

Road Accident Prevention: the work of the Overseas Unit, TRRL

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Surprising though it may seem, road safety is a very old problem. In Great Britain for example, there were over 1,000 deaths on the roads each year even before the advent of the motor car. In 1980, in those European countries supplying road accident statistics to the United Nations, about 100,000 persons were killed and over two million injured by motor vehicles. Over the last thirty years or so in Western Europe and North America much has been done to deal with this growing problem with substantial sums of money spent on a wide range of safety measures. In a number of these countries, Great Britain, for example, the successful application of appropriate counter-measures can be judged by the fact that not only has there been a decrease on the accident rate (in terms of vehicle kilometres travelled) but the actual number of people killed and injured has also decreased.

2. By the early 1970's countries of the non-industrialised world were becoming increasingly aware that they too faced a growing road safety problem. This situation was also recognised by international organisations such as the World Health Organisation and the World Bank.

3. In 1972, following numerous requests made by African and Asian countries for guidance in the road safety field, a small research team was formed within the Overseas Unit of the TRRL. The aim of this team was to undertake research in the countries of Africa, Asia and Latin America with a view to establishing the nature and extent of their traffic accident problems and, in the longer term to assess the effectiveness of remedial measures. The author uses some of the major findings of this research team to provide an overview of the safety problem in these countries and to put forward suggestions for appropriate low cost countermeasures.

4. A preliminary study (1) of accident costs carried out by the Overseas Unit indicated that in those non-Western countries for which data were available, the total cost of road accidents was almost 1% of their gross national products. In countries such as Indonesia and Nigeria this means that road accidents may well be costing over £500 million per annum. In a range of smaller countries such as Colombia, Pakistan and Egypt equivalent costs may exceed £200 million. Clearly these are sums of money that these countries can ill-afford to lose. 1% of the total GNP's of all countries below £1000 GNP/capita per annum combined is approximately £10,000 million - a very crude estimate of the total annual cost of accidents in these countries.

5. Another way of illustrating the extent of the road accident problem is to compare road accident fatalities with the number of deaths resulting from diseases and other known causes in non-Western countries. Using statistics published by the World Health Organisation and the United Nations, data were obtained from 20 African and Asian countries using the most up-to-date classification of causes of death used by these two organisations. It was found that road accidents accounted for almost 2.5% of all deaths recorded in these countries, making road accidents the tenth most important cause of death. The analysis was repeated for the age groups 5-64 years thus removing the very young and the elderly and in this case, road accidents accounted for over 6% of all deaths, a value exceeded by only five other causes. When repeated for the 5-44 years age group road accidents accounted for almost 10% of the total number of deaths reported and ranked second to the "multiple" cause of "all other accidents, homicide and suicide". Detailed studies carried out in selected countries over the last few years where reliable data were more readily available also indicate the growing importance of road accidents as a cause of death. In Jordan for example, in 1962 road accidents was the eleventh most important cause of death but by 1980 it was the fourth most important cause, representing almost 6% of all deaths recorded. Although the countries for which data

were available are unlikely to be representative of the entire Third World, it is clear that road accidents represent a growing social problem particularly for juveniles, young adults and those in early middle age.

6. Numerous studies (2,3,4) carried out by the Overseas Unit have attempted to identify the magnitude of the road accident problem in non-Western countries and to rank countries in order of 'seriousness'. Comparisons have also been made between Western and non-Western countries in order to show that the safety problem is particularly severe in the Third World. In order to compare the safety problem in different countries it is obviously meaningless to use total number of fatalities or casualties because of the vastly different population sizes and degrees of motorisation in the various countries. Ideally comparisons should be made as though both their human and vehicle populations were the same. In the past, fatality rates (defined as road accident deaths per 10,000 vehicles licenced) have been used in order to compare the accident situation in different countries. The number of fatalities as opposed to casualties or injury accidents have been used because the poor accident recording systems in most non-industrialised countries means that only fatalities are recorded to any reasonable degree of accuracy. In addition, numbers of vehicles licenced have been used as opposed to millions of vehicle kilometres travelled per annum because very rarely are accurate n-point or trend censuses carried out in developing countries to provide such data.

7. The use of fatalities per 10,000 vehicles as a measure of death rate is far from ideal and recent attempts (5) have been made to express road accident fatalities as a function of both vehicles licenced and persons resident in a country. Results indicate that whatever measure is used, road accident fatality rates in African and Asian countries are considerably greater than in European and North American countries. Studies have also shown that whereas in European countries fatality rates have decreased steadily over the last 20 years, those in a considerable number of African and Asian countries have increased. In other words, over the last 10-15 years or so, the road accident problem in these countries has worsened.

THE NATURE OF THE PROBLEM

8. Broad classifications of accidents and casualty types occurring in a country are important indications of the general strategy required in dealing with the country's road problem. The pattern of accidents taking place will clearly vary from country to country and Table 1 shows that for classes of road users killed, these differences can be considerable. Thus in Hong Kong 70% of all persons killed are pedestrians whilst in Indonesia the proportion is only 20%. In Indonesia however 34% of those killed are riders of motor cycles and scooters. In the UK, only 5% of persons killed were pedal cyclists; in countries such as China where the bicycle is the most common form of transport the proportion is likely to be very much greater. Important differences also exist between the age groups of those killed and injured in road accidents. More often than not these reflect the age distribution of the population in the different countries. This in turn means that there are proportionately more children killed and injured in road accidents in non-Western countries than in the case in Europe and North America, suggesting that the education of children on road safety matters is particularly important in these countries.

TABLE 1 - Percentage of fatalities by road-user class.

Country	Year	Pedestrians	Cyclists	Motor cyclists and scooterists	Drivers and Passengers	Total
Ethiopia	1976	84	1	1	13	100
Guyana	1977	45	13	10	28	100
Hong Kong	1976	70	4	7	19	100
Indonesia	1977	20	2	34	44	100
Jamaica	1978	41	5	17	37	100
Jordan	1979	47	1	2	50	100
Kenya	1972	45	9	2	40	100
Kuwait	1978	55	2	2	41	100
Nigeria	-	35	3	20	42	100
Sri Lanka	1980	51	10	10	28	100
Swaziland	1978	55	5	0	40	100
West Malaysia	1979	22	13	33	32	100
Zambia	1977	40	8	3	49	100
Zimbabwe	1979	36	9	2	47	100
UK	1980	32	5	19	44	100

9. Wide differences between countries can also exist in the urban/rural split: for example, whereas 45% of fatalities in Great Britain (6) occurred on roads in non built-up areas in 1980, the equivalent figure for West Malaysia was 61% with a further 26% occurring in villages and only 12%

occurring in towns. With this situation, it would appear appropriate to devote more resources to rural accidents in West Malaysia than would be the case in Great Britain.

10. An analysis of one complete year's accident records from Kenya (7) showed that 16% of all road casualties were occupants of commercial vehicles. The equivalent value of most Western countries is under 5%. In many African and Asian countries, commercial vehicles are used to transport people to and from places of work and greater attention than in developed countries to accidents involving commercial vehicles might be needed.

11. In non-Western countries a major road safety problem may be present that does not exist at all in Western Europe and North America - accidents involving para-transit forms of public transport. Thus in Surabaya, the second city of Indonesia, 17% of all casualties (8) were drivers or passengers of betjaks (cycle rickshaws). According to surveys carried out in Surabaya there were, in 1974 an estimated 70,000 of these vehicles operating in the city. The drivers and passengers of these vehicles are often placed in a vulnerable position, not only because the vehicles provide little protection but also because the drivers frequently ignore all traffic rules and regulations. Other types of public transport common in these countries are the shared taxi such as the Dolmus of Turkey and the Service taxi of the Middle East. In Jordan, Service taxis are involved in almost a quarter of all accidents yet represent only 10% of the total vehicles registered in that country. This type of problem is rarely encountered in the developed world and remedial measures adapted from Western countries may do little to deal with this situation.

12. The above examples show that major differences exist in the accident patterns of countries in different regions of the world. These differences have been used to emphasise the point that the order of priorities in road safety programmes in African, Asian and Middle Eastern countries could, more often than not, be very different from that in Western countries.

THE APPLICATION OF REMEDIAL MEASURES

13. Over the past 40 years, European and North American countries have built up considerable experience in road safety and practice, which includes substantial body of research data. Potentially, this experience should be of value to non-Western countries in assessing priorities in their own road safety programmes. However, before attempting to apply research findings from, say, Great Britain or the US to less developed countries, a number of general reservations should be made:

- (1) As shown earlier, the nature of the problem in non-Western countries may be considerably different from that in Europe or North America.
- (2) Countermeasures that are effective in developed countries may be ineffective in the developing countries, (and possibly vice versa).
- (3) Although there has been extensive research into the effectiveness of countermeasures in developed countries, the results of this research may be less definitive than might be desired.
- (4) Countermeasures that are appropriate in developed countries may, for financial or other reasons, be inappropriate in less-developed countries.

14. The road safety problem in developing countries is often markedly different from that in Europe or North America. Therefore, although research findings from Western countries can provide some guidance, the inevitable uncertainties surrounding their transfer to non-Western countries emphasises the need for caution in their application. As a direct consequence, there is a need to evaluate any countermeasures that are undertaken, thus emphasising the value of mounting local or regional trials of any countermeasures and carefully monitoring their effectiveness before using them nationally.

15. Over the last few years the Overseas Unit has collected annual police reports from a number of different countries. Most of these reports provide a basic summary of the road accident situation in each country, together with a list of the major "causes" of accidents. These data have clearly not been collected as accurately as those in a comprehensive 'on-the-spot' study (9) carried out by the TRRL and present a completely different data base. In the records collected, the police have ascribed a single "main cause" to each accident as opposed to listing the "factors involved". Nevertheless, this information does provide some insight into what the police regard as the major factors involved in road accidents in non-Western countries. (Note: If the police have little road engineering expertise it is likely that they will underestimate the part played by the road environment).

16. The results from the police data of five of these countries (see Table 2) show that road-user error was identified as the main cause in at least 70% of the road accidents. The percentage of accidents attributed to the three main causes varied considerably from one country to another. However it is dangerous to draw conclusions about variations between these countries as there are

likely to be differences in the types of accident reported to the police and in the way in which the police analyse the accidents for causes.

17. Also it is likely that the percentages are underestimates of the true contribution of these factors because in many of the accidents there are probably several factors involved and not just one. Thus the percentage of accidents due to adverse road conditions and environment may in reality be much higher because many of the road user errors could have been due to inadequate road signing or markings. Nevertheless the results do indicate the importance of road user error as a contributory factor in road accidents in non-Western countries.

Studies of Behaviour

18. Two measures commonly used for controlling road users and improving their safety are traffic signals and pedestrian crossings. Studies (10) were made by the Overseas Unit, TRRL of the behaviour of drivers at traffic signals and pedestrian crossings in selected cities in non-Western countries and comparisons made with results from Great Britain. For example, driver behaviour at "Zebra-type" crossings was observed in five Third World cities and compared with behaviour at selected Zebra crossings in Reading and London. It was mandatory for drivers to stop for pedestrians on the crossing in all cities studied. It was found that the average proportion of drivers stopping in four of the Third World cities ranged from 10 to 17%, whilst in Surabaya the percentage was well under 1%. The equivalent values in Reading and London were 72 and 40% respectively.

19. Observations were also made at signal-controlled junctions in the same cities and the proportions of drivers (presented with a free choice) stopping at the red signal were recorded. Results are given in Table 3. It can be seen that the percentage of drivers choosing not to stop at the red signal in the non-Western cities was greater than in Reading and London. Studies were carried out in Nairobi in 1975 and 1977; the results for 1977 showed a marked improvement over the 1975 value. This surprising result may be due to the fact that the number of signals (and having them set correctly) may have brought about the observed improvement in driver behaviour. It should be noted, however, that in Bangkok, Ankara and Surabaya many junctions were signal-controlled, but behaviour was still poor. Thus, in at least the cases of traffic signals and pedestrian crossings, there is evidence of road safety countermeasures being less effective in African and Asian countries compared with UK (although increased enforcement could perhaps have improved the performance of these measures).

20. Detailed studies of driver behaviour were also carried out in Pakistan (11). Observations of driver behaviour were made at a number of sites often as part of a monitoring programme to determine the effectiveness of remedial measures. From a summary of the results of this work shown in Table 4 it is clear that a very high proportion of drivers were committing errors at junctions particularly when turning right. Also it would appear that stop signs were frequently disregarded even when traffic on the major road was close to the junction and in addition many drivers were taking risks at bends by crossing over the centre of the road.

TABLE 3 - Non-observance of the red signal in selected cities.

City	Number of drivers who had a free choice of stopping at red signal	Number of drivers choosing not to stop at red signal	Percentage of drivers choosing not to stop at red signal
Ankara (2 sites) 1974	101	36	35.6
Bangkok (9 sites) 1975	754	391	52.0
Nairobi (2 sites) 1975	203	101	50.0
Nairobi (10 sites) 1977	3045	210	7.0
Surabaya (6 sites) 1975	253	92	36.0
Surabaya (6 sites) 1976	396	130	48.8
Central London (11 sites) 1977	364	22	6.0
Reading Area (19 sites) 1977	726	30	4.1

21. Again, results suggest that safety improvements such as road signs and markings may be less effective in non-Western countries than in European countries. Changes in behaviour can hopefully be brought about (and the effectiveness of safety measures improved) by the introduction of education and training programmes and also by improved enforcement techniques (see below).

Traffic Law Enforcement

22. With the generally low standard of road user behaviour that exists in many African and Asian countries - which may in turn be due either to lack of awareness of traffic regulations or to a

general "attitude" towards road safety - it is important that adequate traffic law enforcement is provided by the police. Because little research has been carried out in this field it is difficult to assess the potential of police enforcement for accident reduction in non-Western countries, for in many of them the traffic police are not well trained or equipped as they are in Western countries. Further, in many developing countries the police are obliged to spend much of their time controlling traffic, with little time available for traffic law enforcement.

TABLE 4 - Percentage of drivers making errors in Pakistan.

Driver error	Percentage of drivers	
Failed to stop at red signal	13	(6)
Failed to give way when turning left on red signal	12	(6)
Failed to stop at stop sign - traffic near	52	(6)
Failed to stop at stop sign - no traffic near	99	(6)
Cut corner on right turn	48	(3)
Turned right from wrong lane	42	(3)
Failed to give way when turning right	36	(5)
Drove wrong way down dual carriageway	51	(4)
Crossed double white lines	15	(8)

() number of sites

23. The most promising evidence for the road safety benefits of enforcement in developing countries comes from Singapore and Egypt. In Singapore, a combined publicity and enforcement campaign appears to have led to a drop in fatalities of 19% and 50% in serious injuries, although there was a rise of 20% in slight injuries. In Egypt a combined package of police enforcement measures including radar, increased patrols and heavier penalties for traffic offences has had a significant effect on accidents on two major inter-urban roads. On one of these roads there has been an overall reduction in the number of accidents of over 50%. (Comparing a six-month period after the introduction of the improvements with a comparable six-month period before their introduction).

Vehicle Safety

24. Vehicle safety measures can be both "primary" and "secondary" in nature; the former aim at preventing an accident occurring whilst the latter attempt to protect the road-user during the course of an accident. Commercial and public service vehicles are involved in proportionately more accidents in Asian countries than is the case in Europe and North America. The way in which these vehicles are used leads to potentially dangerous situations with open lorries often carrying large numbers of workers and buses carrying people hanging on the outside of the vehicles. Paratransit forms of public transport, cycle rickshaws, shared taxis etc - also have a reputation of being dangerous vehicles in which to travel. The accident records to these vehicles could be considerably improved by legislation prohibiting lorries, buses and minibuses from carrying passengers in a dangerous manner.

25. A study (12) of accident records of a number of transport undertakings in India showed that buses were involved in about five times more accidents than might be expected from their numbers on the road or the annual vehicle kilometrage travelled by different classes of vehicle. Fatality rates per million bus kilometres travelled were about six times greater than for public transport in London and over ten times greater than for other cities in Great Britain. This study examined one complete year's accident records of the Delhi Transport Corporation (DTC). In addition, about 10% of all bus drivers (580) were interviewed to obtain information on their background, experience, knowledge of the highway code and working conditions. Surveys were made of the condition of 237 buses operated by DTC from five of the main depots so that a general assessment of the safety of vehicles could be made. These surveys showed that drivers' received inadequate training and that the general condition of buses was poor.

26. Perhaps the two most important measures that can be adopted to protect the road user during the course of an accident are the use of seat belts for vehicle occupants, and crash helmets for motor cyclists. There is now considerable evidence from a number of Western countries, that compulsory wearing of seat belts results in a significant reduction in injuries, particularly those of a more severe nature. The benefits of wearing a seat belt in any particular accident situation should be similar in both developed and developing countries. In view of the often poorer medical facilities, the benefits could in fact be greater in non-Western countries in the case of the more serious injuries. Regrettably, few of these countries have, as yet, introduced compulsory wearing of seat belts.

Highway Engineering

27. There has been increasing evidence from the UK and the USA that relatively detailed local accident investigation, combined with low-cost engineering remedial measures, can be highly cost-effective. The experience being gained from following this approach in these two countries is of particular relevance elsewhere. In Western countries, a growing emphasis has been placed in recent years on obtaining value for money from money spent on road safety. With their lower gross national products, this must also be an important consideration for African and Asian countries.

28. Work by Jorgensen and Westat (13) in the US indicated clearly the high benefit-cost ratios that could be obtained from "spot" improvements as compared with continuous widening or overall modernisation projects. The limited data available to them strongly suggested that low-cost projects yield the greatest safety benefit per dollar expended. In the UK Duff (14) showed a similar result and his analysis of 29 schemes confirmed that small inexpensive schemes could have a very marked effect on road safety. As far as the author is aware, no studies similar to those mentioned above have been completed in a non-Western country. However, the Overseas Unit, TRRL has started work on the effectiveness of low-cost highway engineering countermeasures in Egypt and Pakistan.

29. In order to investigate the relationship between accident rates and geometric design standards, a different technique was adopted by the author (15). Using data collected in Kenya and Jamaica, personal injury accident rates on main inter-urban roads were correlated with certain geometric design characteristics. Step-wise multiple regression analysis, in which the accident rates were expressed as a function of several independent variables was used to correlate the number of personal injury accidents per million vehicle kilometres with geometric design features. It was found that the accident rates fell as the standard of the road improved; in the equation derived for Jamaican roads, road width and junctions per kilometre were significantly related to the accident rate whereas in Kenya, junctions per kilometre, horizontal curvature and surface irregularity were found to affect the accident rate. Since this work was carried out by the author, research workers in a number of countries, including India and Chile have also managed to correlate accident rates with geometric design.

DATA COLLECTION AND ANALYSIS

30. Little progress can be made on improving the road accident situation in a country until the problem itself has been clearly defined. Accident statistics must be collected over a period of time so that an understanding is obtained of where accidents are occurring, to what classes of road user, at what time of day and in what type of accident. Most of the accident patterns described in the previous section could not have been identified without there being some sort of accident data collection system in operation.

31. Road accident data need to be collected over a wide range of levels from the broad perspective of the national scene to the detail of the individual accident. Although analysis of national accident statistics show the source of problems (as seen above), they do not indicate specific remedial measures. In order to do this, data need to be collected at the "regional" level. In such studies measurements of vehicular and possibly pedestrian flows are obtained as well as accident statistics. Examples of studies of this type given earlier would include work carried out by the Overseas Unit in Nairobi and Surabaya. Finally, a detailed understanding of factors involved in road accidents can be obtained only by "local" in-depth studies of road layout, vehicle design and road-user behaviour. At the present time the Overseas Unit safety team are carrying out such analyses on major roads in Egypt, in the Islamabad region of Pakistan, and also the Addis Ababa-Asab road Ethiopia.

32. As stated, it is essential in dealing with road safety problems that a good accident data collection and analysis system be established. With this goal in mind, the Overseas Unit, TRRL and the Egyptian Ministries of the Interior and Transport began a programme of cooperative road safety research involving the following components.

- (a) Police Accident Booklet Design. An experiment was conducted in which four different designs of police booklet were compared, including one heavily dependent upon symbols and pictograms. From the results, two compromise designs were drawn up and tested in field trials leading eventually to one preferred design. This final booklet has now been tested by the police throughout Egypt and its performance carefully monitored. Since these initial trials took place the booklet has been introduced and further developed in Pakistan and Ethiopia. In this research, the aim has been to optimise the ease, speed and accuracy with which the booklet can be completed, whilst at the same time ensuring that sufficient details are recorded for the purposes of accident analysis.
- (b) Microcomputer Analysis. A low-cost microcomputer system has been developed and tested, again with the emphasis on ease of use (16). The rapid developments in microcomputers in recent years is opening new possibilities in accident analysis. Their low cost and general

robustness in difficult environments make them well suited for use in non-Western countries. Micros also have the benefit of being readily accessible and available for immediate use; since computer facilities are fewer and more centralised in developing countries, this is probably a greater advantage than in more industrialised countries.

In view of these various potential benefits the development of an experimental low-cost microcomputer system was included in the programme of cooperative research in Egypt. Early prototypes of the package were tested in Egypt and development of the system are currently under trial in Pakistan, Botswana, Ethiopia and Papua New Guinea. The system is designed for use at the "Local Authority" level (county large city, etc). Particular emphasis has been placed on ease-of-use, with the operator merely having to select one of a number of options at most stages of the programmes. Accident and casualty cross tabulations, accident record retrieval, histograms of accidents along a route and "stock diagrams" analyses are among the features under developed. In the field, the major hurdle to be overcome is that of maintenance in the event of breakdown.

- (c) Accident Investigation. This work follows broadly the British "Local Authority" approach to accident investigation as described in the British Department of Transport Accident Investigation Manual and in the Guidelines for Accident Reduction and Prevention in Highway Engineering produced by the UK Institution of Highways and Transportation. Analysis has been carried out on roads in the countries mentioned above. Accidents at the most critical black spots have been analysed in detail using the "stick diagram" technique. In this way common factors such as overtaking or nose-to-tail accidents have been identified. Not unexpectedly, marked differences in the nature of the accidents taking place were found with the different sites. Following these analyses appropriate low-cost remedial measures are being introduced and their effectiveness evaluated.

SUMMARY

33. Since 1972 the Overseas Unit of the UK TRRL has been engaged in a programme of research on road accidents in non-Western countries. Results to date indicate that fatality rates (per licenced vehicle) are high in comparison with those in developed countries, and whereas in Europe and North America the situation is generally improving, many developing countries have experienced a worsening situation, particularly over the last five years. A preliminary study indicated that road accidents cost on average almost 1% of these countries' annual gross national product and it is clear that road accidents are utilising scarce financial resources that the countries can ill afford.

34. Using statistics published by the World Health Organisation and United Nations, data was obtained from 20 non-Western countries using the most up-to-date classification of causes of death used by these two organisations. It was found that road accidents ranked highly as a cause of death in these countries. Although the countries for which data were available may not be representative of the entire Third World, it is clear that road accidents represent a growing social problem, particularly for juveniles, young adults and those in early middle age, and also a growing economic problem for the countries as a whole. Almost all countries of Africa and Asia suffer from a lack of financial resources and the sums of money available to spend on road safety improvements, road rehabilitation and maintenance, police enforcement, etc. will be severely limited. Consequently it is particularly difficult for these countries to deal effectively with their road safety problems.

35. Although research findings from Western countries can provide some guidance, the inevitable uncertainties surrounding their transfer to other countries emphasise the need for caution in their application. As shown in the paper, the problem faced by many countries is often markedly different from that in Western Europe and North America. This, coupled with major difficulties in road-user behaviour, knowledge and attitude introduce an element of uncertainty in the potential effectiveness of many countermeasures. Results however suggest that the introduction of improved education, training and enforcement could be highly beneficial in non-Western countries and the potential for improved road safety by these methods is greater than in the developed world. It is essential that scarce resources are not wasted and that any measures that are introduced are carefully appraised and an assessment made of their relative effectiveness. The careful monitoring of remedial measures and an assessment of their cost-effectiveness is one of the goals of an ongoing programme of research within the Overseas Unit of TRRL. This points to the further and fundamental need for a good accident data collection and analysis system. This should be sufficient to produce essential information for accident investigation purposes but, at the same time, it should not be too sophisticated either for the needs or capabilities of those who operate it or contribute to it. This again is part of the ongoing programme of research in the Overseas Unit.

36. The work carried out by the Overseas Unit TRRL over the last ten years has done much to identify the magnitude and nature of the road safety problem in non-Western countries. Based on these research findings it is hoped that international organisations such as the World Bank, WHO etc, in collaboration with the various countries themselves, will be able to invest wisely and effectively in road safety programme to contain this growing problem.

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TABLE 2. The main causes of road accidents as determined by police in different countries

Main cause of accident	JAMAICA 1977		GHANA 1974		BOTSWANA 1976		MALAYSIA 1976		HONG-KONG July-Sept 1977	
	Number of accidents (including damage only)	%	Number of accidents (not known if damage only included)	%	Number of accidents (including damage only)	%	Number of accidents (including damage only)	%	Number of accidents (injury accidents only)	%
Road-user error	7,027	95	8,164	77	844	71	41,997	87	3,309	92
Vehicle defect	108	1	1,679	16	137	12	656	1	*	*
Adverse road conditions or environment	72	1	551	5	19	2	3,675	8	*	*
Other	225	3	262	2	176	15	1,963	4	303	8
TOTAL	7,432	100	10,456	100	1,176	100	52,191	100	3,612	100

* grouped with 'other'