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An analysis of the incidence and causes of road traffic accident in Kisii, Central district, Kenya

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Abstract
Background: *Road traffic accidents (RTAs) are an emerging public health problem. It is estimated that more than 5 million people between 17-40 years of age die annually as a result of RTAs worldwide. Currently, RTA is the tenth leading cause of disease burden in the developing countries, especially in the Sub-Saharan African countries. The objective of the study was to analyze the proportion of accidents by vehicle, as well as investigate group of people vulnerable to RTA.*
Methods: *This was a survey done in Kisii Central District. We interviewed 30 people undergoing treatment at Kisii General Hospital due to RTA injuries and a group of 15 traffic police officers. Fifth-one motor vehicle drivers and 297 non-motorist road users were also interviewed.*
Results: *Pedestrians were 65.7% males while, drivers were 90.2% males. Vehicles involved in RTAs were matatus thus vans and mini buses (73.4%), buses (13.3%) and private vehicles (13.3%). Contributory factors included human errors (59.6%); bad roads (19.5%); defective vehicles (29.9%). Antecedent factors associated with RTAs included over-speeding, overloading and laxed policing.*
Discussion: *RTAs continue to cause avoidable injuries, disabilities and mortality. We show that antecedent factors to RTAs are modifiable through training, improved road design and maintenance, motor vehicle repairs and proper policing.*
Keywords: *Road Traffic Accidents, Road Traffic Injuries, Matatus Vehicles*

I. Introduction

Road traffic accidents (RTAs) are serious public health problem both in developed and developing countries worldwide. They are the leading cause of injury, the eighth leading cause of death for young people aged 15 to 29 years of age. They account for more than 1.2 million deaths, while the number of people injured could be as high as 50 million which amount to 3.6% of the global mortality burden (WHO, 2009). RTAs have impacted negatively to society and its economy. It has claimed the largest toll of human life and tends to be the most serious problem all over the world (Kual et al., 2005).

In 2004, road traffic injuries (RTIs) contributed to 2.7 percent of the total disability-adjusted life years (DALYs) lost globally, a proportion that is expected to rise to 4.9% by the year 2030 and position RTIs as the third leading contributor to the global burden of disease (WHO, 2008). Deaths from injuries sustained from RTAs are projected to rise from 5.1 million in 1990 to 8.4 million world-wide in 2020 (Murray and Lopez, 1992). Low- and middle-income countries (LMICs) contribute 90% of this burden, with the African region accounting for approximately 205,000 fatalities, and 7,151,000 DALYs due to RTIs. This translates to 969 DALYs per 100,000 population in Africa compared to the global rate of 640 DALYs per 100,000 population due to RTIs (WHO, 2008). As LMICs in Africa develop and road infrastructure is enhanced, the number of vehicles as well as their speeds are expected to increase, resulting in increased RTIs and fatality rates in this settings (Söderlund & Zwi, 1995; Chandran et al, 2010; Odero et al., 2003; Peden et al., 2004). Apart from humanitarian aspect of the problem, road traffic accidents and injuries in these countries incur an annual loss of $65 billion to $100 billion annually. These costs include both loss of income and the burden placed on families to care for their injured relative. For instance, the Americans bear 11% of the burden of road traffic injury mortality annually (WHO, 2002).

On average Road Traffic Accidents (RTAs) cause an estimated 13 million deaths and 20-50 million disabilities worldwide annually (WHO, 2012). It is estimated that in 2007, RTA injuries accounted for 23% of all injury deaths worldwide (WHO, 2007). The forecast for the year 2020 raises RTAs to third position, just behind heart disease and clinical depression, and ahead of respiratory infections, tuberculosis, war, and human immunodeficiency virus and the acquired immunodeficiency syndrome (HIV/AIDS) (Nantulya and Muli, 2009).

RTAs are emerging as a leading cause of death and disability in developing countries (Razzak and Luby 1998; Tercero *et al*. 1999). With only 52% of the world's registered vehicles, 72% of the world population, and 80% of road traffic accidents, these countries are shouldering a disproportionate share of the spoils (Tercero *et al*. 1999). The annual road traffic fatality rate for these countries now stand at 20.1 per 100 000 compared to 8.7 per 100 000 in the high income countries (WHO, 2012). Studies show that the risk of dying as a result of a road traffic injury is highest in the African Region (24.1 per 100 000 population), and lowest in the European Region (10.3 per 100 000). At 34.4 per 100 000 population, Kenya's rate ranks among the highest in the world.

The causes of RTAs are numerous, some are alcohol related. Use of alcohol contributes to traffic injuries by impairing driving capabilities and thus increasing the risk of crash involvement. Although alcohol is generally thought to be the most important risk factor among all drugs, some evidence has also linked the use of minor tranquilizers such as benzodiazepines to increase risk of crash involvement (Pludemmann et al., 2004; Gururaj, 2004). Again there is evidence that drivers with diabetes, epilepsy, cardiovascular disease, or mental illness experiences higher crash and violation rates (Mishra et al., 2010) but there is an equal number of studies indicating that neither chronic medical conditions nor disabilities among automobile put them at greater risk of RTAs (Mohan, 2007). According to Cutter (1993), geographical scale is important for impacts and their reduction. Land use pattern, types of road network, local business and activity pattern will influence the system risk in an area (Komba, 2006).

The cost to society such as loss of able bodied men and women who hitherto, would have been involved in productive economical activities, loss of intellectual in our schools, loss of resources to government and families, to insurance companies and damage to properties, etc are inestimable. Again valuing the psychosocial impact on victims is another difficult task. Issues like suffering and loss of life injuries associated with RTAs is difficult to assign monetary value. Beside, injuries, people often suffer from physical pain and anguish that is beyond any economic compensation. Permanent disabilities such as paraplegia (paralysis of the lower half of the body), quadriplegia (paralysis of all four limbs), loss of ability to achieve even minor goals result in dependence on other people for economic support and routine physical care which may although not in all cases for the rest of the victim's life (Onakonaiya, 1992; Jacob, 1990).

Africa, with only 4% of the global vehicles, accounts for 11% of global deaths (Jacobs and Aeron-Thomas, 2012). In Kenya, 68 deaths per 1,000 registered vehicles are recorded annually (3,000 deaths), a rate 30-40 times that in industrialized countries (Odero et al., 2003). In developed countries strategies exist that have proven to reduce road traffic injuries and deaths. They can be implemented in developing countries with equal success. World Health Organization and the World Bank (2004) launched the "World Report on Road Traffic Injury Prevention". It provided extensive information on the risk factors for road traffic injuries and evidence on effective interventions and showed that more than three-quarters of all road traffic deaths occur to young males. This is indeed a worrying situation taking into consideration their socio-economic potential. The report stresses the importance of good post-crash care both in terms of providing quick access for traffic victims to health care, and in ensuring the quality of trained hospital trauma care staff in mitigating the negative outcomes associated with road traffic crashes.

Kenya as witnessed an increase of registered motor vehicles over the past 2 decades – from 1.4 motor vehicles per 100 people in 1985 to 2.7 motor vehicles per 100 people in 2007. Road usage has correspondingly gone up for every type of vehicle. Over a period of 7 years—from 1983 to 1990, there was a significant increase of 125 percent in kilometers driven by buses and taxis and a 91 percent increase in kilometers driven by lorries (Assum, 1998; Odero, 1995; WHO, 1998; WHO, 2009). Motor-cycle use in Kenya has also significantly increased in recent years as a form of transport both in rural and urban areas. A study done in Nairobi alone revealed that over a period of three years alone, motor-cycle registration rose from 4136 in 2004 to 16,293 in 2007 (Nesoba, 2010). A 2000 study showed an unadjusted mortality rate of 35.6% for severe injuries resulting from road collision in Nairobi (Saidi et al., 2004). This rate is six times higher than that reported for countries with high income. The determinants of this mortality are incompletely documented. Since the 2000 study, access to advanced trauma life support (ATLS) protocols has improved and policy enhancement towards enforcement of traffic laws embraced (Chitere and Kibua, 2012). In Kisii, beside motor vehicles, the number of motor-cycle has equally increased to 12,500 over a short period. This essentially has contributed to high burden of RTIs. A study conducted by Assum in 1998, comparing mortality due to RTIs in 12 countries found that out of all 12 countries, Kenya had the highest RTI fatality rate following RTAs. The rate was 1.6 times higher than that for Zimbabwe, 3.6 higher than Chile and 48.9% higher than Great Britain (Assum, 1998).

Other studies conducted in Kenya have shown a steady increase in road traffic fatalities from 7.8 in 1985 to 10.6 deaths per 100,000 in 1998, indicating a 35 percent increase in the rate of RTI fatalities in Kenya (Odero et al. 2003). The increase in road traffic crashes is partly due to rapidly expanding motorized transport and industrial expansion without adequate safety precautions spelt out in the road traffic network. Beyond the human toll, RTIs are responsible for the tremendous loss of the Kenyan economy. The economic loss is estimated to be approximately US $3.8 billion annually which can be translated to 5% of the annual gross national product

(GNP). However, this does not include costs associated with lost productivity and other related costs due to the years of life lost (Odero et al. 2003; Peden et al. 2004). It is important to note that these are old estimates and there are no current ones to compare. There is urgent need to have current estimates which will assess the magnitude of the burden such that equally urgent interventions are implemented to curb road carnage. However, despite the high health and economic burden of RTAs with its associated injuries in Kenya, very little attention has been paid to address the burden. It is regarded as road traffic and insurance issue. It is only recently that World Health Organization and the World Bank have raised the red flag to advocate safety on the world's roads and in particular, the Kenyan roads (Peden, 2010; World Bank, 2011) that the government is trying to enforce the traffic rules to reduce RTIs.

RTA is one of the leading causes of mortality and disability, between 3000 and 13000 Kenyans lose their lives in road traffic crashes every year. The majority of these people are vulnerable road users - pedestrians, motorcyclists, and cyclists. In addition, nearly one-third of deaths are among passengers- many whom are killed in unsafe forms of public transportation (WHO, 2004). This situation places a high demand on hospital resources and significantly exerts a huge burden on the socio-economic development of the country. The estimation is that 45% to 60% of all admissions in surgical wards, and upto 75% in the national spinal cord injury hospital are RTA related cases (NRSC, 1990). According to the recently published WHO and the World Bank (2004)*'Global status Report on Road Safety",* there are no laws for helmet wearing, blood alcohol concentration levels for drivers or child restraints in Kenya where road safety laws do exist, they are poorly enforced.

The most vulnerable road users in Kenya are children, pedestrians, motorized two- or three-wheeled vehicles (cyclists) and the elderly (Ogendi *et al.*, 2013). According to WHO (2012) this vulnerable group account for 57% of the deaths compared to 51% in middle-income countries and 39% in high-income countries (39%). Statistics also show that almost 60% of road traffic deaths in the world are among 15 – 44 year olds and more than three-quarters (77%) of all road traffic deaths occur among men. Unfortunately victims of non-fatal injuries who incur permanent disability, through amputation, head injury or spinal cord injuries etc. are poorly documented.

The cost of RTAs to the global economy is enormous. An estimated US$500 billion a year, of which about US$100 billion is lost in the developing and the transition countries of Eastern Europe (WHO, 2012). The annual losses in developing countries exceed the total annual development aid and loans received by these countries. It has been suggested that the cost to the economy due to RTAs is approximately 1% to 2% of a country's gross national product (GNP). In Kenya, the cost to the economy from RTAs is in excess of US$ 50 million exclusive of the actual loss of life. In the 1980s the annual economic cost of road traffic accidents was 5% of the country's GDP (Yerrel, 1984). In 2011 the WHO estimated that Kenya lost US$4 billion annually due to road traffic fatalities, Given that the GDP in 2012 was $37.23 billion, that means the loss was approximately 11% of the GDP.

Obviously, societal responsibility in the control of road traffic crash (RTC) injuries becomes paramount when the problem is stated in these terms. Morbidity and mortality due to injuries have always existed in the past but their recognition as a public health problem is a phenomenon of the mid-twentieth century. Policy makers and safety professionals in every country find it very difficult to institute changes which actually result in a dramatic decrease in fatalities due to injuries. This is mainly because experience shows that individuals do not follow all the instructions given to them to promote safety. Attempts to educate people regarding safety are also not very effective and wide variations are found between people's knowledge and their actual behavior (Robertson, 1983).

Based on the Accident Cause Code Classification, Kenya Police reports reveal that 85.5% of crashes are caused by poor driver behavior, of which driver error represents 44.4%, pedestrians and passengers 33.9% and pedal cyclists 7.2% (Odero *et al*., 2003; Odero *et al* (1997). Other proximal factors include vehicle defects 5.1%, road environment 2.9%, and other factors 6.4% (Nantulya and Muli-Musiime, 2009).

II. Material and methods

This was a survey done in Kisii Central District. We interviewed 30 people undergoing treatment at Kisii General Hospital due to RTA injuries and a group of 15 traffic police officers. Fifth-one motor vehicle drivers and 297 non-motorist road users were also interviewed**.** We analyzed the proportion of accidents by vehicle type, and factors antecedent to RTAs as well as groups of people involved in RTA. We used data from the police records.

Authority to conduct the study was obtained from the Ministry Higher Education Science and Technology, and from the Traffic Police Headquarter, Nairobi. Those who participated in the study were assured of confidentiality of the information given. They were too requested to give voluntary informed consent prior to collecting data from them.

III. Study Participants

The study participants included drivers of matatus, buses, trucks, lorries and cars, traffic police officers, road traffic accident victims and road users (passengers, pedestrians, motor cyclists and pedal cyclists).

Assumptions

Underlying this study were the following assumptions. That that the respondents of this study had the knowledge especially of traffic rules and insight to participate and complete the instruments of the study.

That the stakeholders and road users had the desire to understand the multi-factorial causes of RTAs and their subsequent consequences and therefore would have the desire to offer suggestions for prevention and control of RTAs.

A structured questionnaire was administered to the road users, matatu and bus drivers. Interview was conducted by the investigator. Informed consent was sought prior to the interview from the respondents.

Results

Socio-demographic profile of the subjects

Out of the 393 road users sampled, 70.2% were males, while 29.8% were females. Again, 63.6% were in the age group 20-30 years, while 21.4%, were in the age group 31-40 years. In addition, 9.2% were between 41-50 years of age, while 5.8% were 51 years and above (see table: i). The study showed majority of the road users were between 20-40 years of age.

Age	Years	Frequency	Percentage
	20-30	250	63.6
	31-40	84	21.4
	41-50	36	9.2
	Above	23	5.8
	Total	393	100
Occupation	Formal employment	167	42.4
	Student	115	29.3
	Farmer	50	12.7
	Housewife	35	8.9
	Business- person	12	3.0
	None	14	3.7
	Total	393	100

Table 01: Socio-demographic Characteristics of road users N=393.

Occupation of Road users (n=393)

In this study 42.4% had formal employment, while 29.3% were students. Farmers formed 12.7% and housewives 8.9%. Business persons were 3.0%, while 3.6% of the road users had no formal occupation. Majority of those who travelled frequently included students and formally employed people (see figure 01). There was a significant relationship between occupation and vulnerability to RTAs.

Preferred mode of transport

Majority of road users (57.9%) preferred matatus, while 26.9% preferred buses. And 10.5% preferred use of private vehicles, while 4.7% preferred lorries. Preferred mode of transport had direct relationship to occurrence of RTAs.

History of previous RTAs among road users (n=393)

The study revealed 41.8% of the road users as having had a previous history of RTA, while 58.2% had none. The study showed that nearly half of the respondents had a previous episode of RTA.

Types of vehicles perceived to be involved in RTAs

Two hundred and eighteen road users (73.4%) reported matatus, while 19.9% reported buses, and 0.6% attributed RTAs to privately owned cars. Again 6.1% attributed RTAs to lorries. There was a significant relationship between the type of vehicle perceived to be involved in RTAs and the actual vehicle which caused RTAs.

Actual vehicles involved in RTAs as reported by accident victims at the hospital (n=30)

Twenty-two victims of RTAs (73.4%) reported RTA to have been caused by matatus, while 3 respondents (10.0%) reported saloon cars. One respondent (3.3%) reported land rover, while four (13.3%) reported road traffic injury was caused by the buses. Majority of vehicles involved in actual RTAs were matatus. This information was collaborated with traffic police records.

Available police records in 2012 and 2013 revealed vehicles which were responsible for road traffic accidents were: Matatus 53.3%, Buses 26%, Small cars 16.7% and heavy commercial vehicles contributed 3.3%. And injury by type revealed pedestrian contributed to 47.9%, passengers 44.3%, pedal cyclists 4.1% and motor cyclists 3.7%.

Factors responsible for RTAs

One hundred and seventy-seven respondents (59.6%) attributed RTAs to human errors, 62 (20.9%) attributed RTAs to defective vehicles, while 58 (19.5%) attributed it to defective roads. There was a significant relationship between human errors, defective vehicles, defective roads and RTAs. Human error was the major cause of RTAs.

Predisposing factors in human error

One hundred and twelve respondents (37.7%) reported over-speeding, while 75 (25.3%) reported miscalculation or poor judgment. Sixty-nine respondents (23.2%) reported avoiding potholes and over-taking, while 41 respondents (13.8%) reported driving while drunk. There was a relationship between over-speeding, miscalculations or poor judgment. Avoiding potholes, overtaking, drunk driving and RTAs (X^2=42.221; df=3; P=0.0005).

Predisposing factors in the traffic environment

One hundred and twenty-two respondents (41.1%) reported defective roads, while 89 (30.0%) reported careless road users. Sixty-eight respondents (22.9%) reported over-loading, while 18 (6.0%) reported too long distance driving causing fatigue as predisposing factors. the traffic environment was a significant factor as a cause of RTA (X^2=77.714; df=3; P=0.0005.

Predisposing factors in the traffic environment

One hundred and seventy-five respondents (59.6%) reported un-roadworthy vehicles, while 88 (27.9%) reported failure of breaking systems, 37 (12.5%) reported tyre or wheel burst. Majority of vehicles causing RTAs were un-roadworthy. The defective vehicles were significantly associated with RTAs(X^2=238.843, df=3; P=0.0005).

Characteristics of hospitalized accident victims (n=30)

Out of 30 respondents, 21 (70%) were males**,** while 9 respondent (30%) were females. Majority of the victims of RTAs were between 20-40 years of age. Majority who circumbed to RTAs were males.

Hospitalization (n=30)

Out of 30 RTA victims, 27 (90%) had serious injuries, while 3 (10%) had mild injuries. Nine victims (33.9%) had a hospital stay of between 1-30 days, while 13 (48.2%) were hospitalized for 31-180 days. Seven RTA victims (14.8%) stayed for a period exceeding 180 days, while one had stayed over a year in the hospital

Table 02: Hospitalization (n=30)

Days	Frequency	Percentage
1-30	9	33.3
31-180	13	48.2
180-360	7	14.8
Over 1 year	1	3.7
Total	30	100

Hospitalization of Victims of RTA

Training of drivers (n=51)

Out of 51 drivers, 41 (80.4%) attended a driving school, for instructional training, while 10 (19.6%) learnt driving on the job. There was no significant relationship between formal and informal driver training and occurrence of RTAs.

Driving experience of drivers

Thirteen drivers (25.5%) had a driving experience of less than four years, while 27 (52.9%) had driven for between 5 and 10 years and 3 (5.6%) had driving experience of above 16 years. There was a significant relationship between driving experience and occurrence of RTAs. Most drivers involved in RTAs had driving experience of less than 4 years (X2=27.247; df=3; P=0.05).

Previous history of RTA among drivers (n=51)

Out of 51 drivers, 38 (74.5%) had previous history of RTA, while 13 (25.5%) had no similar history.

Types of insurance cover of vehicles involved in RTAs (n=49)

Out of 49 vehicles involved in RTAs 31 (63.3%) had third-party insurance cover, while 10 (20.4%) had comprehensive insurance cover. Eight vehicles (16.3%) did not have any insurance cover. There was an association between insurance cover and occurrence of RTAs. Accidents were common with vehicles which had third party cover.

Accident report filed to the traffic police

Out of 49 vehicles involved in RTAs, 39 (79.6%) filed accident report to traffic police, while 10 (20.4%) did not report. The study showed that some RTAs' were never reported to the traffic police.

Court cases filed for road traffic offences 2001 to 2004

From the year 2001, the Kisii law courts had 2,600 traffic offences filed, 2002 had 2,400 cases. 2003 had a record of 3,800 cases, while 2004 had the highest record of 4,700 cases.

Incidence of RTAs statistics in Kisii Central District

Available police records showed RTAs statistics were on the increase. From 2001 to 2013 fatality increased by 7.5% while serious accidents increased by 47%. One hundred and forty-five accidents occur annually. Table 03 show a summary of accidents per year.

Table 03: Kisii RTA Statistics (source: police records)

Severity of RTA	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Fatal accident	9	19	26	30	32	34	35	40	38	52	60	56	64
Serious accident	57	83	56	146	133	128	148	154	136	144	154	134	158
Slight accident	53	13	35	54	49	60	70	58	68	76	73	78	76
Total	119	115	117	230	218	227	253	252	242	272	287	268	298

Persons killed and injured 2012 to 2013

Between January and May 2012, 19 pedestrians had been killed, 5 drivers and 4 passengers. Pedestrians had the highest number of deaths while passengers had the highest number of injuries (see table 04).

Table 04. Number of Persons killed and injured 2012

Victims	**Drivers**	**Motor-cyclist**	**Pedal cyclists**	**Passengers**	**Pedestrians**
Killed	2	7	--	27	23
Serious injury	3	12	1	110	21
Slight injury	1	2	1	47	10
Total	6	21	2	184	54

Table .05 Persons killed and injured 2013

Victims	**Drivers**	**Motor-cyclist**	**Pedal cyclists**	**Passengers**	**Pedestrians**
Killed	5	1	1	4	19
Serious injury	7	-	5	161	44
Slight injury	6	2	6	66	22
Total	18	3	12	231	85

Victims of RTAs who were hospitalized at the District Hospital

Between 2008 to 2013, 40 people died while under-going treatment from injuries sustained. Among the deaths, 20 victims (83.3%) were males while 4 (16.7%) were females. A total of 1432 people were injured out of 917 (64%) were males while 515 (36%) were females (see table 03 and 04). The data showed that an average of 364 people sustained RTIs, of which 4 died.

Table 05: Victims of RTAs hospitalized at Kisii District Hospital

Year	**2008**	**2008**	**2009**	**2009**	**2010**	**2010**	**2011**	**2011**	**2012**	**2012**	**2013**	**2013**
Victim	Male	Female	Male	Female	Male	Female	Males	Female	Males	Female	Males	Female
Died	9	2	8	1	2	1	1	0	3	1	9	3
Injured	333	153	211	109	186	105	187	148	219	87	158	106
Total	342	155	219	110	188	106	188	148	222	88	167	109

Recommended methods of preventing RTAs by road users

All road users had the knowledge on how RTAs should be prevented and they suggested the following ways; observing and enforcement of traffic rules (19.6%), avoiding over-loading (17.1%), avoiding over-speeding and over-taking carelessly (18.8%), stopping drunk driving (11.2%), building good roads (6.6%), use of seatbelts and speed governors (4.3%), having well trained drivers (3.6%), banning un-roadworthy vehicles (3.1%), educating road users on road safety (2.0%), and maintaining vehicles and vehicle inspection (2.6%), and stopping police leniency (11.1%) can go along to prevent road carnage in our roads.

Some antecedents to the road traffic accidents

Drunken drivers, bad road (pot holes), mechanical failure, excess number of passengers, break down in law enforcement and perceived over speeding are some of the antecedent factors to RTAs.

IV. Conclusion

The results show that Matatus (public mini buses), buses and small cars are the leading causes of accidents. Human errors and failings, defective vehicles and bad roads contribute significantly to RTAs. Victims of RTIs include pedestrians and passengers.

Recommendations

This study suggests and recommends that the public be sensitized, to curb road carnage. This includes public education, enforcement of observance of traffic rules, avoiding over-speeding, overloading and careless overtaking; stopping drunk driving; wearing seatbelts, recognizing the rights and needs of pedestrians, constructing good roads, provision of safe and efficient public transport, training and re-training of public service vehicle drivers.

V. Discussion

Road traffic deaths occur among young adults between 15 and 44years of age. Again 73% of all fatalities are young males who are an economic assert to society. The study revealed that vulnerable road users include pedestrians, cyclists and motor cyclists. They account for a much greater proportion of road traffic collisions. Road traffic injuries cause emotional, physical and economical harm. There is a moral need to minimize such losses. Beside loss of lives road crashes consume massive financial resources that society can ill afford to lose. It is important to estimate the cost of road traffic injuries to society: to justify the expenditure necessary in promoting road traffic injury prevention to make the best use of investments when different options are available; to ensure that the most cost-effective safety improvements are introduced in terms of the benefits that they will generate in relation to the cost of their implication.

Road traffic accidents are now becoming a public health problem in low- income countries (Kual et al., 2005; WHO, 2009). The study revealed that matatus and buses are the leading cause of RTAs in Kisii. This can be attributed to population increase and the number of vehicles using the roads. Change in behavior of drivers has been slow. This has resulted to a large number of traffic accidents that have an increase in fatality. The overall estimation of accident costs is difficult and particularly in developing countries. Correct costing is needed to accurately determine the cost effectiveness of traffic management schemes ((Söderlund & Zwi, 1995; Chandran et al, 2010; Odero et al., 2003). On average, the total cost of road accidents, including an economic valuation of lost quality of life, is approximately 2.5% of GNP (Yerrel, 1984 WHO, 2002) excluding the valuation of lost quality of life. RTAs cost an average of 0.5-5.7% of GNP, When valuation of lost quality of life is disregarded, costs ranged from 0.3-2.8% of GNP. However, the losses caused by traffic accidents are quite heavy in both developed and developing countries. And if they are to be reduced substantially, a comprehensive strategy for accident reduction and prevention is required (WHO, 2002; 2012; Jacob, 1990; Onakonaiya, 1992).

Factors contributing to accidents

Most of the factors contributing to accident occurrence and rates may be grouped and labeled as "economical" factors. The World Bank (2004) relates much of the accident problem in developing countries to a shortage of funds, for both owners of vehicles and the governments.

Some of the factors affecting accidents may be conveniently divide them into 2 groups: a) Direct factors- which contribute directly to the occurrence of individual accidents. These include: road user behavior, drivers ability and attitude, traffic engineering, roads and environment and medical services. b) Indirect factors- that contribute to the total population and rate of accidents in the country. They include demographic (population structure and distribution), and vehicle population and characteristics (number, type, usage and occupancy). The study revealed that over loading, over speeding of matatus and buses are major factors that contribute to higher accident risks or to more serious accidents. In developing countries the resource constraints, especially of hard currency may produce the following consequences. Moreover, road user behavior is reckless. Studies show that drivers routinely ignore traffic laws (Odero et al., 2003; WHO, 2004) and pedestrians routinely walk in the middle of streets and cross without checking for traffic. However, in general, drivers' errors, often accompanied by law violations are in the chain of events leading to more than 90% of all highway accidents. However, the nature of behavior differs between individual drivers. While alcohol for example, is found to be the most common causes of accidents in many developed countries. Investigations into some aspects of driver behavior in some rich developing countries (Pludemmann et al., 2004; Gururaj, 2004), indicated that drivers acquire many dangerous and harmful driving habits and that driver observation of traffic regulations is poor. In recent years, many countries have launched integrated road safety programs which attempt to incorporate all the diverse elements related to accidents and casualties which are expected to increase the efficiency of road safety, work and generate new solutions to the accident problem (WHO, 2004).

Strategies for better road safety

RTAs are a significant but preventable, cause of death, disability and economic loss in developing countries and particularly in our Country-Kenya. Comprehensive strategy for accident reduction and prevention is required to improve road safety in any country. WHO (2004) has proposed such a strategy and produced guidelines that draw a clear distinction between accident reduction and accident prevention, with both is being necessary. Theoretically, reduction of accidents requires: (i) reducing personal travel (and consequently road traffic). (ii) reducing the risk, severity and consequences of road traffic accidents. These approaches can be applied in a variety of ways: 1) "Technical"- which is direct measures, intended mainly to improve safety. These include measures related to land use development, road and road user, vehicle design, traffic laws and their enforcement, medical services and insurance premiums. 2) "Institutional"- which can improve road safety indirectly and are related to road safety organization, financing, research and development and staff education training. An accident reduction program should entail the following stages: a) Identification of problem locations (black spots) through the analysis of accident data. b) Diagnosis of the symptoms (namely factors involved in accident occurrence). The result also suggests that road accidents fatality rates could be reduced by improving road engineering, re-training drivers of public service vehicles, adopting right driving behavior, observing traffic rules, timely medical services and education.

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