

A REVIEW OF GLOBAL ROAD ACCIDENT FATALITIES

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1 Introduction

1.1 Background

The problem of deaths and injury as a result of road accidents is now acknowledged to be a global phenomenon with authorities in virtually all countries of the world concerned about the growth in the number of people killed and seriously injured on their roads. In recent years there have been two major studies of causes of death worldwide which have been published in the 'Global Burden of Disease' (1996, World Health Organisation, World Bank and Harvard University) and in the 'World Health Report –Making a Difference' (WHO 1999).

These publications show that in 1990 road accidents as a cause of death or disability were by no means insignificant, lying in ninth place out of a total of over 100 separately identified causes. However, by the year 2020 forecasts suggest that as a cause of death, road accidents will move up to sixth place and in terms of years of life lost (YLL) and 'disability-adjusted life years' (DALYs)¹ will be in second and third place respectively.

This growing awareness is reflected in the recent establishment of the Global Road Safety Partnership (GRSP) by the World Bank, the International Federation of the Red Cross and Red Crescent Societies, bilateral aid agencies and other interested parties under the framework of the World Bank's Business Partners for Development (BPD) Programme. A steering committee for GRSP is now in place with the aim of creating a global information network that aims to produce solid evidence of the positive impact of partnerships – both the development impact and the business benefits. Two important aspects of GRSP are the involvement of the private sector in funding road safety projects and the promotion of greater awareness of road safety worldwide.

With the setting up of the GRSP it was considered important that a comprehensive summary of the global situation was made available to all involved in the problem of road accidents in developing and transitional nations. For example, using published statistics from countries throughout the world, TRL has in the past attempted to identify the number of people killed in road accidents world-wide and also on a regional basis. The last attempt to do this however used 1990 data and is now out of date (Ghee et al 1996). Further, since that time, more research has been done on the under-reporting of accidents (including fatalities) and a better estimate can be obtained of the global situation. Using different statistics, the World Health Organisation (WHO) investigated deaths from many causes in the two above studies. Differences exist in these early estimates provided by TRL and WHO, and the GRSP Steering Committee proposed that a review should be undertaken to resolve these differences and identify the current situation as accurately as possible. It was agreed that the World Bank, the Department for International Development UK (DFID) and TRL would co-fund a study which would be restricted to the analysis of published material.

¹ DALY's express years of life lost to premature death and also years lived with a disability, adjusted for the severity of the disability.

The study was carried out by TRL with the following objectives:

- To derive an estimate of road accident fatalities world-wide and on a regional basis for the year 1999 and to derive forecasts of the likely number of deaths in the years 2010 and 2020
- To provide an estimate of accident costs world-wide (based on accident costs as a percentage of Gross National Product (GNP)),
- To obtain regional analyses of fatality trends, rates and risk (deaths per 10,000 vehicles and per 100,000 population respectively) and casualty trends by age, sex and road user type.

The main sources of data used for this study were the International Road Federation (IRF) and the United Nations annual yearbooks, World Health Organisation (WHO) publications, recent regional and country studies, such as the Asian Development Bank (ADB) funded Road Safety in Asia/Pacific, the Inter American Development Bank financed Latin America Study and the EC PHARE Multi-Country Transport Programme. Road casualty data also came from TRL publications and individual country studies and national statistics published by the UK, USA and others. A full report has been produced for the GRSP and is summarised here.

2 Estimating Global Road Fatalities

Previous reviews of global fatalities undertaken by TRL, World Bank and others have produced a wide range of estimates and whilst the problem of data reliability and under-reporting has been regularly acknowledged previous forecasts have been based on the use of officially published statistics based in turn on police reports. Using these values to obtain a more accurate estimate of the current global fatality situation (on a regional basis) required several factors to be taken into account as follows:

1. Updating the fatality figures given for the latest year available (usually 1995/96) to 1999.
2. Estimating for those countries where fatality data was not available.
3. Making adjustment for those countries which do not use the definition of a road death occurring when a person dies within 30 days of the accident taking place. This ranges from 'on the spot' to 'within a year of the accident occurring'. Furthermore many developing countries state that they use the '30-day' definition and may do so at the local level (for prosecution purposes) but at the same time, official statistics are often based on preliminary information which is not always updated
4. Adjusting official figures to take into account the under reporting of fatal accidents. Figures derived for both developed and developing countries were based on detailed research undertaken in recent years on this particular topic. Rather than use one figure for under-reporting in developing countries, upper and lower adjustment factors were calculated.

There is no standard approach to regional groupings used by the many different international organisations concerned with road safety. However in order to aid interpretation of data, a total of 192 countries were assigned to six major regional groups as follows:

- Africa
- Asia/Pacific
- Central and Eastern Europe (CEE)
- Latin/Central America and the Caribbean (LAC)
- Middle East and North Africa (MENA)

- Highly motorised countries (HMC), i.e. North America, Australia, New Zealand, Japan and Western Europe.

Less motorised countries (LMC) is the collective term used to describe the first five regions where motorisation is typically much lower than in the industrialised HMCs.

2.1 Current Global Fatality Estimate

Based on the factors described above, a realistic estimate of global road deaths is between 750,000 and 880,000 for the year 1999. The calculations and regional totals are presented in Table 1 and Figure 1.

Table 1: 1999 Estimated road fatalities with under-reporting (UR) adjustments

	1999 estimate	30 day fatality		Low UR estimates		Upper UR estimates	
		adjustment factor	Estimate	Adjustment Factor	Estimate	adjustment factor	Estimate
HMC	98,834	ECMT*	105,654	1.02	107,767	1.05	110,937
Africa	58,319	1.15	67,067	1.25	83,834	1.50	100,600
C/E Europe	63,540	1.15	73,071	1.25	91,339	1.50	109,607
Asia-Pacific	228,405	1.15	262,666	1.25	328,332	1.50	393,999
LAC	64,699	1.15	74,404	1.25	93,005	1.50	111,606
MENA	28,864	1.15	33,194	1.25	41,492	1.50	49,790
Global	542,661		616,056		745,769		876,539

*ECMT standard adjustment factors applied.

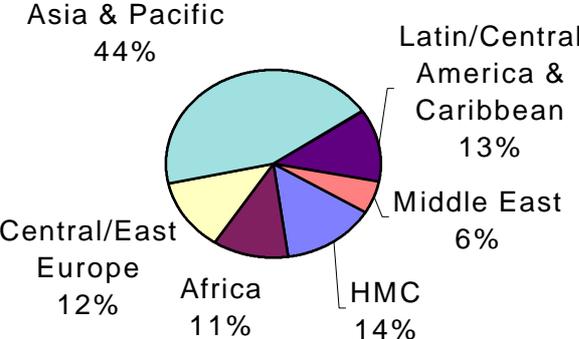
It should be noted that these estimates are less than those derived by the WHO in the studies mentioned above. However the WHO estimates were based on forecasts from 1990 data which in turn came from a variety of sources. The WHO forecast was that in 1998 there would be 1.17 million deaths worldwide. A lack of detailed information on WHO data sources, forecasting techniques etc. made detailed comparisons difficult.

Results from a number of countries show wide variation between official (i.e. police) statistics and information from other sources. For example in the Philippines only one out of five medically reported road deaths are included in police statistics (WHO, 1996). In Indonesia, insurance companies report almost 40 per cent more deaths than the police (Lu, 1988). The Department of Health in Taiwan reported in 1995 some 130 per cent more deaths than the police (Razzak, 1998). In Karachi a recent study comparing road casualties reported by the police with ambulance statistics showed only about half of road accident deaths were reported by the police. Under-reporting also appears to be high in China which already has the world's highest reported number of road deaths. Thus the Beijing Research Institute of Traffic Engineering (Liren, 1996) estimated that the actual number of people killed in road accidents in 1994 was about 111,000, over 40 per cent greater than the 78,000 reported officially by the police.

Using results from a number of studies indicated that in developed countries under-reporting of fatalities was minimal (between 2 - 5 per cent), (James 1991, and Simpson, 1997) whilst in developing countries upper and lower adjustment factors were between 25 to 50 per cent increases of those numbers reported by the police (Sayer, 1984).

It can be seen that the burden of global road fatalities is on the LMCs where 86 per cent of the world's road fatalities occur, with almost half of all fatalities in Asia. Figure 1 shows the regional distribution of 750,000 fatalities, the low end of the range suggested for 1999.

Figure 1: Estimated road fatality regional distribution (1999)



2.2 Estimate of Global Injuries

Whilst the under-reporting of injuries are known to be even worse than with fatalities, a minimum estimate within a likely range has been derived. Based on the International Road Traffic and Accident Databases (IRTAD) report and earlier studies that had estimated approximately 50 percent of road injuries were reported, it was decided that a ratio of 100 injuries for every fatality would apply in the HMCs. For LMCs, a ratio of between 20 to 30 was taken to be a minimum estimate. These values produce annual road accident injury estimates for 1999 of at least

- 11 million in HMCs
- 12 to 23 million in LMCs
- global estimate of between 23 and 34 million road accident injuries per annum

This estimate is approximately twice the global road injury estimates currently being suggested. An estimate of the number or percent of injuries that are disabling was beyond the scope of this review.

2.3 Fatality Forecasts

Forecasting future deaths worldwide is fraught with difficulties. For example, past trends may be thought to give a reasonable picture of what may happen in the future. However some countries, such as Japan experienced rapid deterioration in road safety in the 1960s with an 80 per cent growth in road fatalities but then with massive investment reduced deaths by almost 50 per cent over the next decade. However deaths started to increase once again in

the early 1980s due in part to a continued increase in vehicle ownership but with a slowing down of investment in life-saving activities. Additionally, trends in many parts of the world are not consistent and there is evidence (see later) that rapid increases of deaths in Africa and Asia/Pacific show signs of slowing down (that said growth rates in Africa and Asia are still high and of concern).

Social and political changes also play a part and ideally would be taken into account in any forecasting activity. However, these changes are difficult to predict. For example, in the CEE region, changes in road accident reporting methodology took place with the transition to market economies. Whilst the trend in this region over recent years has been one of fewer

Figure 2 Fatalities/10,000 licensed motor vehicles in selected countries

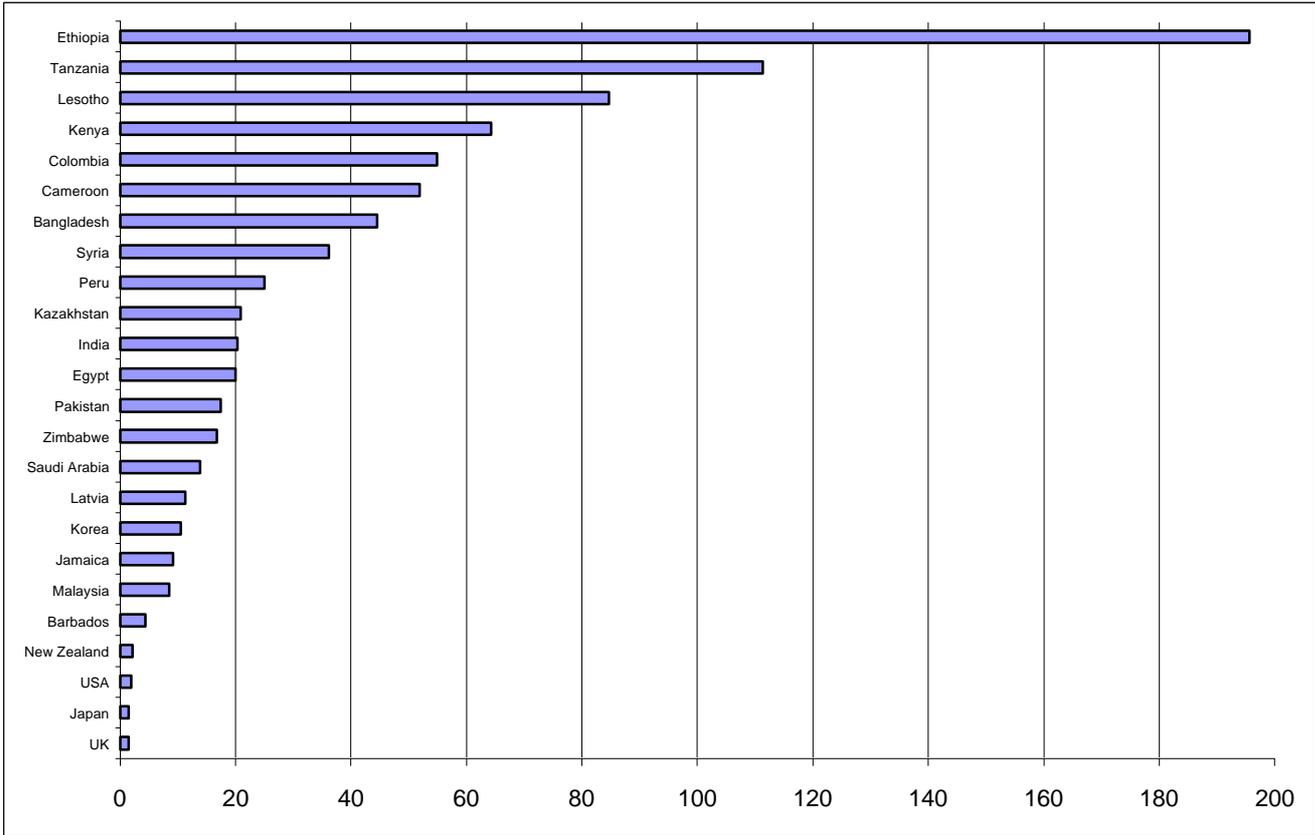
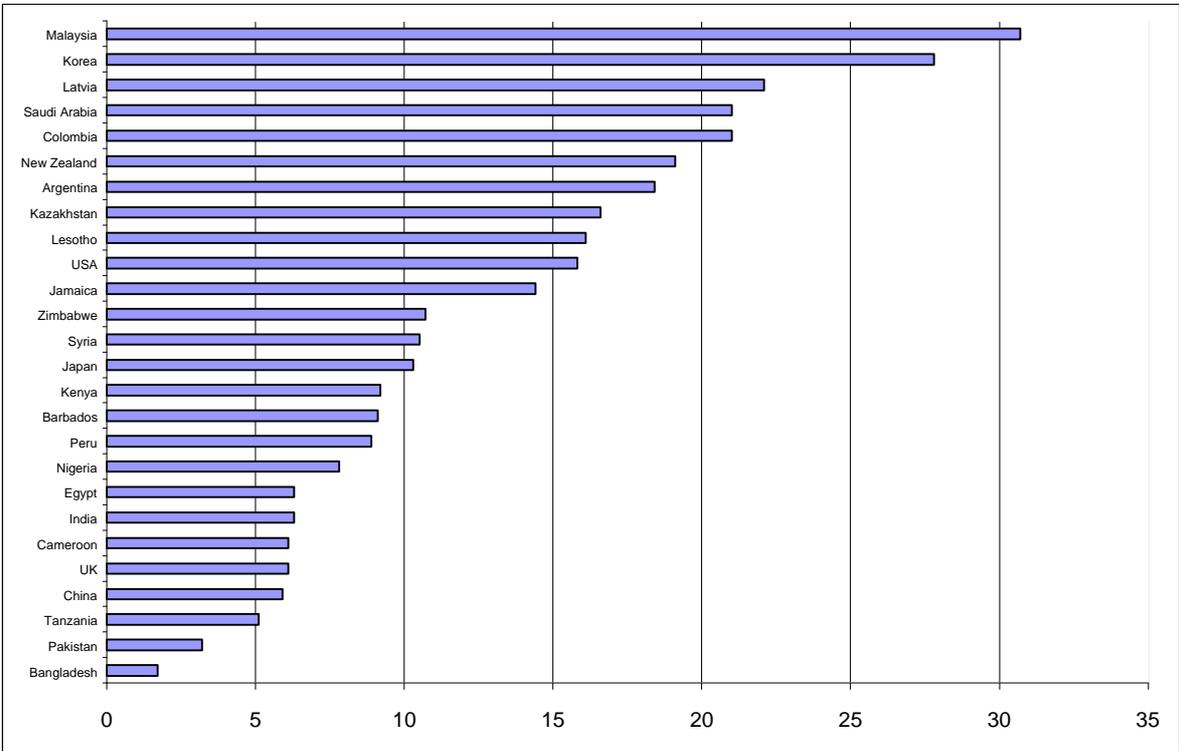


Figure 3 Fatalities/100,000 population in selected countries



fatalities, it is quite possible that with economic development and rapid motorisation there is potential for growth in the number of accidents and fatalities.

Forecasting future trends should be approached cautiously for the reasons outlined above. With these caveats in mind, we suggest that for 2010 the likely range of global road deaths will be between 900,000 and 1.1 million and between 1 million and 1.3 million in 2020.

3 Economic Costs Of Road Accidents

3.1 Introduction

Apart from the humanitarian aspect of reducing road deaths and injuries in developing countries, a strong case can be made for reducing road accident deaths on economic grounds alone, as they consume massive financial resources that the countries can ill afford to lose. That said, it must of course be borne in mind that in developing and emerging nations, road safety is but one of the many problems demanding its share of funding and other resources. Even within the boundaries of the transport and highway sector, hard decisions have to be taken on the resources that a country can devote to road safety. In order to assist in this decision-making process it is essential that a method be devised to determine the cost of road accidents and the value of preventing them.

The first need for cost figures is at the level of national resource planning to ensure that road safety is ranked equitably in terms of investment in its improvement. Fairly broad estimates are usually sufficient for this purpose, but must be compatible with competing sectors.

A second need for road accident cost figures is to ensure that the best use is made of any investment and that the best (and most appropriate) safety improvements are introduced in terms of the benefits that they will generate in relation to the cost of their implementation. Failure to associate specific costs with road accidents will almost certainly result in the use of widely varying criteria in the choice of measures and the assessment of projects that affect road safety. As a consequence it is extremely unlikely that the pattern of expenditure on road safety will, in any sense be 'optimal' in terms of equity. In particular, if safety benefits are ignored in transport planning then there will inevitably be associated under-investment in road safety.

A study conducted almost a quarter of a century ago (Fouracre and Jacobs, 1977) estimated road accidents to cost on average 1 per cent of a country's gross national product (GNP). This figure has been used by many countries and international aid agencies to estimate (albeit crudely) the scale of costs incurred by road accidents but as countries have developed, a higher range, 1 to 3 per cent has been suggested by the World Bank and others (but it should be stressed, with limited supporting evidence) for road accident costs.

Expressing accident costs as a percentage of GNP provides an albeit crude but useful approach to costing accidents, particularly on a global or regional basis. That said, there is no real substitute in individual countries to carrying out a detailed appraisal of national accident costs.

3.2 Results of accident costing procedures

Information was obtained of 21 studies world-wide which had attempted to cost road accidents. (One in: Latin America, seven studies in Asia, four in Africa, one in the Middle East and eight in developed countries). An analysis of these studies showed all developing countries using the 'Human Capital' approach whilst the majority of developed countries used the 'Willingness to Pay' approach. (For a critique on costing road accidents, the reader

is referred to TRL Overseas Road Note 10, 1995) Values derived of national accident costs (usually for the year 1995 or 1996) were expressed as a percentage of GNP for the different countries and results ranged from 0.3 per cent in Vietnam and 0.5 per cent in Nepal and Bangladesh to almost 5 per cent in USA, Malawi and Kwa Zulu, Natal. It should be noted that in this analysis the costs determined by the different countries have been used directly and not amended in any way. However relatively little is known about the accuracy of the costing procedures used in each country. For example, whether or not under-reporting of accidents has been taken into account, how damage-only accidents have been assessed, what sums (if any) have been added to reflect pain, grief and suffering if the Human Capital approach has been used etc. Overall it does appear that in most countries, costs exceed 1 per cent of GNP which may now be considered to be an under-estimate of national accident costs. However, the figures also indicate that costs as a percentage of GNP may be lower in less developed countries and therefore caution should be exercised in moving from 1 per cent of GNP to a much higher level for developing countries.

The following table provides a crude estimate of global and regional costs assuming that the annual cost of road accidents is about 1 per cent in developing countries, 1.5 per cent in transitional countries, and 2 per cent in highly motorised countries.

Table 2: Road Accident costs by Region (US\$billion)

Region	Regional GNP 1997	Estimated Annual Accident Costs	
		GNP per cent	Cost
Africa	370	1.0	3.7
Asia	2454	1.0	24.5
Latin America/ Caribbean	1890	1.0	18.9
Middle East	495	1.5	7.4
Central & Eastern Europe	659	1.5	9.9
Highly Motorised Countries	22,665	2.0	453.0
TOTAL			518.0

Table 2 implies that road accident costs may be of the order of US\$65 billion in developing and transitional countries, and US\$453 billion in highly motorised countries, making a crude estimated total of US\$518 billion worldwide.

4 Regional Analyses

4.1 Introduction

The report presented to the GRSP provides a detailed summary of the road safety situation in the individual regions. However the differences within the regions are often as wide as those between them. The regional summary was presented in three parts starting with the current situation and basic safety and motorisation indicators for the ten countries with the largest number of road fatalities. A review of the change in the last decade in motorisation, fatalities and population followed with sub-regions and information on the largest country presented separately. Lastly, information on the type of road accident casualties, including road user type, age and gender distribution, was presented.

Several indicators were used as no single indicator accurately describes the traffic safety situation in a country. The most common method used in motorised countries is the number of injury accidents per million vehicle kilometres per annum (which clearly relates accidents taking place to a measure of exposure to traffic) but few developing countries have vehicle usage data. Instead, the number of reported fatalities per 10,000 motor vehicles, have been used by TRL and others to compare traffic safety records between countries. Yet fatality

rates might be considered to be of less importance to a specific country than the actual number of deaths taking place. Fatality risk, the number of reported fatalities per 100,000 population, is the most common indicator used by the health sector to prioritise diseases and other causes of death. In this section therefore both fatality rates and risks are presented.

4.2 Results

A brief summary of findings is presented below with this section of the study attempting to highlight the road safety situation within the various regions. It has shown that fatality rates (i.e. death per 10,000 vehicles) were lowest in developed countries (in the range 1.1 to 5.0) whilst the highest (frequently in excess of 100) were found in African countries, particularly Ethiopia, Lesotho and Tanzania (See Figure 2). Fatality risk (i.e. deaths per 100,000 population) was highest in a disparate group of countries including Malaysia, Korea, Latvia, Saudi Arabia and Colombia, and (See Figure 3). In most of these analyses, as might be expected, values in Central and Eastern European countries lay closer to those of Western Europe, than to countries of Africa, Asia or Latin America.

Table 3 shows an interesting comparison of the global distribution of road accident deaths and licensed vehicles by region.

Table 3 Distribution of global deaths and licensed vehicles

Region	Global percentage of		
	Road fatalities	Vehicles	Population
Highly motorised countries	14	60	15
Asia/Pacific	44	16	54
Central/Eastern Europe	12	6	7
Latin America/Caribbean	13	14	8
Africa	11	4	11
Middle East/North Africa	6	2	4
Total	100	100	100

Thus highly motorised countries with 60 per cent of global vehicles have only 14 per cent of global deaths. Conversely Asia/Pacific with only 16 per cent of vehicles has about 44 per cent of global deaths. Central and Eastern Europe, Africa and the Middle East show a similar pattern. Latin America/Caribbean is the only region of the developing world where the global distribution of road deaths and vehicles match.

One of the most important differences between developed and developing regions is that over the last ten years or so the number of deaths taking place actually fell by about 10 per cent in Western Europe and North America, whilst in the Africa, Asia/Pacific and Latin America regions road deaths continued to rise. Figures 4a to 4f show trends in road deaths, population and motor vehicles in different regions of the world over the period 1986-95. In comparing trends in a relatively small group of countries the changes in the major country can dominate and trends in USA, China, South Africa, Poland, Brazil and Saudi Arabia are shown separately. Most noticeably, fatality trends in South Africa and Poland differ from other African and East European countries respectively whereas in the other regions trends in the major and other countries tend to show a reasonably similar pattern. Thus over the period 1987-95 deaths in the Asia Pacific region rose by 39 per cent, in Africa by 26 per cent (excluding South Africa) and in the MENA region by over 36 per cent and in the Latin America/Caribbean region by over 100 per cent (excluding Brazil). In Central and Eastern Europe there was a marked difference between Poland where deaths increased by 31 per cent and other countries where deaths fell. In Africa and Asia there is now some

Figure 4a Recent trends in the HMCs

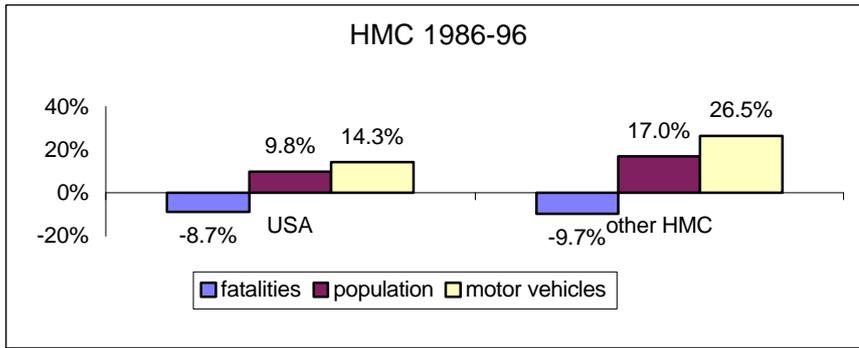


Figure 4b Recent trends in Asia

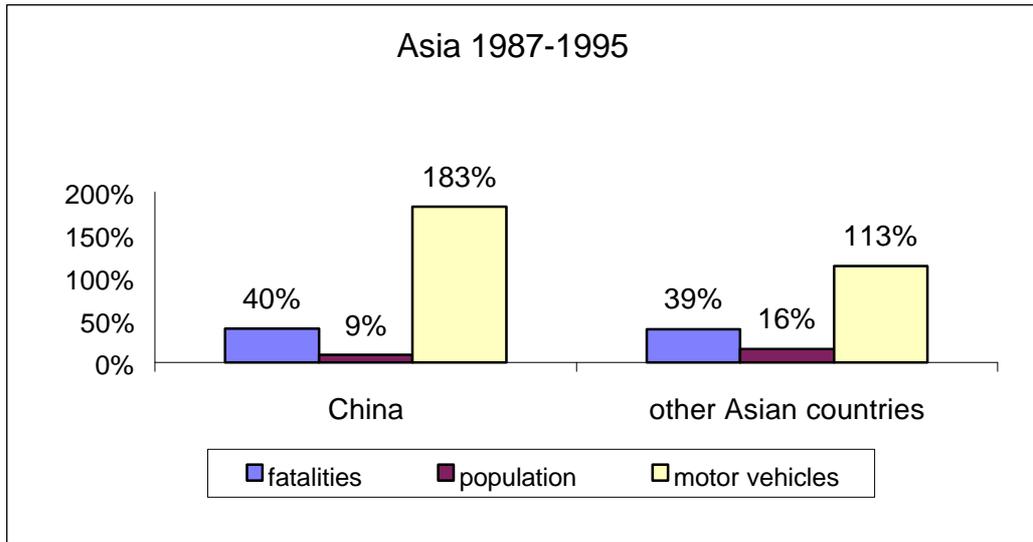


Figure 4c Recent trends in Africa

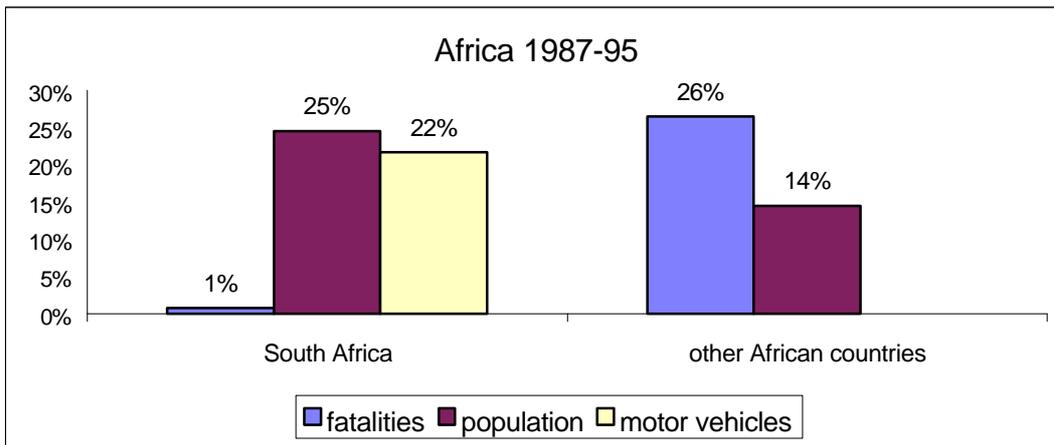


Figure 4d: Recent trends in Central/Eastern Europe

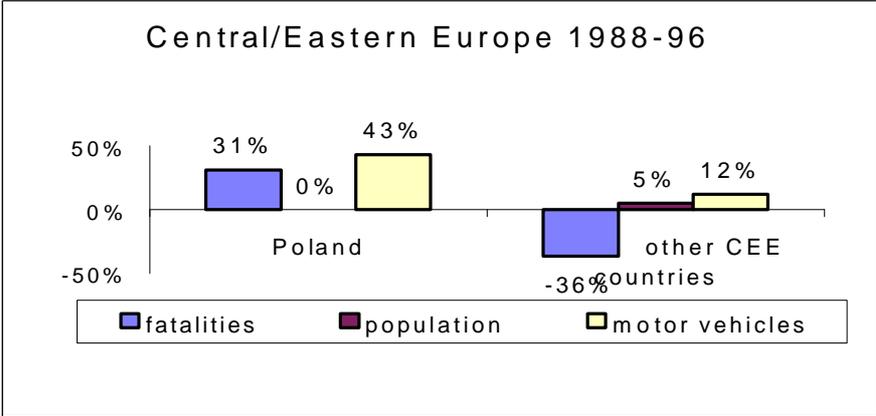


Figure 4e Recent trends in LAC

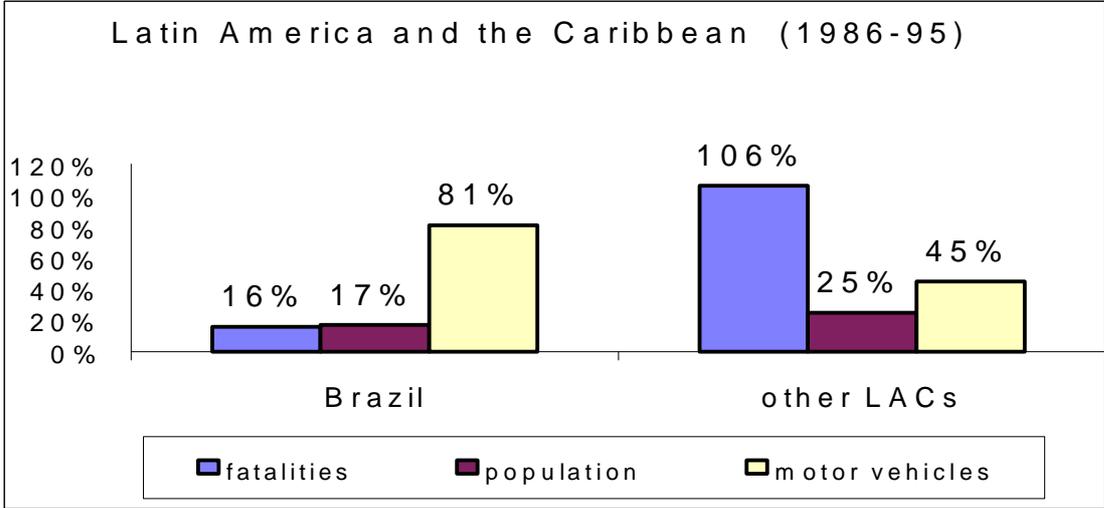
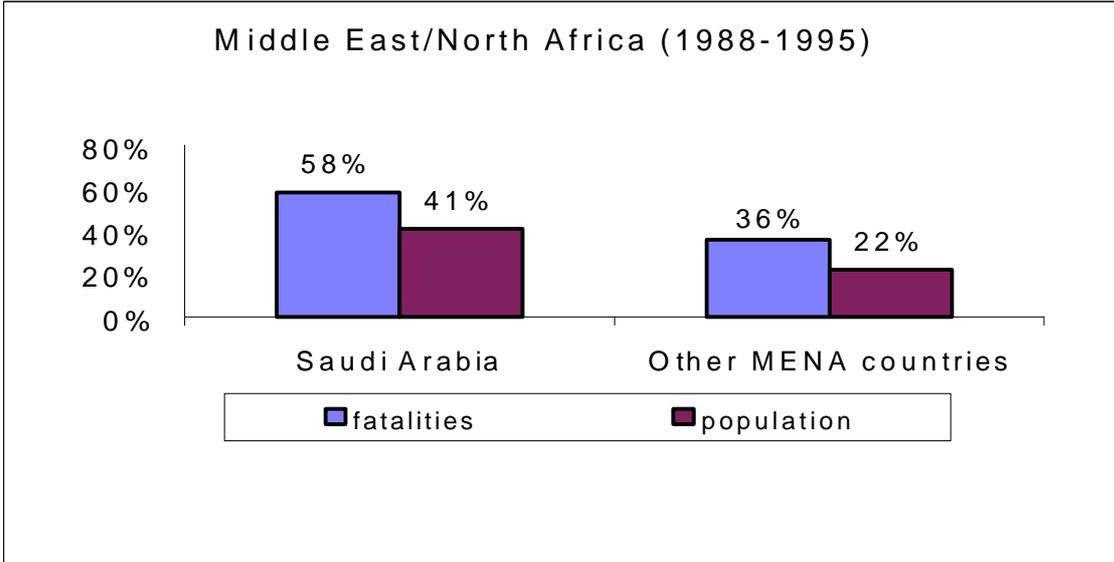


Figure 4f Recent trends in MENA region



evidence that the rapid increase in road deaths throughout the 1970s and early 1980s is now slowing down but nevertheless the problem still causes concern in these regions.

As might be expected, the majority of people killed the West are car drivers and passengers but with about 15 to 20 per cent being pedestrians. In Asian countries, a wide variation was found with, for example, almost 70 per cent of those killed being pedestrians in Hong Kong and about 50 per cent in Korea. In China, Malaysia and Thailand, pedestrian deaths were surprisingly low at around 10-15 per cent of the total. Conversely in Singapore, Taiwan (China) and Malaysia over 50 per cent of deaths were motorcyclists. When deaths involving pedestrian, non-motorised vehicles and motorcycles are combined in Asian countries to form the overall category 'Vulnerable Road Users', (VRU's) they represent a significant proportion of all people killed. For example in Hong Kong, Singapore, Malaysia and Taiwan, VRU's form 80-89 per cent of all fatalities and in Fiji and Korea about 50 per cent (ADB, 1997).

In African countries (Gorell, 1997), pedestrians were again one of the main classes of road users involved in fatal accidents. Pedestrian deaths also featured strongly in Middle Eastern countries (usually over 30 per cent of all deaths). An analysis of deaths by gender showed wide variation between countries (even within regions). The overall tendency however was for females to be more involved in non fatal accidents than in fatal. This probably indicates the fact that females tend to be injured in urban accidents at lower speeds. The overall tendency was for there to be proportionately more females involved in both fatal and non-fatal accidents in the higher income countries.

An analysis of casualties and fatalities by age showed that young people are involved in proportionately more accidents in Africa, Asia and the Middle East than in the West. In general, the data from all regions indicated that road accidents involving the economically active in the age group 25-40 dominate.

5 Summary

The GRSP was launched in order to “reduce the number of deaths, injuries and disabilities and associated social costs of road crashes through partnerships which promote collaboration and coordination of road safety activities among GRSP participants”. The World Bank, DFID (UK) and TRL agreed jointly to fund a study in order to assist the GRSP to define as best as possible the magnitude of the road safety problem, particularly in developing countries.

5.1 Global and regional rates and trends

- ◆ Using published data as a base, the study estimates that in 1999 between 750,000 and 880,000 people may have died as a result of road accidents and that the majority of these deaths occurred in developing and emerging nations, with approximately half in the Asia-Pacific region alone.
- ◆ Road fatalities are expected to continue to increase with a fatality toll estimated between 900 thousand and 1.1 million by the year 2010 and between 1.1 and 1.3 million by 2020.
- ◆ Crude estimates were derived of accident costs in global and regional terms and it was found the global cost in 1998 might have been of the order US\$520 billion and of this total cost in the developing regions, would have been about US\$65 billion.
- ◆ Trend data showed that the total number of people killed in road accidents in regions of the developing world continues to increase, whereas in the West there has been a

steadily decrease since the late 1960's. However evidence exists that the rate of increase of deaths in the developing world is now slowing down, particularly in Africa.

- ◆ Results also show that the highest fatality rates (deaths per 10,000 motor vehicles) worldwide occur in African countries, particularly Ethiopia, Uganda and Malawi whilst fatality risk (deaths per 100,000 population) is highest in a disparate group of countries including Thailand, Malaysia, South Africa and Saudi Arabia.
- ◆ It should be emphasised that pedestrians are a particularly high risk group throughout Africa and Asia as well as the Middle East. Car occupant casualties dominate in developed countries and are much more common in the Latin America/Carribbean region.

5.2 The Way Forward

The report for the GRSP identifies weaknesses in the quality of existing data, particularly from developing countries and highlights the following areas that could be examined within the GRSP programme so that a greater understanding of the global road accident situation can be obtained.

- ◆ Better use of injury information from hospital data which could complement that obtained from police records.
- ◆ Greater priority should be given by the medical community, led by the WHO to monitoring road accident victims and include road accidents in national hospital surveillance systems.
- ◆ Accident databases in many developing countries should be improved through greater use of accident reporting and recording systems such as TRL's accident package MAAP.
- ◆ Given the widespread evidence that inadequate use is made of even the limited amount of accident information collected in developing countries, more effective dissemination and research is required into the application of accident data.
- ◆ The economic cost of road accidents is also generally not well understood in developing countries and further research is merited on accident costing and its application.

5.3 Concluding remarks

In conclusion, this study has attempted to identify the magnitude and nature of the road safety problem worldwide but particularly in the developing regions of Africa, Asia and Latin America and the Caribbean. Hopefully the newly formed GRSP can assist in the reduction of this global toll of death and injury by the mechanism of partnerships between the public and private sectors which promote collaboration and coordination of road safety activities worldwide.

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