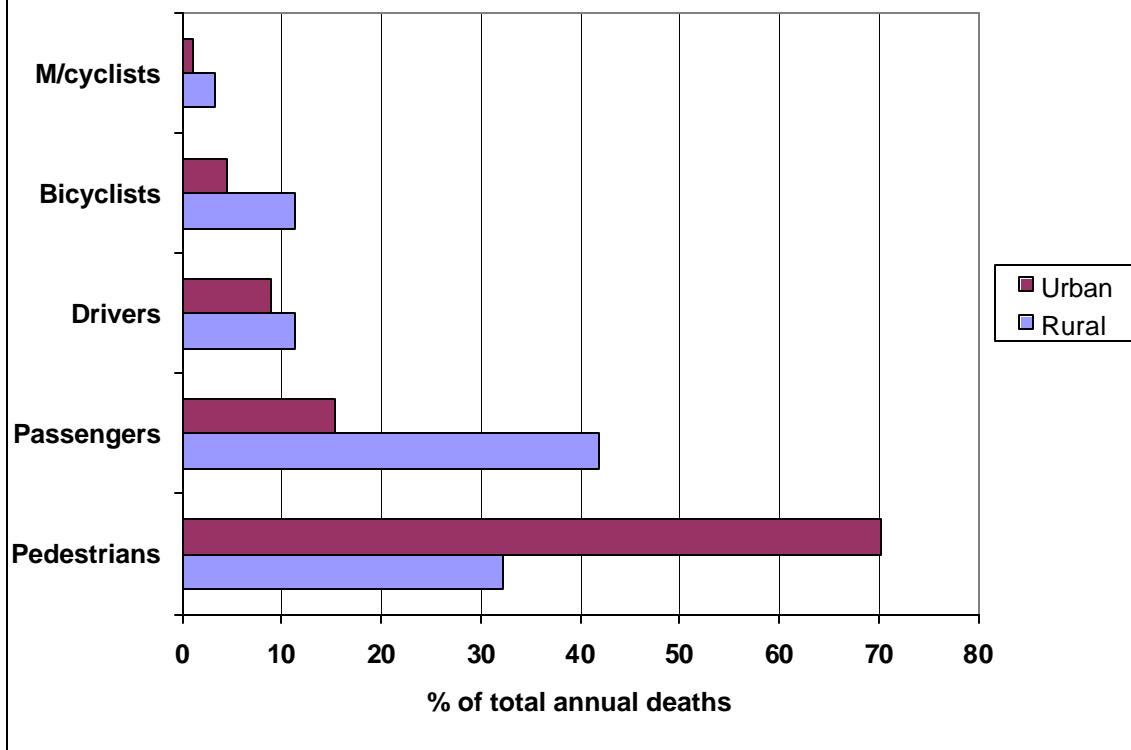
Source: World Health Report 1999 Database (Krug ,1999).

Fig. 7: People Killed in Traffic Crashes by Road User Category



Source: Nantulya, Musiime and Omurwa, 1999 (unpublished data)-Kenya data: World Disaster Report, 1998-Vietnam data, NHTSA Report, 1999; Malawi, Global Road Safety Partnership(2001).

Fig. 8: Fatalities in Road Traffic Crashes in a Rural area, Nyanza, and an Urban Nairobi, Kenya in 1996.



Source: Nantulya, Musiime and Omurwa, 1999 (unpublished data).