A STUDY OF ACCIDENTS VICTIMS' AND DRIVERS' KNOWLEDGE AND PRACTICES ON ROAD TRAFFIC ACCIDENTS IN THIKA AND MACHAKOS HOSPITALS.

ROSELINE KAARI NDWIGAH

A THESIS SUBMITTED IN PARTIAL FULFILMENT FOR THE DEGREE OF MASTER OF PUBLIC HEALTH AND EPIDEMIOLOGY OF KENYATTA UNIVERSITY.

AUGUST

2003

DECLARATION.

This thesis is my original work and has not been presented for a degree in any other university or any other award.

ROSELINE KAARI NDWIGAH

Signature..... Date 02:09:2003

SUPERVISORS APPROVAL.

We confirm that the candidate under our supervision carried out the work reported in this thesis.

DR. EPHANTUS W. KABIRU.

KENYATTA UNIVERSITY

Signature..... Date 3rd SEP 2003

PROF. ROMANUS O. OKELO

KENYATTA UNIVERSITY

Signature..... Date 3-9-03

DEDICATION.

To my loving ~~and~~ parents, Moses and Margery Ndwigah, my brothers Edu, Dan, and sisters Jayne and Doreen, thank you for your love, sacrifice and support through out the study. I love you all.

God bless.

ACKNOWLEDGEMENT

I am grateful to several people for the role they have played to enable me accomplish these studies.

My deepest appreciation however goes to my university supervisors Dr. Ephantus W. Kabiru and Prof. Romanus O. Okelo for their guidance, encouragement and availability through out the study.

Many thanks to Jackson and Hezron for all the help accorded during the research.

I am greatly indebted to the management and staff of Thika and Machakos District hospitals for their permission to carry out research and their assistance during the data collection process. Special thanks to the traffic police department and all the drivers and accident victims who made the research possible.

God bless you all.

TABLE OF CONTENTS.

LIST OF APPENDICES.

LIST OF TABLES

LIST OF FIGURES.

LIST OF ABBREVIATIONS

AA: Automobile Association of Kenya

AAA: American Automobile Association

BAC: Blood Alcohol Content

CI: Confidence Interval

DALYL: Disability Adjusted Life Years Lost

FGD: Focus Group Discussion

IFRC: International Federation of Red Cross and Red Crescent Societies

MoE: Ministry of Education

MoH: Ministry of Health

NCSDR: National Centre on Sleep Disorders Research

NHTSA: National Highway Traffic Administration

NRSC: National Road Safety Council

PSV: Public Service vehicles

ROK: Republic of Kenya

RTA: Road Traffic Accident

RTI: Road Traffic Injury

SAS: Sleep Apnea Syndrome

UAE: United Arab Emirates

WHO: World Health Organisation

YPLL: Years of Potential Life Lost.

DEFINATIONS OF KEY WORDS.

The key words used in the study are defined below:

1. **A dangerous road location**: - It is a site that tends to frequently experience road traffic accidents. Such a site experiences more RTA's than other locations on the road network. Another word used in literature is "black spot".

2. **A '*matatu*'**: - It's a small-scale motorised public means of transport in Kenya. It is important in the transport of people and goods both in rural and urban areas in Kenya. The term is derived from the Kikuyu term "*mang'otore matatu*" which means "thirty cents" the standard charge for fare in 1970 (Aduwo, 1990).

3. **A road traffic accident (RTA)**: - It refers to a collision or mishap involving one or more of the means of transport using the road. It can take such forms as a head-on-vehicle collision, rollover by a vehicle, vehicle-pedestrian collision, vehicle-cyclist collision, vehicle-animal collision, cyclist-pedestrian collision, passenger falling from a moving vehicle, a vehicle being hit by another from behind, sides and a vehicle running into objects.

4. **Means of transport**: - Are a media that move on the modes to facilitate movement. They include walking, carts, bicycles, vehicles, trains, aeroplanes and motorcycles.

5. **Road traffic accident casualties**: - Are three levels of injury: fatalities, serious and slight injuries. An RTA is fatal when deaths result, serious when serious injuries are incurred and slight when minor injuries are experienced.

6. **Traffic conflict**: - Is a situation whereby the action or manoeuvre of a vehicle or road user threatens another vehicle and/ or road user with possibility of a collision. Examples of such threatening actions are emergency breaking, stopping, swerving or running into the road by pedestrians. These actions lead to near accident.

7. **Transport**: - It is the movement of people and goods via modes of road, railway, footpaths, waterways and airway.

ABSTRACT.

Kenya has witnessed two apparent trends in the road transport sector. On one hand, there has been a tremendous increase in transport activity while on the other there is deterioration in the state of road safety. According to the WHO (1993) report, an average of 800, 000 human lives are lost annually and between 10 and 15 million persons injured in the world as a result of Road Traffic Accidents (RTA's). This heavy toll represents one death every fifty seconds and one injured person every two seconds worldwide. The aim of the study was to determine the knowledge, and practices of surviving accident victims and drivers regarding road traffic accidents, what they perceived as causes of accidents on Kenyan roads and ways of curbing them.

This study was undertaken in Thika and Machakos Hospitals and some sampled car termini in Nairobi and a total of 315 respondents were interviewed. Data was collected through structured questionnaires and focus group discussions. A sample of 200 drivers participated in the study where 73.5% were males and 26.5% females. Forty one point five percent of the drivers had been involved in a road accident at one time where 24.1% of them were fatal. Among the reasons cited by the drivers as the causes of accidents were careless driving (40.7%), vehicle defects (24.7%), road defects (18.5%) and others, which included fatigue, stress and emergency breaking (16%). Eighty four percent of the drivers' felt that speeding was a major factor in causing accidents. Though speeding by drivers had no statistically significant association with accidents, more than half, (55%) of the drivers admitted to driving at a speed of 100km/hr and above ($\chi 2$= 1.016; p=0.313; df=1).

Eighty seven percent of the drivers had driving licenses while the rest, 13% did not have. Out of the 115 accident victims interviewed, 51.3% and 48.7% from Machakos and Thika District Hospitals respectively. Seventy three point nine percent of the victims were in-patients while the remaining 26.1% were outpatients. Majority, (58.3%) had arm/leg fractures, 33% head/ and neck injuries, 28.7% back/ and chest injuries, 14.8% limb(s) amputed while those with minor injuries were only 13%. Eighty seven percent of accident victims felt that overloading of vehicles was a major cause of accidents. However, 69.9% said they would board a '*matatu*' that was full if they were late to get to some place. There was no significant relationship between overloading as a cause of accidents and those who said they would board a full '*matatu*' ($\chi 2$ =0.887; p=0.364; df=1). All accident victims felt that speeding was an important cause of accidents in Kenya.

The results showed that the highest mentioned ways of reducing accidents by the drivers and accident victims were expansion and maintenance of the existing road network and formulation of government policies on road safety. The study points out the need to urgently address the issue of road traffic accidents due to the effects they have on social, physical and emotional attributes of the victims and entire society. The results of this study may be used by policy makers and other organizations advocating for road safety to formulate policies that will target on reducing mortality through RTA's.

CHAPTER ONE

1.0 INTRODUCTION AND LITERATURE REVIEW.

1.1 BACKGROUND INFORMATION.

Road Traffic Accidents (RTA) are among the leading causes of mortality among economically active adults in Kenya. According to MoH Development Plan (1989-1993), RTA,s is one of the leading causes of mortality and disability in Kenya. This situation places a high demand on hospital resources and also exerts a huge burden on Kenya's economy. The estimation is that between 45% and 60% of all admissions in surgical wards and up to 75% in the National Spinal Cord Injury Hospital are RTA cases (Republic of Kenya, NRSC, 1999).

According to Nordberg (1994), unintentional injury is the ninth most common cause of death, responsible for 5.2% of the total mortality in the world. Data in Africa are mainly based on hospital records and very few population based incidence estimates made. The relationship between alcohol and traffic injuries both in pedestrians and drivers/passengers has been inadequately explored in developing countries (Adams, 1995).

The road traffic accident situation has become a matter of concern to the government and people of Kenya. At the community level, this concern is partly revealed in the appeals made not only to the government but also to individual road users to solve the problem of road traffic accidents. One of the suggestions offered is that the government should institute effective intervention measures and also road users to exercise extreme care on the road. Though road traffic accidents in Kenya are due to a number of underlying factors, there is a strong view that the human factor is a major

cause. In particular, concern has been raised about road user behavior, adherence to road safety standards and effectiveness of existing road safety measures (Automobile Association, 1988; Assum, 1997, 1998; Agoki, 1991).

The close correlation between health and economic growth was recently unveiled in a report from the World Health Organization (WHO, 2002). A commission chaired by a US economist claimed that each 10% improvement in life expectancy spurs between 0.3% and 0.4% point rise in growth rates.

RTA's involving public vehicles result in more serious accidents than private vehicles (Nantulya and Musiime, 1997) and since majority of the people in Kenya are likely to be using public vehicles, they thus carry a greater burden of injuries from RTA's.

Due to the number of lives lost through RTA's, it is a major public health issue that requires urgent attention.

1.2 LITERATURE REVIEW.

1.2.1 The global picture of Road Traffic Accidents.

Injury has only recently been recognised as a major global public health issue. The landmark report, Global Burden of disease, published in 1996 by the World Health Organisation, World Bank and Harvard University, pointed a clear picture of how significant injury is to public health (Murray and Lopez, 1996). The report presented data on premature mortality and disability from unintentional injuries (traffic related injuries, falls, fires and others) and intentional injuries (self inflicted, violence, wars). According to this report, in 1990 roughly 5 million people worldwide – two thirds of them males died of injuries. Injuries accounted for approximately 15% of the total burden of premature mortality and disability globally in 1990, and this was true across all regions of the world; by 2020, the report projected that injury related burden will increase to approximately 20% (WHO, 1996). Motor vehicle crashes represent the largest single cause of all injury- related deaths worldwide. Among adults of ages 15-44 years worldwide, traffic crashes were the leading cause of death for males and the fifth for females. Increasing motorization is the leading death contributor to this increase in motor vehicle crash deaths, and can be seen most clearly in developing countries where an increasing number of large motor vehicles (cars, trucks, buses) share the road with pedestrians, cyclists and drivers of motorcycles and motor scooters (World Bank, 1996).

Road accidents turn out to be the substantial cause of death in many areas of the world, according to a WHO report issued by the sustainable Mobility Project (WHO, 2002). Toward the end of the 1990's, between 80,000 and 90,000 people were killed each year in road accidents in Western Europe and North America. In some countries,

road accidents are a primary cause of death in the 15 to 30 year old age group (Assum, 1998).

According to Occupational Safety and Health Association, 6,023 work related fatalities occurred in the US in 1995 (Jones, 1996). Almost 33%, of these accidents were caused by motor vehicle accidents. While 6.3% of US workers on average experience an occupational injury or illness each year, organizations can expect 20% of their fleet drivers to be involved in a vehicle accident annually (Jones, 1996). Data compiled by the US department of transport shows that 41,471 people were killed in motor vehicle crashes in 1998.These 41,471 deaths occurred as a result of 37,081 actual crashes involving 56,865 vehicles (Lowe, 1990).

A survey in Britain estimated that out of the 55 million persons alive in 1985, about 222,000 were expected to die through RTA in some future year (Department of Transport, Great Britain 1987). This was worked out to mean that of the 55 million persons alive, as many as 1 in 250 could die in a RTA. The most affected were projected to be 17-32 and 74-79 age groups. Most of the projected RTA deaths (about 65%) were men, particularly at younger ages.

In New Zealand, with a population of just over 3,500,000, RTA is the second important cause of premature deaths, after cancer. Motor vehicle accidents are the leading cause of death for the 15-24 year olds (Jones, 1996). Road crashes, leading to casualties and disabilities have also been identified as a major public health problem in the Caribbean, striking especially young people in the age group 15-25 years (WHO, 1985).

Japan has had a highly fluctuating rate of road traffic accidents, with the year 1970 identified as the worst in her history of road traffic accidents (The Japan Research Center for Transport Policy 1994). The peak of RTA deaths (16,765) and injuries (981,096) was reached in 1970. These figures declined in 1971, marking the beginning of a steady downward trend, which began to level off after 1975. However in 1978, injuries began to increase again and the number of deaths began to rise in 1980. Despite the implementation of comprehensive traffic safety programme, the number of accidents and resultant fatalities and injuries has continued to grow in Japan. The number of accidents per 10,000 motor vehicles and 100,000,000 motor vehicle-kilometers of travel fell steadily until in the middle of the 1980's, leveling off since then.

An assessment by the London Research Center (1996) of road traffic accident casualties by mode of travel in Greater London for the year 1995 established that pedestrians had the highest proportion of involvement (20.8%) and taxis had the lowest.

According to official data from the Ministry of Labour and Social Security, during 2001, out of the 188 fatal accidents at work reported in Britain 43(23%) were road deaths (WHO, 2002). The trends are also highly similar in all the regions of the world. During the last decade all industrialized countries have experienced substantial abatements in traffic fatalities – down 25% in Western Europe and 30% in the US. Safer vehicles, highway designs and better post accident care are among the reasons. However, although improving, the level of transportation – related accidents in developed countries is still a matter of concern, according to the Mobility 2001 report, which warned "much more attention will have to be paid to particular requirements of elderly drivers, passengers and pedestrians (Mobility Report, 2001).

According to WHO statistics, there are about two million traffic accidents in the European region every year killing 120,000 and injuring 2.5 million people. One in every three deaths involves young people under 25 years of age. Pedestrians and cyclists comprise 30-35% of deaths. Every year in the same region about 25,000 males under 25 years die in road accidents (WHO, 1999).

1.2.2 The road Traffic Accident situation in Africa.

Traffic accidents are a major cause of death and injuries worldwide, but while declining in the developed world, fatalities are still on the rise in many developing countries.

The situation in Africa appears to be deteriorating. Low-income countries suffer some 80 times more traffic fatalities per vehicle than high-income countries. Pedestrians and cyclists are generally disproportionately represented among accident victims and so are poor people. The lack of institutional engineering and infrastructure interventions are evaluated as more important explanations than merely the number of cars. Lack of driver training, public education and insufficient law enforcement are other reasons behind the tragic statistics (WHO, 2002).

An estimated 885,000 people per year lose their lives in traffic accidents according to WHO. The majority of traffic accidents (70%) occur in low and middle-income countries of the developing world, even though private vehicle usage is markedly lower than in wealthier nations (Assum, 1998). The differences in risk per vehicle are dramatic; in several African countries, fatality rates exceed 100 per 10,000 vehicles compared with less than four in Western Europe. In Kenya, 40% of road accidents happen in cities and 60% occur in rural areas (World Bank, 1996).

The rate of fatal injuries per vehicle has climbed 300% since 1968 in Africa, whereas it has dropped slightly in the developed world. One reason for the higher fatality rate is that each incident frequently affects many people, for example, when an accident involves an overcrowded bus. Inadequate safety standards are another contributor to high fatality rates. In developing countries, pedestrians account for about 40% of deaths from traffic accidents, compared with 20% in developed countries. A major reason for this is the concentration of different road users jostling for space on crowded city roads (Assum, 1997).

1.2.2.1 Comparison between Africa and Scandinavian countries.

The table below briefly describes the similarities and dissimilarities of road fatality situation in four African and two Scandinavian countries.

Table 1. Road fatalities, total and by vehicles and inhabitants, and vehicles per 100 inhabitants, 1994-1999. (Source: Assum (1998), (1999); NRA, Sweden 1999, 2000).

	Kenya	Mozambique	Tanzania	Zimbabwe	Norway	Sweden
Fatalities	2617	960	1663	1274	303	580
Per 10, 000 vehicles.	60.1	137	66.1	27.0	1.2	1.2
Per 100,000 inhabitant	10.0	6.0	5.6	11.1	6.8	6.6
Veh/ 100 inhabitants	1.7	0.44	0.8	4.1	58	56

1.2.2.1.1 Dissimilarities

The dissimilarities are found in the risk of accident involvement, which can be operationalized as fatalities per 10,000 vehicles. This risk varies from 137 in Mozambique to 1.2 in Norway and Sweden. The number of vehicles per 100 inhabitants also varies greatly, from 0.44 in Mozambique to more than 100 times as many in Scandinavia. What is not shown in Table 1 is the difference in the number of accident victims. In the African countries, pedestrians and public service vehicle passengers make up 70-80 per cent of the fatalities (Assum, 1998) whereas in Scandinavia car occupants (drivers and passengers) make up almost 70 per cent of the fatalities (Official Statistics of Norway, 1998).

1.2.2.1.2 Similarities

The main similarity shown in Table 1 is that the public health problem, i.e. the number of fatalities per 100,000 inhabitants, is of the same magnitude, ranging from 5.6 in Tanzania to 11.1 in Zimbabwe. Norway and Sweden fall between these two African countries in this respect. Both African and Scandinavian countries have expressed the ambition of reducing the number of fatalities and serious injuries, despite a high increase in the number of vehicles in Africa and a high and still increasing number of motor vehicles in Scandinavia.

1.2.2.1.3 Same problem – different situations.

In both Africa and Scandinavia, the issue is to reduce public health problems resulting from road accidents, although the situations are quite different.

In the African countries, there are small but rapidly increasing numbers of vehicles; few countermeasures are implemented and the question is how to implement effective

countermeasures. Low cost measures have a relatively effective accident-reducing potential since implementation of measures has so far been somewhat limited (Assum, 1998).

In Scandinavia, there are large numbers of vehicles, and many countermeasures have been implemented. The question however, is what more can be done. The measures known to be effective, such as speed enforcement and traffic engineering (Assum, 1997), still have a certain potential, but further implementation will lead to increased conflict with mobility and costs will be very high.

1.2.2.2 The unseen epidemic.

Beginning in the 1970s, road safety improvements in North America, Europe, Japan, Australia, and New Zealand resulted in significant reductions in the rates of motor vehicle fatalities. Control of drunk driving, the mandatory use of child-restraint devices and seat belts, and improvements in passive protection, such as airbags, have further reduced the number of deaths and the severity of injury (Assum,1998). The situation is quite different, though, in the developing world where a growing number of accidents on the roads have caused the problem to reach epidemic proportions. In the highly motorized countries, the occupants of cars are the primary victims of traffic accidents. In the developing, newly motorizing countries, the majority of deaths and injuries are sustained by vulnerable road users such as pedestrians, bicyclists, motorcycle and scooter riders, and passengers on public transportation. They travel together on the same roads with buses, trucks, and cars, in a chaotic traffic stream. Mismatched collisions between the unprotected humans and the heavy vehicles cause frequent death and serious injury, even at lower speeds. Unlike the developed countries where cars are the predominant mode of private transportation, in the newly

motorizing countries, more affordable motorcycles and scooters are being purchased and are joining the unregulated traffic stream in large numbers. The resulting explosive 16-18% vehicle growth rate in many Asian countries will lead to doubling of the fleet in five years and a trebling in eight years, causing even more severe problems. Not separating the various road users, sparse traffic safety laws, inadequate police enforcement, absence pre-hospital emergency care, and limited resources for acute hospital and rehabilitative care are additive factors explaining the frequency of accidents and their devastating consequences.

1.2.2.3 The magnitude and Significance of the Problem

Annually, 800,000 people die and 10-15 million are injured or permanently disabled from accidents on the world's roads. Under- reporting of injuries is common in the developing world and these estimates may represent less than the true number. Seventy five percent of the fatalities and injuries occur in the developing world and the problem is growing. A five year study, published in 1996, entitled *"The Global Burden of Diseases and Injury"* by researchers from the Harvard School of Public Health and WHO examined the relative significance in terms of death and disability of the major health conditions and projected changes between 1990 and 2020. A startling finding of this report was the prediction that road traffic accidents would move from ninth place to third place on the list as a cause of worldwide death and disability. In this position, it would be exceeded only by heart disease and unipolar major depression. By comparison, war will rank eighth and HIV tenth. In its 1994 annual report, The International Federation of Red Cross and Red Crescent Societies (IFRC) recognized road traffic accidents as a major global health problem, equal in magnitude and seriousness to wars and natural disasters (European Federation, 1995). They recommend that this global epidemic require urgent attention.

1.2.2.4 The Economic Impact of RTA's.

The World Bank estimates that the annual cost of traffic accidents in the developing countries is 100 billion US dollars (World Bank, 1999). As the combination of all forms of foreign loans and aid totals 60 billion US dollars, it is clear that road traffic accidents are seriously undermining economic and social development in these countries. The trauma victims are often young people who are the workers and wage earners in their families. When they are killed or disabled, there is a profound effect on their entire family.

Assessing road safety work in five countries, Assum (1998) claims " there is no doubt that the main problem in Africa is the implementation of accident counter measures rather than a shortage of counter measures unique to African conditions". Contrary to this statement, the position can be taken that road accident problems in Africa or in developing countries in general are of a different nature compared to those of industrialized countries.

Consequently, counter measures with proven effect in industrialized countries cannot be expected to have the same effect in developing countries.

1.2.3 The Road Traffic Accident situation in Kenya.

Little has been done on Road Traffic Accidents as a Public Health concern in Kenya and therefore literature is mainly based on reports and journals.

There are few studies in developing countries that have tried to explain the epidemiology of RTA's. These studies have shown that RTA's are the most frequent cause of injuries presented to casualty departments in hospitals (Nordberg, 1994).

In Kenya, a study documented that RTA's were the single most important cause of death in children aged between 5-15 years in the City of Nairobi. Children were most

frequently involved as pedestrians and passengers in public transport vehicles (Nantulya and Musiime 1997).

According to the World Bank (2000) report, about 865,000 RTA deaths occur annually worldwide, among which 85% are in developing countries. A number of developing countries including Kenya are ranked highly as regards mortality resulting from RTA (Odero and Zwi, 1997). Fatalities from RTA account for 10% of all deaths in the 14-44 age group. The costs involved in taking care of RTA casualties have inevitably risen causing a considerable strain on the human and financial resources in Kenya. This also leads to overcrowding in health facilities (ROK, NRSC, 2000). In Kenya, deaths from RTA have increased by 43% over the last 10 years and alcohol is seen to be an important contributing factor (Downing and Sayer, 1991). Epidemiological data showed that Kenya had 8,229 RTA during 1996 with 14,562 individuals injured and 1,490 (10.2%) killed. Out of the injured 4,852 (33.2%) had serious injuries and 8,220 (56.4%) had mild ones. This corresponds to 60 deaths per 10,000 vehicles (ROK, NRSC, 2000).

Trends show that nearly 80% of those killed on Kenyan roads are pedestrians and passengers followed by drivers who account for 14% (Agoki, 1988). Therefore, in order to reduce RTA's efforts should be directed towards drivers as they have a responsibility for themselves as well as passengers (35% of total killed). Thus, drivers are potentially responsible for nearly 49% of those killed whereas pedestrians have a share of 45% (Agoki, 1988). This further indicates that concerted efforts in road safety improvements should be directed towards both drivers and pedestrians.

Injury prevention efforts can begin in earnest only with the Nations political community first recognizing the increasing impact this public health problem has on global economies and that injuries are preventable. The number of injuries and deaths

resulting from RTA is therefore a major concern to Public Health Authorities and attention should be given to accident prevention and mitigation to curb loss of lives through RTA's.

1.3 STATEMENT OF THE PROBLEM

Road traffic injuries (RTI's) are a major cause of death and disability globally with the highest numbers occurring in developing countries. RTI's are currently ranked 9th globally among the leading causes of Disability Adjusted Life Years Lost (DALYL); this ranking was projected to rise to 3rd by 2020 (WHO, 1995). In 1998, developing countries accounted for more than 85% of all deaths due to road traffic accidents (World Bank, 1999).

Also, road traffic accidents may be seen as a social rather than a public health problem. Another reason is our own cultural and individual perspective, reflected in the language we often use to describe them. In many cultures, including our own, road accidents are perceived as normal and people normally refer to them as 'fate' implying that these events are acts of destiny and out of our control, yet the science of injuries shows that their causes are often predictable and preventable.

However, public policy responses to this epidemic have been curtailed at both local and national levels. The records of most accidents are not made public and policy makers may not be aware of the magnitude of the problem. Therefore, there is need to recognize this growing problem as a Public Health crisis and design appropriate policy responses.

1.4 JUSTIFICATION OF THE STUDY.

There is an increasing concern about Road Traffic Accidents from a health point of view. The health perspective is concerned with the effects of RTA on quality of life, the care of surviving victims and long-term consequences of these accidents on the victims, their families and society.

Road Traffic Accidents are a public health concern because they have led to increase in fatality rates /and years of Potential Life Lost (YPLL). This in turn has led to economic loss and a considerable strain on the country's human and financial resources. RTA, being a leading cause of death to young and economically viable people globally, necessitates a study on accident victims and drivers to find out contributing factors. Many deaths and disabilities continue to occur on Kenyan roads and little is documented about factors that contribute to this.

As public Health scientists, practitioners and advocates one must remain diligently aware of the emerging challenges that can negatively impact our economies and work together to effectively enhance the health and well being of all our populations. Road accidents present a major cause of death and pose an enormous public health burden worldwide.

Therefore, the study aimed to establish the road safety knowledge, attitudes and practices of accident victims and drivers in Thika and Machakos Hospitals on RTA's which will then assist policy makers and relevant authorities to lay down appropriate measures to curb RTA's thus reducing loss of life. There is an urgent need to prevent RTA in view of the effects they have on the health of victims, and the toll on the economy of the country.

1.5 RESEARCH QUESTIONS.

The study sought to answer the following questions:

1.5.1 What do accident victims and drivers perceive as causes of accidents on Kenyan roads?

1.5.2 What is the relationship between the perceived causes of accidents and the practices of drivers and accident victims?

1.5.3 What do accident victims and drivers believe can be done to reduce the number of accidents on Kenyan roads?

1.6 NULL HYPOTHESIS.

Knowledge and practices on road safety have no relationship with road traffic accidents.

1.7 OBJECTIVES OF THE STUDY

1.7.1 General objective

The general objective was to establish the road safety knowledge and practices of accident victims and drivers in the study area with regard to RTA's.

1.7.2 Specific objectives

1.7.2.1 To determine the accident victims and drivers knowledge on the main causes RTA,s in Kenya.

1.7.2.2 To establish the relationship between the perceived causes of accidents and the practices of accident victims and drivers.

CHAPTER TWO.

2.0 MATERIALS AND METHODS.

2.1 THE STUDY AREA.

The study was conducted in Thika (fig 1) and Machakos (fig 2) District hospitals and car parks /terminus Nairobi City. Thika District is located on the southern part of Central Province (fig 3) and shares common boundaries with several districts both within and outside Central Province. To the south it borders Nairobi City and Kiambu District to the west, Muranga District to the north and Machakos District to the east. It covers an area of 2,024 square kilometres (ROK, 1997).

Machakos District is one of the twelve districts that comprise Eastern Province (fig 3). The district borders Kitui and Mwingi Districts to the east, Makueni District to the south and Kajiado District to the west. The district has a total area of 6,051 square kilometres (ROK, 1997).

2.1.1 Demography.

Thika District has a population of 645,713 and 171,569 households (ROK, 1999). The district has a density of 329 persons per square kilometre. Due to rapid population growth in the district, there is an increasing imbalance between supply and demand of basic facilities such as health and other services.

According to 1999 census, the population of Machakos District was 906,644 with 186,297 households and a density of 144 per square kilometre (ROK, 1999).

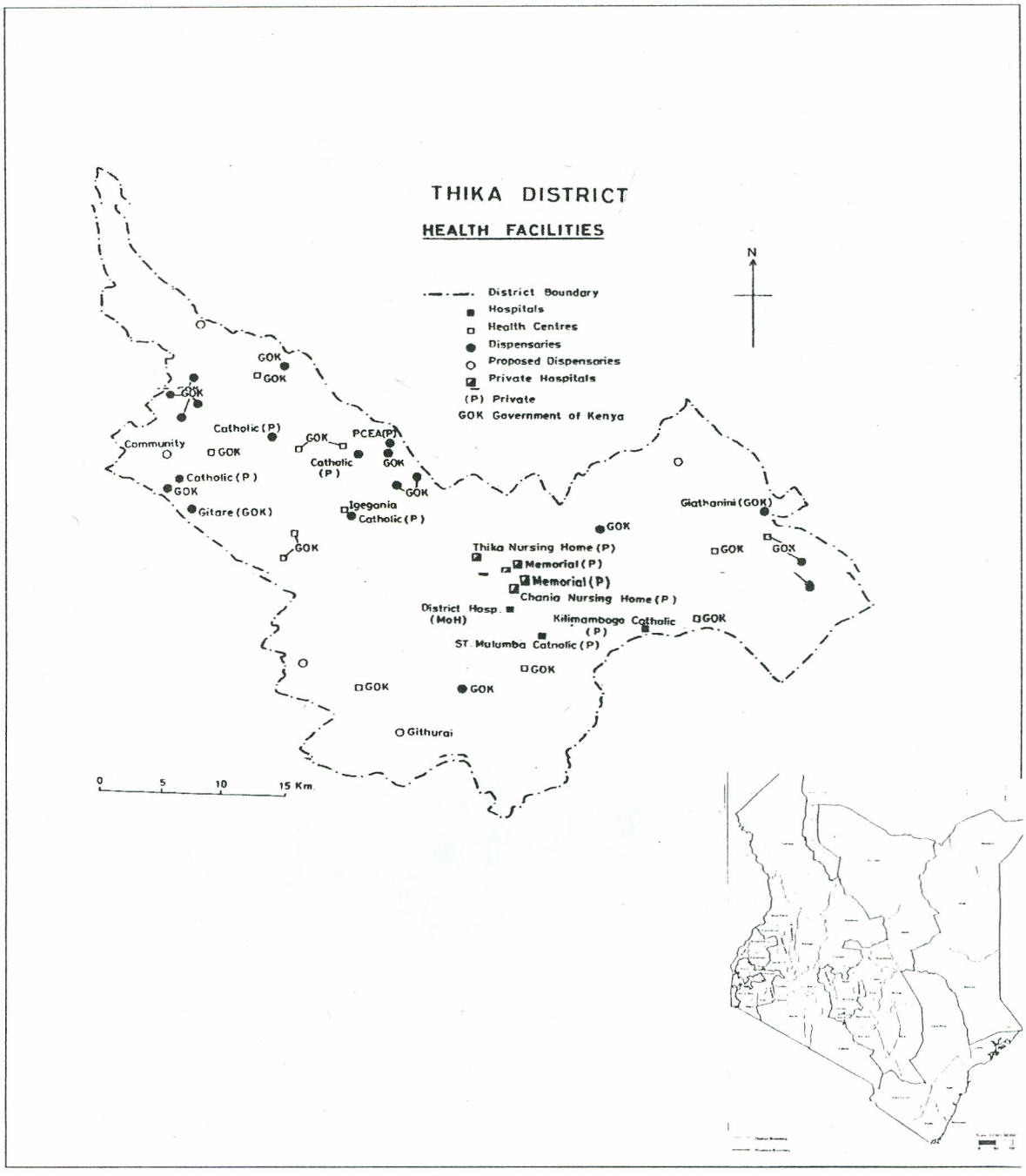


Figure 1: Thika District Health Facilities.

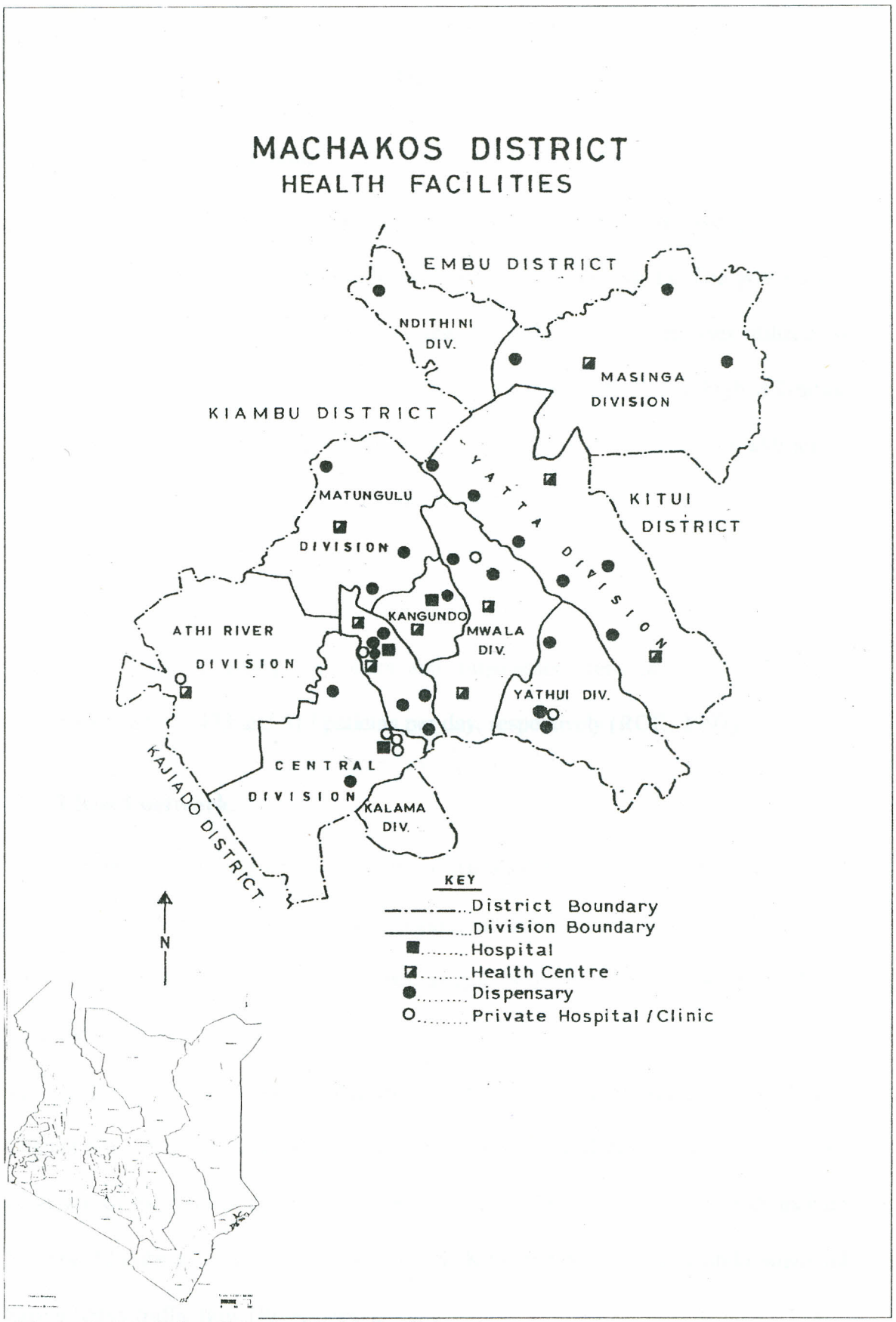


Figure 2: Machakos District Health Facilities.

The district has a high human population growth due to preference for a large family size and the high rate of urbanisation in Machakos town.

2.1.2 The Health care system.

Thika District has a large number of health facilities. There are two government hospitals and one private hospital that are fully operational (fig 1). The government hospitals, namely Thika District Hospital and Gatundu Hospital are over utilized, as they serve about 2,000 patients daily. Thika District Hospital has a high utilization level due to its location off the Thika- Nairobi highway (ROK, 1997). In addition to these there are other nursing homes and health centres in the district.

In Machakos, the health facilities are not evenly distributed through out the district. Of the seven hospitals, five are found in Machakos town, including the district hospital (fig 2). The average in-patient and outpatients attendance at the Machakos General Hospital is 473 and 517 patients per day, respectively (ROK, 1997).

2.1.3 Road network.

Thika District has a total of 1,032.8 km of classified roads that include international trunk roads, primary, secondary, tea, minor and rural access roads (ROK, 1997). Trunk roads passing through the district include Nairobi- Muranga highway. Apart from the trunk roads, the others are in poor conditions.

The classified road network of Machakos District covers a distance of 1,562.9 km. Despite the extensive road network, its distribution in the district is not even and the condition of the road is also not good throughout the year. Some of the roads include Nairobi- Mombasa, Nairobi- Garissa, Nairobi- Kitui and Nairobi- Kangundo which all have a heavy traffic flow (ROK, 1997).

2.2 STUDY POPULATION.

The study population consisted of accident victims both in the in- patient and out patient departments of the two district hospitals.

Drivers in Nairobi were also sampled from the various vehicle terminuses.

2.2.1 Inclusion criteria.

a) Accident victims in the sampled hospitals who were in a position to participate in the study.

b) Drivers of both private and commercial vehicles who were in Nairobi at the specific time of study.

2.2.2 Exclusion criteria.

a) Accident victims in the sampled hospitals who were not in a position to participate in the study.

b) Drivers of both private and commercial vehicles but were not in Nairobi at the specific time of study.

2.2.3 Ethical considerations.

Permission to carry out the research was sought from the ethical committee at the Ministry of Education (Appendix IV), and the MOH, Thika District Hospital (Appendix V) and Machakos District Hospital (Appendix VI).

Participation was voluntary through informed consent and the information obtained was kept in strict confidence and was only used for the purpose of this study.

2.3 STUDY DESIGN.

This was a descriptive cross sectional study whereby only a section of the accident victims and drivers were sampled to participate in the study. Qualitative and quantitative data were collected using structured questionnaires (Appendix I and II). Focus group discussions (Appendix III) were held with the traffic police department. The selected variables to be measured were knowledge, attitude and practices of accident victims and drivers on road traffic accidents. The questionnaire was both interviewer and self-administered.

2.3.1 SAMPLING METHOD.

The study was carried out in two district hospitals; Machakos and Thika. Accident victims who were in a position to participate in the study were interviewed both from the in and out patient departments.

Random numbers were used to come up with 20 vehicle terminuses in Nairobi whereby I liased with the heads of the '*matatu*' termini who introduced me to their drivers. Purposive sampling was done to select the drivers to be interviewed. This sampling method was used because one had to select the drivers who were at the stage waiting for their vehicles to fill since they are constantly on move.

2.3.2 SAMPLE SIZE.

The sample size was arrived at by calculation using the standard formula as used by Fisher *et al.*, (1998) as shown below.

~~1998) as shown here below~~.

$$N = \frac{Z^2 pqD}{d^2}$$

Where, N = Sample size

Z = Standard normal deviate (1.96) which corresponds to 95% confidence interval

p = Proportion of the target population estimated to have particular characteristics

q = 1-p

d = Degree of accuracy = 0.05

D = Design effect = 1

Thus,

$$N = \frac{1.96^2 \times 0.5 \times 0.5 \times 1}{0.05^2}$$

$$= \mathbf{384.}$$

The study population involved two groups of people, namely accident victims and drivers. A ratio of 1:1 was used to come up with a sample size of 200 respondents in each of the two groups.

Having sampled 20 vehicle terminuses, 10 drivers were sampled per terminus.

Records in the two hospitals were reviewed to establish the number of accident victims who had been treated in the past months and probability proportional to size

sampling was used to come up with the number of accident victims to be interviewed per hospital.

In Thika District Hospital, records revealed that 613 accident victims had been treated in the hospital from the month of January to August 2002 while Machakos District Hospital had treated 599 in the same duration.

Therefore, using probability proportional to size sampling method,

599+613=1212

599/1212×200=98.8 ≅ 99

613/1212×200=101.

Therefore 101 and 99 accident victims were to be sampled from Thika and Machakos Hospitals respectively.

This target however, was not realized due to some limitations. Some accident victims were not willing to be interviewed and only 60 from Thika and 55 from Machakos responded. The target for drivers was met, 200 were interviewed and the sample size obtained therefore was 315.

2.4 DATA COLLECTION.

Data was collected through an interactive process between the respondent and investigator. One focus group discussion was held with ten policemen from the traffic department in Nairobi.

Questionnaires to the accident victims and '*matatu*' drivers were interviewer administered while those to private car drivers were self-administered.

The questionnaire for accident victims was pre-tested in Chogoria and Kyeni Mission Hospitals while that of drivers was pre-tested at the Embu Town Stage. Both

questionnaires were restructured after pre-testing because it was realised that all objectives had not being covered.

2.5 DATA ANALYSIS.

Statistical data analysis was done using the SPSS statistical package.

A variety of analytical techniques were used depending on type of data and the variable to be analysed. Analysis of the structured data begun with descriptive statistics of variable and proceeded to analysis of relationship between the variables. Independent and dependent variables were compared. Independent variables such as age, sex, education level, and occupation were marched with dependent variables measuring knowledge, attitude and practices. Differences were compared using chi-square test. Level of significance was fixed at 0.05 ($p= 0.05$). Tables and graphs were used to display the regularities in data.

Qualitative analyses from the focus group discussion (FGD's) that helped to understand some attitude and practice issues of the traffic department were done.

CHAPTER THREE

3.0 RESULTS.

3.1 CHARACTERISTICS OF THE STUDY POPULATION.

The main characteristics of the study population are presented in Tables 2a & b.

3.1.1 Gender and age distribution of the study population.

Out of the 200 drivers sampled, 73.5% were males while 26.5% were females. Forty two point five percent of the drivers population fell in the age group 21-30 years, 33% in the 31-40 years age group and fewer people in other age categories (Tables 2a & b). There was a significant relationship between gender and age of drivers in that out of the 85 in the age group of 21-30 years, majority, 32% were males and the remaining 10.5% were females ($\chi 2=25.443$; df=4).

3.1.2 Education level

Among drivers, 45% had attained post-secondary level; 41% secondary level and the remaining were in other categories (Table 2a & b). There was a significant association between gender and education with majority of male drivers, 53% having attained secondary level and majority of female drivers, 94% being in the post secondary level ($\chi 2=71.398$; df=3).

Thirty three point nine of the accident victims had attained the secondary level education and only 9.6% never attended school. The remaining were in other education level categories (Table 2a & b).

Table 2a: Characteristics of the study population-drivers N=200

	Frequency	Percentage
Sex		
Female	53	26.5
Male	147	73.5
Age		
10-20yrs	3	1.5
21-30yrs	85	42.5
31-40yrs	67	33.5
40-60yrs	42	21.0
Above 60yrs	3	1.5
Education level		
Finished Secondary	82	41.0
Post secondary	90	45.0
Finished Primary	28	14.0
Occupation		
Driver	111	55.5
Others	89	44.5%

Table 2b: Characteristics of the study population-accident victims in Thika and Machakos Hospitals. N=115

	Frequency	Percentage
Sex		
Female	44	38.3
Male	71	61.7
Age		
6-15yrs	12	10.4
16-25yrs	7	6.1
26-45yrs	87	75.7
Above 45yrs	9	7.8
Education		
Never been to school	11	9.6
Finished Primary school	39	33.9
Finished Secondary school	39	33.9
Post secondary	26	22.6
Occupation		
Student	14	12.2
Self employed	23	20.0
Unemployed	48	41.7
Employed	30	26.1

3.1.3 Occupation

Fifty five percent of the drivers interviewed were drivers by profession with 47.5% being public service vehicle drivers and 11% private car drivers (Table 3). Others, who included pharmacists, lawyers, and civil servants, lecturers were 45%. There was a significant relationship between highest education level and respondents occupation with 36% out of 90 who had attained post secondary education being in other occupations and the remaining 9% being drivers ($\chi 2=99.462$; df=6).

Majority, 41.7% of the accident victims were unemployed, 26% were employed and 20% were self-employed. The least however, were students who were only 12.2%.

3.1.4 Category of road user at time of accident versus category of patient.

Fifty seven of the accident victims were passengers, 23.5% pedestrians and only one was a motor cyclist. The remaining fell in other categories of road user (Table 4). Seventy three point nine percent were in-patients and 26.1% out patients. There was no significant relationship between category of road user at time of accident and category of patient ($\chi 2=1.274$; p=0.938; df=5).

Table 3: Category of driver

Category of driver	Frequency	Percentage
Private car driver	22	11.0
PSV driver	95	47.5
Non-PSV driver	19	9.5
Owner driver	64	32.0
Total	200	100

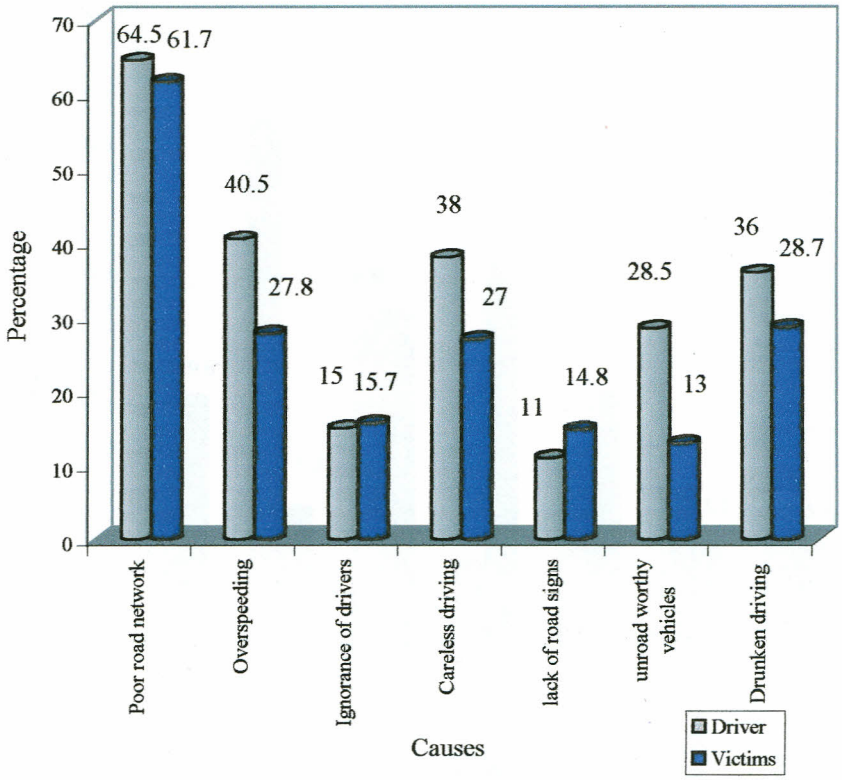
Table 4: Category of road user at time of accident.

Category of road user	Frequency	Percentages
Pedestrian	27	23.5
Passenger	57	49.6
Conductor	7	6.1
Driver	8	7.0
Pedal cyclist	15	13.0
Motor cyclist	1	.9
Total	115	100

3.2 DRIVERS' AND ACCIDENT VICTIMS' VIEWS ON CAUSES OF RTA'S IN KENYA.

Both drivers (64.5%, n=200) and victims (61.7%, n=115) cited poor road network as the highest cause of road accidents in Kenya (Fig. 4a). The second was speeding which was mentioned by 40.5% drivers and 27.8% accident victims. Thirty eight percent of drivers said that careless driving was also a major cause of accidents and 36% noted driving while drunk.

Figure 3a: Drivers and victims views on causes of RTA's in Kenya.

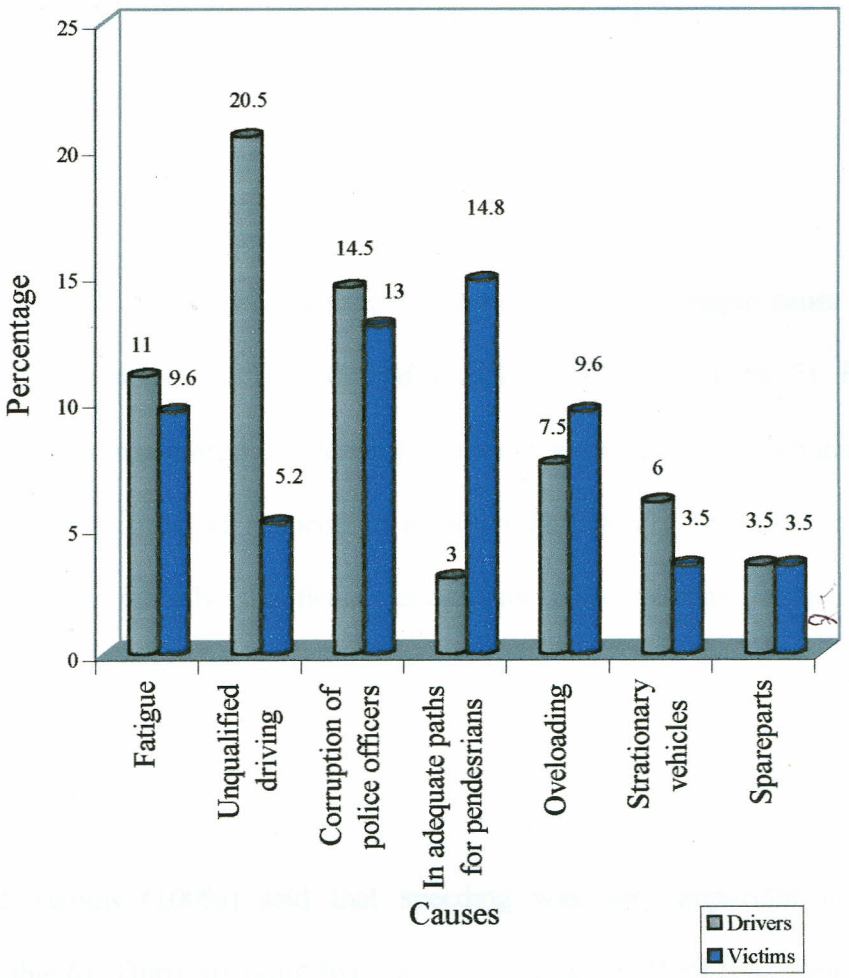


Other factors identified by the respondents were lack of proper road signs and markings (11%*; 14.8%**), unroadworthy vehicles (29.8%*; 5.2%**), fatigued drivers (11%*; 9.6%**), unqualified driving (20.5%*; 5.2%**), police corruption (14.5%*; 13%**) inadequate paths for pedestrians (3%*; 14.8%**), overloading of vehicles (7.5%*; 9.6%**), stationary vehicles packed on roads (6%*; 3.5%**) and substandard vehicle spare parts (3.5%*; 3.5%**) (Figure 4b).

NB. * is the percentage of drivers.

** is the percentage of accident victims.

Figure 3b: Drivers and victims views on causes of RTA's in Kenya.



3.3 RELATIONSHIP BETWEEN PERCEIVED CAUSES OF ACCIDENTS AND PRACTICES OF ACCIDENT VICTIMS AND DRIVERS.

3.3.1 Speeding

Eighty four percent of the drivers said that speeding was a major cause of road accidents while the remaining 16% viewed it as less important (Table 5). Fifty five percent of the drivers admitted to speeding (drove at a speed of 100km/h and above) while the rest 45% drove at a speed of between 10-90km/h. Though speeding by drivers had no statistically significant association with speeding as a cause of accidents, more than half of them admitted to speeding (55% versus 45%; $\chi 2=1.016$; $p=0.313$; $df=1$).

All accident victims (100%) said that speeding was very important in causing accidents (Table 6). Thirty six point five said that they would want the driver to speed if they were getting late for an important meeting.

3.3.2 Overloading.

More than half (58.5%) of the drivers said that overloading was very important in causing accidents and the rest, (41.5%) viewed it as less important (Table 5). Fifty nine point nine admitted to carrying excess passengers and 40.4% did not. There was no significant relationship between overloading as a cause of accidents and the carrying of excess passengers by drivers ($\chi 2=2.960$; $p=0.085$; $df=1$).

Almost all, (87%) of accident victims said overloading was a very important cause of accidents (Table 6) and 69.6% said that they would board a *'matatu'* that was full if they were late to get to some place. There was no significant relationship- between the two ($\chi 2=0.887$; $p=0.346$; $df=1$).

3.3.3 Fatigue by drivers.

Majority of the drivers (69.5%) said that working long hours without rest was a major factor in causing road accidents while 30.5% said otherwise (Table 5). Only 38.1% admitted to over working, as they did not go for offs unless they were feeling unwell. There was no significant relationship between fatigue by drivers as a cause of accidents and working long hours without rest by drivers ($\chi 2=2.980$; $p=0.084$; $df=1$).

3.3.4 Alcohol consumption.

Drunken driving was viewed as a very important cause of accidents by 93.5% of drivers, and only 6.5% saw it as less important (Table 5). Twenty-eight point three said they drove while drunk and 71.7% did not. There was no significant relationship between driving while drunk as a cause of accidents ($\chi 2=0.046$; $p=0.829$; $df=1$).

3.3.5 Unroad-worthy vehicles

Majority (75%) of the drivers said that unserviced vehicles that were poorly maintained were very important in causing accidents and others felt otherwise (Table 5). Of the two hundred drivers interviewed, 52.5% had roadworthy vehicles. The remaining 47.5% either did not service their vehicles at all or did it once in a while. However, statistically there was no significant relationship between RTA's and servicing of vehicles by drivers ($\chi 2=0.809$; $p=0.369$; $df=1$).

3.3.6 Inexperience by drivers.

Inexperienced drivers were termed as those who had only driven for one year or less and they accounted for 27.6% of the total number of drivers while the rest, 72.4% had driven for more than one year. More than half, (60.8%) said that inexperience of a driver was very important in causing road accidents (Table 5). Chi-square test showed that there was no significant relationship between RTA's and inexperience of drivers. ($\chi 2=0.629$; $p=0.428$; $df=1$).

3.3.7 Bribing of police to avoid arrest due to offences.

More than half, (52%) of drivers viewed bribing of police as very important in causing road accidents and 48% saw it as less important (Table 5). Majority (52.5%) however went ahead and bribed police and only 47.5% said they did not. There was no a significant relationship between RTA's and bribing of police ($\chi 2=3.499$; $p=0.061$; $df=1$).

Eighty- eight point seven percent of the accident victims said that bribing of police was very important in causing accidents and only 11.3% saw it as less important (Table 6).

However, 53.9% said that they would want the driver to bribe police so as to avoid delays on the journey.

3.3.8 Inadequate paths for pedestrians

Majority, (87%) of the accident victims said that lack of paths for pedestrians and cyclists was very important as a cause of accidents and only 13% said otherwise (Table 6). However 59.1% said that if there was a path for pedestrian and it was congested, they would walk on the main road provided there was no car in sight. The

remaining 40.9% said they would not walk on the main road. There was no significant relationship between RTA's and inadequate paths for pedestrians as a cause of accidents. ($\chi 2$=0.240; p=0.624; df=1).

3.3.9 Driver distraction

3.3.9.1 Use of cell phones

Fifty eight percent of the drivers viewed the use of a cell phone while driving as very important in causing road accidents (Table 5). Out of the 65% of drivers who had cell phones, 35.4% admitted to using them while driving and 64.6% either switched them off or pulled over to answer a call. There was no significant relationship between RTA's and use of cell phones. ($\chi 2$=1.890; p=0.389; df=2).

3.3.9.2 Disturbance of driver by loud music.

Seventy three percent of accident victims said that disturbance of driver by loud music while driving was very important as a cause of accidents while 27% saw it as less important (Table 6). However, 56.5% said that they boarded cars with loud music and 43.5% did not. There was no significant relationship between the two ($\chi 2$=0.393; p=0.531; df=1).

3.3.9.3 Passengers talking to the driver.

Sixty percent of accident victims said that driver disturbance by passengers was very important as a cause of accidents (Table 6) but 51.3% though said that they conversed with the driver while en route. There was no significant relationship between RTA,s and passengers talking to the driver while en route. ($\chi 2$=0.371; p=0.542; df=1).

3.3.10 Pedestrian not obeying traffic rules.

Half of the accident victims (50.4%) viewed the failure of pedestrians to obey traffic rules as a very important cause of accidents (Table 6) and 62.6% said that if the pedestrian light had not shown they would go right ahead and cross. The remaining 37.4% said they would wait for the light to show. Statistically there was no significant association between RTA's and pedestrians not obeying traffic rules ($\chi 2=1.631$; $p=0.202$; $df=1$).

Table 5: Views on causes of RTA's as perceived by drivers

Causes of RTAS	Very important		Least important	
	Frequency	Percentage	Frequency	Percentage
Pot holes	183	91.5	17	8.5
Narrow roads	154	77	46	23
Livestock	68	34	132	66
Unclear road signs	149	74.5	51	25.5
Over speeding	168	84	32	16
Breaking of traffic rules	148	74.4	51	25.6
Fatigue	139	69.5	61	30.5
Inadequate paths	147	73.5	53	26.5
Stationary vehicles	159	79.5	41	20.5
Alcohol and drugs	187	93.5	13	6.5
Breaking of traffic rules-pedestrians	121	60.5	79	39.5
Overloading	117	58.8	82	41.2
Unroad worthy vehicles	150	75	50	25
Inexperienced drivers	121	60.8	78	39.2
Inadequate road safety education	138	69	62	31
Use of mobile phones	116	58	84	42
Witch craft	17	8.5	183	91.5
Substandard spare parts	89	44.5	111	55.5
Bribing of police	104	52	96	48

Table 6: Views on causes of RTA's as perceived by accident victims

Causes of RTAS	Very important		Least important	
	Frequency	Percentage	Frequency	Percentage
Over speeding	115	100	0	0
Overloading	100	87	15	13
Inadequate paths	100	87	15	13
Breaking of traffic rules-pedestrians	58	50.4	57	49.6
Inadequate road safety education	103	89.6	12	10.4
Witch craft	7	6.1	108	93.9
Disturbance of the driver by loud music	84	73	31	27
Use of mobile phones by driver	101	87.8	14	12.2
Disturbance of the driver by passengers	69	60	46	40
Under age drivers	82	71.3	33	28.7
Elderly drivers	19	16.5	96	83.5
Bribing of police	102	88.7	13	11.3

3.4 WAYS OF CURBING ACCIDENTS AS SUGGESTED BY THE ACCIDENT VICTIMS AND DRIVERS.

Sixty four percent of the drivers as compared to 51.3% of accident victims' felt that proper maintenance and improvement of the road network would help reduce accidents. Widening and creating of dual carriage for busy roads was also cited and an example was the Nairobi-Mombasa, which they said, had cost many lives due to its narrowness.

Majority of the drivers (55%) and 43.5% accident victims cited formulation of government policies. These, they said included strict laws on drunken driving, enforcement of traffic laws, elimination of defective vehicles from the roads, overloading of vehicles and on fake driving documents.

The issue of the seriousness of the Kenya Bureau of Standards on quality check of vehicle spare parts also came up.

At least 21.5% of the drivers and 15.7% of the accident victims felt that drivers also had a big role to play in curbing of accidents. These, they said could be achieved in terms of in-service courses, introduction of professional counselling and stress management in the *'matatu'* industry, total health check up i.e. both mental and physical, for all drivers before acquiring and renewal of licences. Recognizing and rewarding of drivers by various organizations to boost their morale may also reduce RTA's.

Nineteen point five of drivers and 25.2% accident victims also saw education to the general public on road safety as another factor that would lower the rate of accidents. This could be achieved by incorporating road safety in both the primary and secondary school curriculum's and organisation of road safety awareness campaigns.

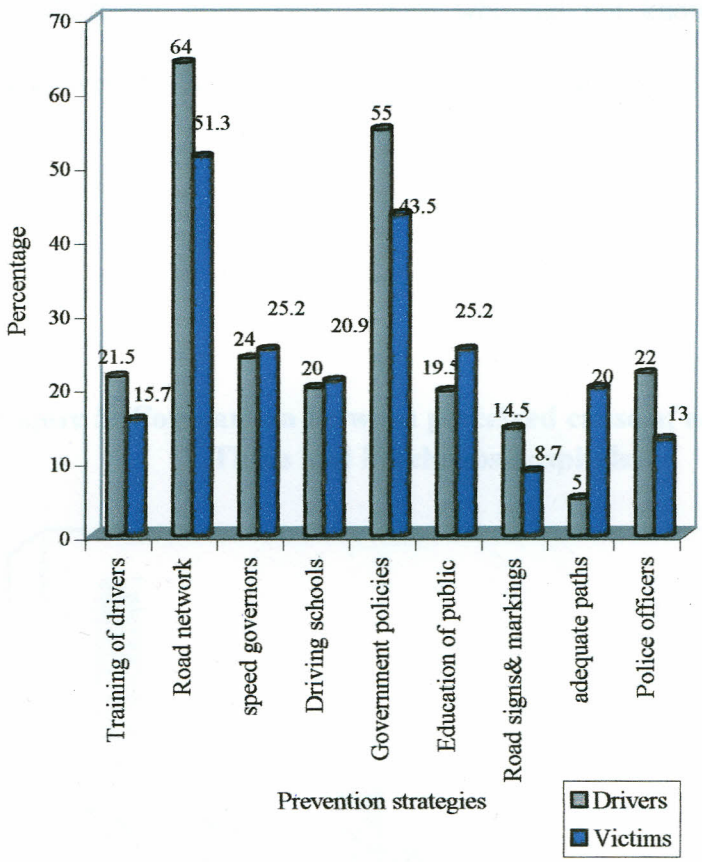
Forty-one (20.5%) of the drivers and 24(20.9%) accident victims felt that there should be a total overhaul of the driving schools and its curriculum. They felt that due to the mushrooming of driving schools in the country without any controlling body, there was a likelihood of having 'half-baked' drivers and therefore unqualified drivers on our roads. They also felt that the driving school curriculum needed to be expanded to include among other things emergency driving, stress management and basic psychology.

Other ways that were suggested are provision of adequate paths for pedestrians and cyclists (5%*; 20%**), proper road signs and markings (14.5%*; 8.7%**), introduction of speed governors in public service vehicles (24%*; 25.2%**) and dealing with corrupt police officers (22%*; 13%**) as they allowed un road worthy vehicles on the roads

(Figure 5). They also felt that the police force should be trained and equipped to detect alcohol levels in drivers and to improve accident reporting to create awareness to the public. NB. * is the percentage of drivers.

** is the percentage of accident victims.

Figure 4: drivers and victims knowledge towards prevention of RTA's.

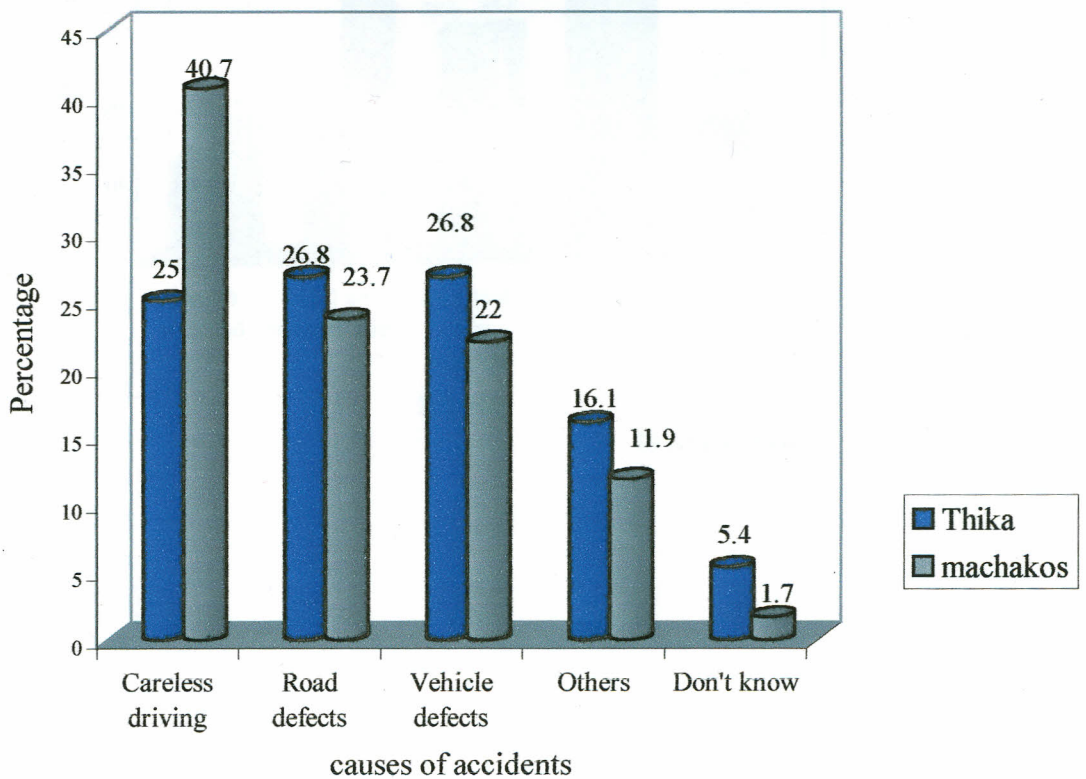


3.5 COMPARISON BETWEEN THE TWO HOSPITALS

3.5.1 Comparison between perceived cause of accident in Thika and Machakos Hospitals.

Majority (40.7%) of the accident victims in Machakos Hospital attributed the road accident to careless driving as compared to the 25% in Thika. Others were road defects, by 26.8% in Thika and 23.7% in Machakos, vehicle defects, 26.8% and 22% in Thika and Machakos respectively. Those who did not know the cause of the accident in Thika were 5.4% and 1.7% in Machakos (Figure 6).

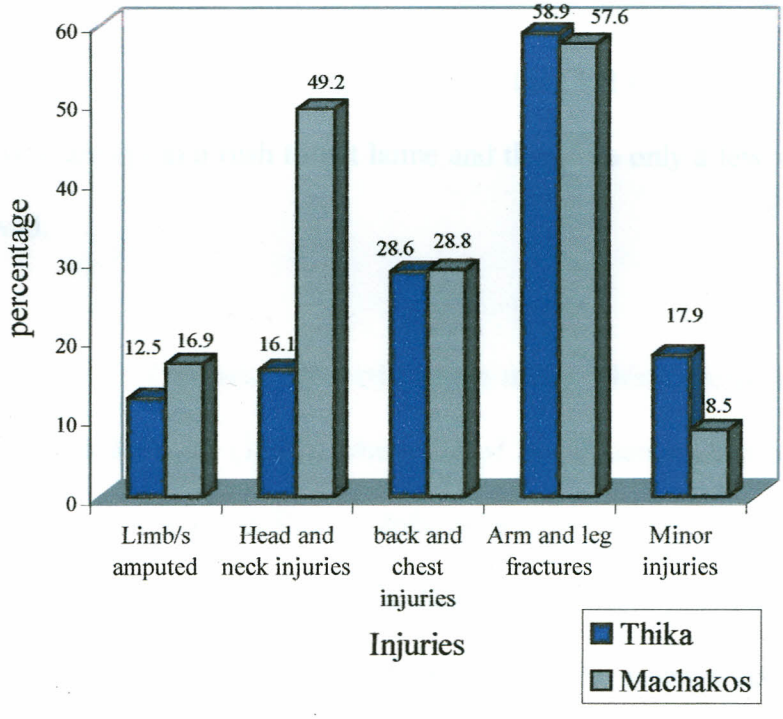
Figure 5: Comparison between perceived cause of accidents in Thika and Machakos hospitals



3.5.2 Comparison between the extents of injuries.

More than half of the accident victims, (58.9%) and (57.8%) in Thika and Machakos Hospitals respectively, had sustained arm and leg fractures. This was followed by 49.2% who in Machakos Hospital suffered head and neck injuries and only 16.1% in Thika. Others included back and chest injuries, 28.6% in Thika and 28.8% in Machakos, and amputed limb(s), 12.5% in Thika and 16.9% in Machakos (Figure 7).

Figure 6: Comparison between extent of injuries in Thika and Machakos hospitals.



CHAPTER FOUR

4.0 DISCUSSION

4.1 CHARACTERISTICS OF THE STUDY POPULATION.

Earlier studies on RTA demonstrated that 90 % of all accidents could be attributed to road user characteristics (Knippling, 1998).

Most of the drivers (73.5%) were males as compared to 26.5% who were females. This can be explained by the fact that being an African society, until recently driving was a male dominated field. It's also often seen that in families that have only one car, the man usually drives the lady to work and picks her later in the evening and hence she rarely drives. On the other hand, since my sampling of private car drivers/ and owner driver had to be done in the evening as they left their work places, the female drivers were always in a rush to get home and therefore only a few were willing to be interviewed.

Sixty two percent of the accident victims were males. This corresponds to a study that was done by MoH, UAE (1995), where out of 247 patients admitted to hospital as a result of injuries sustained in RTA's, 86% were male and 14% were female, a ratio of 6:1. A similar study by World Bank (1999), indicated that majority of accident victims in the US were often young males who were workers and wage earners in their families. The reason behind this then could be explained by the fact that majority of bread winners, and especially in Kenya are males and are therefore at high risk of RTA's than females due to travelling.

Majority, 75.7%, of the accident victims were in the 25-45-age bracket. This concurs with a previous study (WHO, 1999), that 80% of the victims of road traffic crashes

are usually young and less than 45 years. According to Satcher (2000), motor vehicle crashes represent the largest single cause of all injury related deaths worldwide for the young and economically active people. Among adults aged 20-44 years worldwide, traffic crashes were the leading cause of death for males and fifth for females in the European Region (WHO, 1999). This can be explained by the fact that this age bracket is the economic peak period of a person and travelling is done almost on daily basis as one tries to earn a living and therefore their risk of an accident is higher as compared to one who does not travel often.

All drivers had formal education and only 9.6% of the accident victims had never gone to school. This could be due to the developed system of education in the country. This is supported by the 1999 census data, which showed that by 1999 only 18% of the eligible population had never been to school.

Fifty percent of the accident victims were passengers and 24% pedestrians. This concurs with a similar study carried out by Agoki (1988) that indicated that nearly 80% of those killed on Kenyan roads are pedestrians and passengers followed by drivers who account for 14%. In the UAE, a study indicated that majority of the traffic victim crashes were pedestrians (52%) followed by passengers (MoH, UAE, 1995). A conclusion can be drawn that passengers and pedestrians are at higher risks of accidents as compared to other road users. The high rate of pedestrian accidents could be due to a very high traffic mix in the midst of ineffective road user system (inadequate foot paths), transport planning and enforcement.

4.2 DRIVERS' AND ACCIDENT VICTIMS' VIEWS ON CAUSES RTA'S IN KENYA.

The suggestions, to a large extent factors and circumstances that the respondents had highly rated as leading to RTA's in Kenya, should also be seen as reflective of comments on shortfalls in existing road safety strategies and programmes.

Sixty five percent of the drivers and 62% of the accident victims viewed poor road network as the highest cause of accidents in Kenya. In the FGD, they argued that there was a tremendous increase in the number of motor vehicles while on the other hand little was being done to expand and maintain the road network and this gave a ripe situation for RTA's to occur. This therefore means that growth in number of motor vehicles could easily translate to traffic accidents if the necessary management and traffic regulation mechanisms are not put in place.

Gichaga (1989) views road traffic accidents in Kenya as being the function of three basic elements: drivers, vehicles and roads. He further identifies the condition of the road and its environment as significant considerations in understanding the causes and incidences of RTA's. However, he observes that even after an engineer has designed and provided what he believes is an accident free road, road traffic accidents still occur. This points to the fact that it is not only the road that is to be considered in accident causation and prevention but also other underlying factors such as movement patterns, road user system and effectiveness of existing road safety measures.

Another factor that came up was corruption among the police force. Drivers accused the police officers of demanding bribes. Corruption is basically a social and not a road safety problem. However, it becomes a road safety problem when the vice penetrates into the sector among traffic officers, vehicle licensing officers, court officials and vehicle inspectors. This in turn has led to declining standards in the

transport sector and what we have on the roads are poorly maintained, unlicensed and unroadworthy vehicles-accidents waiting to happen.

However, as much as we may lay the blame on the police force, it is necessary to find out why they may choose to be corrupt. One of the reasons that came up in the FGD was the amount of their pay, terms and conditions of work. They claimed that their pay was too little to sustain them and their families while on the other hand; their risks at work were high. Many said that to survive, they had to supplement their poor pay with bribes, which were higher than their salaries. The other issue that also came up in the FGD was lack of equipment and retraining to deal with new and upcoming issues, which greatly lowered their morale. These same sentiments are shared by Assum (1997), who felt that despite the role the police enforcement plays in ensuring safety on the road, their operations are limited by lack of equipments, vehicles and training.

The police officers agreed that corruption was a key factor in accidents but they had to find means and ways of survival.

Unqualified drivers were mentioned by 20.5% of drivers and 5.2% of the accident victims as a cause of accidents. The issue that came up on this was uncontrolled mushrooming of driving schools whose curriculum was not constantly reviewed to suit new and upcoming needs.

In Kenya, despite the effort to improve driver training and testing, compulsory driver training has not been effected. This can be effected by enacting a law that requires all drivers and especially the PSV drivers undergo training in recognized driving schools. Majority of the drivers claimed that they learnt to drive from friends and relatives, who on one hand may not be well equipped on road traffic rules, regulations and some important aspects of driving. There were also complaints and problems with bribery

in driver testing and issuing of licences, including forged licences, leading to the risk of getting unskilled drivers on the roads.

The drivers also identified fatigue as another cause of accidents especially among the commercial drivers. According to NCSDR (1995), fatigue of commercial drivers has been ranked high as a cause of accidents in the U.S. Thirty eight percent of the *'matatu'* drivers interviewed said that they did not go for off duty unless they were sick. Some of the reasons they gave were non-payment of salary during off duty and job insecurity.

Other factors mentioned by the respondents were speeding, overloading, careless driving and driving while drunk. Drivers said that so many expenses were incurred in the *'matatu'* business that the only solution was to overload and over speed so as to make as many trips as possible.

A suggestion that came up was the reduction of taxes on *'matatu's* by the government and job security for the public service vehicle drivers. This was a useful observation given the fact that *'matatu'* operation costs take up most of the money generated on daily basis. Maranga (1989) found out that most (new) '*matatu's* rarely make profits. The income they generate is spent on a number of costs namely: purchase (loan repayment), insurance, road licence, '*matatu'* route associations, fuel, tyres, salary allowance, miscellaneous (including bribes), maintenance costs and depreciation. Due to many costs that have to be met, *'matatu'* operators are compelled to overload, operate at high speed and ignore some traffic regulations in order to meet their financial obligations. In many cases, these actions result in '*matatu*' initiating and/or causing road traffic accidents and conflicts.

Inadequate paths for pedestrians was also seen as a cause of accidents whereby a concentration of road users, pedestrians and cyclists jostle for space with motorists on crowded city roads.

In an ideal situation, the principle of traffic compatibility should be applied to ensure that all means of transport using the road are well catered for in terms of provision of separate lanes, adequate road space and general management of road traffic. In Kenya, this principle has not been implemented to a large extent and this is why there is inadequate supply and development of facilities for pedestrians and cyclists on the road network, both in rural and urban areas. This partly explains the difficult situation facing pedestrians, resulting in high incidences of pedestrian accidents. The lack of institutional, engineering and infrastructure interventions are evaluated as more important explanations. However, lack of driver training, public education and insufficient law enforcement are other reasons behind the tragic statistics of RTA'S.

4.3 RELATIONSHIP BETWEEN PERCEIVED CAUSES OF ACCIDENTS AND PRACTICES OF ACCIDENT VICTIMS AND DRIVERS.

Strict enforcement of speed limits will reduce the number of RTA's. Such measures have been found highly effective in the USA. In 1994, 706 persons were killed in Wisconsin (US) motor vehicle crashes, 39% of who were involved in alcohol, 34% speed and 19% were involved in both alcohol and speed (1994 Wisconsin Traffic Crashes facts). Eighty four percent of drivers agreed that over speeding was an important cause of accidents and 55% of them admitted to over speeding. The high speed at which public service vehicles are driven is partly meant to make more trips, thereby carrying more passengers and augmenting the financial gains. These gains are

deemed necessary because of the fact that '*matatu*' business offers direct and indirect financial benefits to a number of individuals and institutions: drivers, owners, conductors, stage workers, commercial banks, petrol stations, insurance companies, local authorities and corrupt police officers. Some of the '*matatu*' drivers claimed that their pay depended on the amount of money they took home to the vehicle owner.

Overloading of passengers in '*matatu's* is partly due to lack of sufficient passenger vehicles at peak periods and also a desire by the operators to maximise profits (Nantulya and Muli-Musiime, 1997; Shorter and Onyancha, 1997). Despite the difficult working environment, the 'matatu' workers, especially drivers and conductors, are expected to raise a good amount of money to meet the financial obligations associated with the 'matatu'. Majority explained that due to this demand/pressure, overloading and over speeding was the only way to offset the financial obligations.

Seventy percent of the accident victims said they would board a 'matatu' that was already full if they were late to get to some place. In rural areas, where distances travelled are too long and the vehicles are few, overloading is seen as very normal. Due to the over crowding, whenever such vehicles are involved in RTA's the number of victims is high and injuries severe.

Fatigue by drivers was found to be an important factor in causing accidents. Every year, fatigue/falling asleep while driving is responsible for at least 100,000 automobile crashes, 40,000 injuries and 1550 fatalities (Sommers, 1999).

Driver fatigue has long been recognized as a major risk factor for commercial drivers and estimates of the percentage of crashes that are partially/completely attributable to fatigue range from 1 to 56%, depending on the data base examined, the level of detail gathered from crash investigators and the study methodology employed (Connor and Norton, 1998). Fatigue covers a broad range of physical and mental impairments to significant mental tiredness causing stupor. It is considered to be the main cause of driver recognition failure, which includes inattention, preoccupation on /distraction, drowsiness and falling asleep.

Driving requires the simultaneous application of well co-ordinated physical skills, visual recognition, information processing, and decision-making This requires both rapid and appropriate response to stimuli.

Some drivers admitted to falling asleep or the desire to sleep while driving. Scientists say that sleep related fatigue is particularly dangerous because the driver does not compensate (i.e. recognize his/her limits and adjust driving behaviour) not only because of their impairment in physical skills and cognitive processes but most importantly because they fail to recognize the decline in driving abilities (NCSDR, 1995).

The NCSDR identified three main groups of people at highest risk of causing accident due to fatigue: young people (16-19 years) especially males: shift workers whose sleep is disrupted by working at night or working long irregular hours and those with untreated sleep apnea syndrome (SAS). In 1995, NHTSA, study confirmed recognition errors as the primary cause of 45% of crashes (Najm and Mock, 1995) with 35% of these cases being caused by driver drowsiness.

Twenty eight percent of the drivers admitted to driving while drunk. According to (AAA, 1999), among fatally injured motor vehicle drivers in 1999, 28% had BACS at or above 0.10% and 34% were males as compared to 16% females. Alcohol involvement in road accidents is highest among men, 21-40 years and it peaks at night and is higher on weekends than weekdays.

An American study that evaluated the relationship between alcohol intake and fatal crash accidents found that fatal accidents doubled with every 0.02% increase in blood alcohol concentration. Individuals with 0.05-0.09% BAC had nine times increased risk while those with greater than 0.15% BAC had a 300-600 increased risk of fatal crash compared to individuals with 0% BAC (NHTSA, 1995).

Among passenger vehicle drivers fatally injured between 9pm and 6am in 1999, 53% had BACs at or above 0.10% compared with 15% during other hours. Thirty nine percent of fatally injured driver on weekends (6pm Friday to 6am Monday) in 1999 had BACs at or above 0.10% and on other days of the week the proportion was 21%, (NHTSA, 1995). The relationship between alcohol and traffic injuries both in pedestrians and drivers/passengers has been inadequately explored in developing countries (Adams, 1995).

A roadside survey in Nairobi during seven consecutive nights showed that 20% of drivers tested had consumed alcohol, 8.4% had blood alcohol over 50mg% and 4% had over 80mg% (Odero and Zwi, 1997). Excessive speeding and alcohol use significantly increase the frequency of RTA's and severe injuries.

Fifty three percent of the drivers had their vehicles serviced weekly while the remaining either did not service at all or did it irregularly (once in a while). Due to the important role the '*matatu's* and buses play in passenger and goods transportation in

Kenya, it is necessary to improve their safety by ensuring that they are serviced and are in good working conditions. The problem facing developing countries such as Kenya is that safety standards are easily compromised because of the heavy cost that go with safety equipments, spare parts and maintenance (Assum, 1998). This reflects some of the reasons given by the drivers for failure to service their vehicles. Some of the drivers preferred to buy cheaper but poor quality spare parts as compared to more expensive and long lasting ones.

The lack of effective enforcement of vehicle standards in Kenya, partly explains why the country is having vehicles imported that cannot be sold in countries with high vehicle standards. The lack of effective enforcement also underlies the poor roadworthiness of public service vehicles in a country such as Kenya (Assum, 1998).

Drivers, especially '*matatu*' operators complained about unnecessary harassment from traffic police officers as a cover up to demand and induce bribes. Some of the reasons they gave for contending to bribe were: to avoid delays both in court and on the road, fear of intimidation and false accusations, it was a routine and police expected it, and to avoid fining due to mistakes as it would incur more expenses. The '*matatu*' operators argued that the police officers try to look for any offences to induce the operators to offer money. Rather than end at stating or citing cases of corruption among some of the enforcement officers, it is necessary to ask why these officers may choose to be corrupt. Some of the solutions given by the drivers as a way of ending corruption among the police force was to increase their pay and incentives. This concurs with a study carried out by Automobile Association (1990), which indicated that part of the answer to this question lies in the terms and conditions of work of the police personnel which are thought to be unsatisfactory. This points to the

fact that addressing the problem of corruption by the enforcement officers requires that the root cause be tackled first, particularly their terms and conditions of work.

The 1997-2001 Kenya National Development plan has a section on the need to improve the infrastructure for non-motorised transport means that include walking by pedestrians (ROK, 1997). The fact that 87% of the accident victims viewed lack of paths for pedestrians and cyclists as a major cause of accidents on Kenyan roads shows that there is need for urgent attention on the issue.

Due to lack of facilities, pedestrians and cyclists are forced to take risky actions such as running and riding across a road with heavy motor vehicle traffic. Such actions can easily result in an RTA as a pedestrian being caught halfway the road by an on coming vehicle. In developing countries, pedestrian's account for about 40% of deaths from traffic accidents compared with 20% in developed countries (Assum, 1997). A major reason for this is the concentration of different road users jostling for space on crowded city roads.

In America, driver distraction is a leading suspect in about 1 in 4 of the nations 6.3 million motor accidents (AAA, 1999). Research suggests that even with one's hand on the wheel and eyes on the road, the cognitive distraction of simply concentrating on something other than driving can get one in trouble. The average driver does not have the training to process all these information safely while en route. Out of the 65% of drivers who had cell phones, 35% admitted to using them while driving, According to a report by AAA (1999), not only are they studying the risks of using a cell phone in the car, but also other electronic devices like navigation and entertainment systems.

This comes on the heels of a joint study by the AAA and the network of Employers for traffic safety that reported that 25% of 6.3 million crashes each year are caused by drivers distracted by "other" activities. Fifty one percent of accident victims admitted to conversing with the driver while en route. This could also be a big distraction for the driver who has to concentrate on the driving. In general, driver distraction is one of the leading causes of the traffic accident deaths. This has not been explored to a great length in Kenya. Using and talking on a cellular phone requires a large amount of attention and can be a contributing factor to accidents. Studies have reported findings that there are higher incidences of accidents when drivers use a cell phone and other reports have concluded that cell phone usage does not result in higher accident rates (AAA, 1999). Nevertheless, the fact still remains that using a cellular phone is one of many distractions a driver faces. However, concern about driver distraction should not be limited to cellular phones but there are other factors like loud music and passengers conversing with the driver.

4.4 WAYS OF CURBING ACCIDENTS AS SUGGESTED BY ACCIDENT VICTIMS AND DRIVERS.

Majority of the drivers and accident victims were very knowledgeable about prevention of accidents.

Majority 55% of the drivers and 43.5% of the accident victims felt that the government had not taken its responsibility and still had a lot to do. This could be as result of the laxity that has been shown by the government in formulation of policies that will help in reduction of RTA's. Enforcement of existing laws and regulations is not well done and traffic lawbreakers get away with the offences. This was also cited by Muiruri (1997), who felt that though the basic road safety legislation and policy

exists, there are a number of aspects of the legislation that need amendments and even cases where a new bill may have to be enacted.

However it should be emphasized that since there exists a guide in form of legal, policy framework and targets that constitute the basis to organise road safety work, the first challenge is to effectively implement, enforce and improve what already exists.

A criticism was raised by the respondents that though the problem of RTA was appreciated, there was lack of political will, concern and priority by the government. Most felt that the key stakeholders had been left out in decision making. This concurs with Wambugu (1997) who felt that lack of participation of other key stakeholders has been found to prevail in aspects of transport planning and management in Kenya whereby industrialists and entrepreneurs are not directly involved in transport decision-making and implementation.

Humans are social beings. Appreciation, motivation and recognition falls on the Maslow's hierarchy of needs. Fifty five percent of the drivers felt that this need was not fulfilled in their profession, which they noted was also a factor in accidents. The phrase "who cares or appreciates what drivers do" was a common phrase among the '*matatu*' drivers. They felt that no single person appreciated the work they did, especially commuters who sometimes were very rude. This at times made them abusive, alcoholics and drive carelessly.

The other issue was on substandard vehicle spare parts where the highest mentioned were tyres and tubes. They felt that the Kenya Bureau of Standards (KBS) had laxed

and was not keen on checking the quality of vehicle spare parts, which had in turn led to many accidents, and loss of lives.

They felt that there was indeed lack of effective enforcement of vehicle standards in the country and commitment on the part of the government.

Fifteen percent of the accident victims felt that underage drivers and inadequate training of drivers was also a major contributor to accidents in Kenya. This too was a unanimous comment from the FGD with the traffic police department. They felt that the age limit for one to drive a public service vehicle (PSV) should be increased to twenty-eight years. This agrees with a study by NCSDR (1995), where it was noted that young drivers are one of the most vulnerable groups in terms of fatigue crashes; they are seriously over represented in both fatalities and injury accidents.

A similar study indicated that teenage driver accidents continue to be high. From 1995-1999 teenage drivers were involved in 24% of accidents in Kentucky and the leading cause of death for teens in the U.S is traffic crashes, attributed to inexperience (NHTSA, 1995).

Twenty five percent of the drivers felt that education on road safety and improved reporting of accidents to the public would help in reduction of accidents.

Focus on road safety measure should include road safety education. The basic assumption in this intervention is that awareness of the magnitude of the problem of RTA as well as knowledge of traffic rules and regulations will partly contribute towards improvement of the behaviour of road users.

In brief, road safety education in Kenya has the following shortcomings: road traffic education was unplanned, teachers were not instructed in road traffic education, little education material was available, school curricula excluded road traffic education and there was lack of systematic information and propaganda about road traffic issues (National Road Safety Council, Kenya and Ministry of Foreign Affairs, Finland 1999). Though there is road safety education for primary schools, it is noted that this programme has not been expanded to cover secondary schools, colleges and universities. It is necessary that this be done. It should also not be left entirely on the formal school system but involve other persons and institutions such as community youth clubs, religious groups and non-governmental organisations.

There is an urgent need to target the road user groups such as operators of PSV, parastatal vehicle drivers, company executives, government executives, pedestrians, private car motorists and employers to disseminate road safety education. There is even more need to repackage the information on road safety for different user groups and disseminate it using relevant channels.

On accident reporting, it was interesting to note that accident data collected was not stored systematically by any one authority and as a result, retrieval of data for analysis is rather difficult. During the FGD, the respondents felt that they were not properly equipped and trained and that they had so many other duties to perform at the same time.

There is lack of road discipline amongst road users in Kenya (Kipkore and Gichaga, 1980). More than half of the drivers interviewed admitted to indiscipline while driving. These were issues like, using a cell phone, obstruction and driving while drunk.

Accident victims too admitted to doing some things that were likely to cause accidents. Some of these were crossing roads without bothering with traffic lights and talking to driver while en route.

Kipkore and Gichaga (1980), established a high frequency of traffic law violation in selected roads in Nairobi, particularly with respect to causing obstruction, failing to conform to traffic lights requirements, failure to keep proper lanes, failing to stop at a stop sign, failing to give way to pedestrians and failure of pedestrians to observe lights at signal controlled crossings. This however, could be due to lack of proper law enforcement. There is therefore need to amend some legislations and create new bills that spell out penalties to traffic law breakers, both to the drivers and the general public.

Twenty percent accident victims and 5% of the drivers also cited creation of adequate paths for pedestrians and cyclists as a way of reducing accidents.

This therefore, shows that a lot remains to be done if the country hopes to reduce the statistics behind road traffic accidents.

4.5 COMPARISON BETWEEN THE TWO HOSPITALS

There was not so much difference observed between the accident victims interviewed in Thika and those in Machakos Hospitals in terms of injuries.

Leg and arm fractures featured predominantly in the two hospitals. While Thika Hospital had 58.9% accident victims having sustained arm/leg fractures, Machakos had 57.6%. This probably can be explained by the fact that since majority of the persons in Kenya travel by use of public service vehicles, they therefore do not use seat belts. In an event of an accident, the occupants are thrown all over due to the impact and therefore end up sustaining leg and arm fractures.

According to a recent study by Insurance Research Council (AAA) (1999), it was found that accident victims who reported wearing seat belts were much less likely to be seriously injured, disabled or killed in an accident than those not wearing seat belts.

Half of the accident victims in Thika and 49.2% in Machakos Hospitals were passengers at the time of accident. The two hospitals are near highways; i.e. Nairobi-Thika and Nairobi-Mombasa, and most accident victims are usually passengers travelling on the highway who are rushed to the nearest hospitals in the event of an accident.

To lessen the human suffering due to RTA's, in 1999, the World Bank formed the Global road safety partnership (GRSP). This brings together the private sector, government and civilian societies to conduct focused projects and safety campaigns.

Kenya is not an exception and therefore all should join forces to ensure that human suffering through RTA's is a "thing" of the past.

CHAPTER FIVE

5.0 CONCLUSIONS, RECOMMENDATIONS AND AREAS FOR FURTHER RESEARCH.

5.1 CONCLUSIONS.

1. This study has shown that the knowledge towards occurrence and prevention of accidents among accident victims and drivers was high.
2. Even though drivers and accident victims identified some actions as cause of accidents, some still went ahead and practiced them. Therefore, this shows that a large number of the public does not apply their knowledge on road safety.
3. Most of the respondents interviewed identified poor road network and government policies as major causes of accidents in Kenya.
4. Everyone, i.e. the government, private and public sector, drivers and the general public have a big role to play in the reduction of accidents in Kenya.

5.2 RECOMMENDATIONS.

1. Those in authority should establish a well coordinated and funded road safety research program in Kenya to provide the information needed for necessary decision making in road safety measures.
2. The government should seek to reduce the number of taxes attributed to the public service vehicle business to avoid issues like overloading and speeding in an aim of meeting the high expenses.

3. There is need for amendment of existing legislation and policies and enacting of new bills in the transport sector and to ensure that proper implementation and enforcement is carried out. This is by having strict penalties on practices that are perceived to be causes of accidents. Some of these are drunken driving, breaking of traffic rules, carrying of excess passengers and mandatory use of seat belts.
4. Government ministries will benefit from collaborating with each other and other key partners, such as non-governmental organizations, private industry and donor community to enhance knowledge, promote safety and prevent or control RTA's.
5. Identification of unsafe areas on the roads and groups of persons at high risk, so that specific interventions can be implemented and evaluated, and appropriate advocacy efforts undertaken.
6. During data collection, a number of deficiencies were noted in the collection and recording of RTA data by the concerned authorities. Accident data are not collected nor stored systematically by any one authority and therefore retrieval of data for analysis and dissemination is rather difficult. There is therefore an urgent need to collect and integrate the data on RTA's for dissemination to the public to create awareness on the tragic statistics behind RTA's.

5.3 AREAS FOR FURTHER RESEARCH.

1. Effects of RTA on quality of life of survivors and their families which is due to the fact that road traffic accidents have both short and long term consequences. The short and immediate injuries can have long term effects on the quality of life of survivors and their families. Little is documented on this aspect in Kenya.
2. It has been noted in the recent past that terrible air and train accidents have occurred in Kenya and many have lost their lives. Since this study mainly focused on road accidents, a study on air and train accidents would contribute towards providing a full picture of traffic safety in Kenya.
3. Road safety of the elderly and the disabled, since their transport needs have been neglected in transport planning, and yet there is an increasing number of elderly and disabled persons in Kenya who travel on the road.

REFERENCES

Adams, J., (1995). Risk and Freedom: The record of safety regulation. Cardiff: Transport Publishing projects.

Aduwo, G. O., (1990). The problems and prospects of the 'matatu' mode of public transportation in Nairobi, Kenya. A geographical analysis, University of Nairobi; M.A. Thesis.

African Urban quarterly (1992). Urbanisation and planning of the city of Nairobi, Kenya; volume 7 numbers 1 and 2 February and May 1992.

Agoki, G. S., (1988). Characteristics of road traffic accidents in Nairobi: unpublished PhD Thesis. University of Nairobi.

Agoki, G.S., (1991). Technological solutions for road carnage in Kenya. Proceedings of the National seminar on solutions for development in Kenya now and the 21st century, 14-15 March, 1991, Jomo Kenyatta University College of Agriculture and Technology, 180-201.

Assum, T., (1997). Appraisal of road safety initiates in five selected countries in Africa. Paper presented at the joint ECA/ OECD 3rd Africa road safety congress, 14-17 April 1997, Pretoria, S. Africa.

Assum, T., (1998). Road safety in Africa: Appraisal of road safety initiatives in five African countries. Sub-Saharan Africa transport policy programme, the World Bank and economic commission for Africa.

Assum, T., (1999). Mozambique Road Safety Emergency Action plan- final report Oslo, Norway.

Automobile Association, (1990). AA road safety report: An absence of manners, Nairobi.

American Automobile Association, (1999). Official road crashes statistics of America.

Connor, J., and Norton, R., (1998). The role of fatigue in car crashes: A systematic review. Proceedings of road safety conference 1998 Wellington New Zealand, land transport safety authority.

Department of Transport, Britain. (1987). How many of us will die in road accidents? Statistics Bulletin (87) 43, London.

Downing, A.J. and Sayer I.A., (1991). A preliminary study of children's road-crossing knowledge in three developing countries. TRRL Supplementary Report 771.

Fisher, A. A., Laing, E. J., Stoeckel, J. E. and Townsend, J. W., (1998). Handbook for family planning operations research design, second edition (1998) London.

Gichaga, F. J., (1989). The engineer in road building: The Kenya perspective. An inaugural lecture, University of Nairobi, delivered on Thursday, 2nd November, 1989.

Japan Research Centre for transport policy, (1994). The social and economic loses of road accidents-primarily concerning accidents in 1991. Traffic Safety Research Project.

Jones, W. (1996). Road Accidents in New Zealand. IATSS Research Journal of International Association of Traffic and Safety Sciences 20, No. 1: 168-169.

Kipkore, S. K. and Gichaga, F. J., (1980). Violation of traffic laws in selected roads in Nairobi. International Road Federation (IRF), fourth African- Highway Conference, Nairobi, 20-25th January 1980.

Knipling, R. W., (1994). Crashes and fatalities related to driver drowsiness. Research from the office of crash avoidance. Washington, DC national highway traffic safety administration; pp 1-8.

London Research Centre, (1996). London accident analysis unit: Reducing accidents, saving lives; Fact sheet.

Lowe, M.D., (1990). Alternatives to the automobiles: Transport for liveable cities. World Watch Paper 98.

Maranga, P. K., (1989). Road traffic accidents and conflicts on some T-junctions in Nairobi. M. Sc. Thesis, University of Nairobi.

Ministry of Health, United Arab Emirates (1995). Health statistics annual report, 1991-1995; Abu Dhabi Emirate, UAE, 1995.

Mobility Report 2001: Third Ministerial Conference on Environment and Health London 2001 Copenhagen, WHO Regional office for Europe.

Muiruri, W. M., (1997). Towards an integrated national policy on RTA's and safety. The Nairobi law monthly, no. 67 (Feb 1997): 23-29.

Murray, C. J., and Lopez, A.O., (1996). Global Burden of diseases and injury, joint publication of WHO, Harvard school of Public Health and World Bank. (cited by Dhliwayo, M. E. 'A review of the road safety situation in Africa.' A paper presented at the 3rd African Road safety congress 14-17 April 1997, Pretoria, South Africa).

Najm, O. and Mock, C. N., (1995). Epidemiology of transport related injuries in Ghana. Accident analysis and prevention; 31: 359-70.

Nantulya, V.M, and Musiime, F.N., (1997). The road traffic accidents in Kenya: Health equity and policy dilemma, Kchapter.

National Centre for Sleep Disorder Research (1995). Fatigue related automobile crashes, NHTSA/ NCDRS.

National Highway Traffic Safety administration (1995). Drowsy driving and automobile crashes NCSDR/ NHTSA expert panel on driver fatigue and sleepiness.

National Road Administration of Sweden, (2000). The reasons behind the rising tragic statistics.

National Road Safety Council of Kenya, (2000). Manual on urban transportation planning, land use and road safety. Ministry of Foreign Affairs, Finland and Ministry of Local Government and Physical Planning, Kenya.

Nordberg, C.J., (1994). Global Burden of Disease and injury, Joint publication of World Health Organisation, Harvard School of Public Health and World Bank. (cited by M.E. Dhliwayo. " A review of the Road Safety Situation in Africa." A paper presented at the Third African Road Safety Congress 14-17 April 1997, Pretoria, South Africa).

Odero, W.G. and Zwi, A., (1997). Road traffic injuries in developing countries: A comprehensive review of epidemiological studies. Tropical Medicine and International Health Vol 2 No. 5 (May): 445-460.

Official Statistics of Norway, (1998). Road traffic accidents statistics. Norway, Oslo 1998.

Republic of Kenya, (1989). Ministry of Health Development Plan, 1989-1993. Nairobi: Government Printers.

Republic of Kenya, (1989). Road accident costs in Kenya. Nairobi: Ministry of Public Works, National Road Safety Council of Kenya, Road Safety Unit.

Republic of Kenya (1997-2001): Machakos district development plan, 1997-2001: Government printer.

Republic of Kenya (1997-2001): Thika district development plan, 1997-2001: Government printer.

Republic of Kenya (1999): Kenya population and housing census volume one, office of the vice president and Ministry of planning and National development, central bureau of statistics, Nairobi: Government printer.

Republic of Kenya (1999): Kenya population and housing census volume two, office of the vice president and Ministry of planning and National development, central bureau of statistics, Nairobi: Government printer.

Republic of Kenya (1999): National Road Safety Council of Kenya, Ministry of Foreign Affairs, Finland and the Kenya Police Traffic Department, (1999). Traffic Police notes on road safety and traffic law enforcement. NRSC 01-91.

Satcher, D., (2000). Injury: An overlooked global health concern; Volume 284 no. 8, August, 2000.

Shorter, A. and Onyancha E., (1997). Secularism in Africa- a case study: Nairobi city. Nairobi: Pauline's publication Africa.

Sommers, H., (1999). Health costs due to road traffic related air pollution. An impact assessment project of Austria, France and Switzerland. Economic evaluation Rome.

Wambugu, P., (1997). Stake holder analysis of transport planning, management and investment in Kenya. Paper prepared for presentation at the first African transport forum, Cairo, Egypt, 26-27th November.

Wisconsin traffic crashes facts, (1994). Department of transport 1995. Ref: WA 275 W811.

World Bank, (1996). Accident facts in Kenya.

World Bank, (1999). The 'matatu' public sector in Nairobi. London: Intermediate technology consultants Ltd.

World Bank, (2000). Kenya: Urban transport infrastructure project. Staff appraisal Report. Report Number 13848-KE.

World Health Organisation, (1984). Joint HQ/PAHQ workshop on the prevention and care of motor vehicle injuries in the Caribbean: Report on a WHO meeting, Bridgetown, Barbados, 12-15th June 1984.

World Health Organisation, (1993). Handle life with care: Prevent accidents and negligence. World Health Day 7 April 1993, Switzerland: World Health Organisation.

World Health Organisation, (1995). Asia Seminar on road safety: Report, Bangkok, 10-12 March 1995.

World Health Organisation, (1996). Statistics annual, Geneva, 1996.

World Health Organisation, (1999). Charter on Transport, Environment and Health, WHO Regional office, Copenhagen, Europe.

World Health Organisation statistics annual, (2002). WHO: Geneva, 2002.

APPENDIX I

RESEARCH INSTRUMENTS
ACCIDENT VICTIMS QUESTIONNAIRE

The purpose of this study is to investigate the knowledge and practices of accident victims and drivers on road traffic accidents. This can be attained if you are honest with the information you give. The information you give will be confidential and will be used for the purpose of this study only.

DEMOGRAPHIC DATA.

1. Sex: 1.Female ( ) 2.Male ( )
2. Age in years ( )
3. Highest education level:
   a) Never been to school 1. ( )
   b) Still in school: 1.Primary ( ) 2. Secondary ( ) 3.Tertiary ( )
   c) Primary school 1.dropped ( ) 2. Finished ( )
   d) Secondary school 1.dropped ( ) 2.Finished ( )
   e) College 1.dropped ( ) 2. Finished ( )
   f) University 1.dropped ( ) 2.Finished ( )
4. What is your occupation? ----------
5. Category of patient: 1.In patient ( ) 2.Out patient ( )

KNOWLEDGE ASSESSMENT.

6. What category of a road user were you at the time of the accident?

a) ( ) Pedestrian: What were you involved in?

3. { } Vehicle hit from behind by another. 4. { } Vehicle to passenger

e). ( ) Pedal cyclist: What were you involved in?

1. { } Bicycle roll over. 2. { } Hit a pedestrian.

3a). { } Hit by vehicle. 1. [ ] Hit and run. 2. [ ] Stopped to assist.

f) ( ) Motor cyclist: What were you involved in?

1. { } Motor cycle roll over. 2. { } Hit a pedestrian.

3a) { } Hit by vehicle. 1 [ ] Hit and run. 2 [ ] Stopped to assist

7. How many other accidents have you been involved in?

1. ( ) None 2. ( ) Less than five. 3. ( ) More than five.

8. What type of journey was it?(most recent)

1. ( ) Long distance. (Over 160 Km) 2. ( ) Short distance. (Less than 160 Km).

9.Place and name where accident occurred----------

10. What time did the accident occur?

a). During the day 1. morning hours ( ) 2. Late hours ( )

b) During the night 1. early hours ( ) 2. Late hours ( )

11. Were there any fatalitiues? 1. Yes ( ) go to 12 2. No ( )

12. If yes hiow many?.....

13. How often do you use the road?

1. Every day ( ) 2. A few days in a week ( ) 3. A few days in a month ( )

14.How long after the accident did you get help?

1. Immediately ( ) 2. After one hour ( ) 3. After several hours ( )

15. Do you have any knowledge of first aid? 1. Yes ( ) 2. No ( )

16. If you were not badly hurt, did you try to help others who were badly injured?

1. Yes ( ) 2. No ( ) go to 17

17. If no why?.....

18.Did you try to assist yourself after the accident? 1. Yes ( ) 2. No ( ) go to 19

19.If no why?.....

20. Who assisted you after the accident?

1. Other motorists ( ) 2. The community living around the accident scene ( )

3. The police ( ) 4. The driver and occupants of the vehicle that hit you (i.e. if you were a pedestrian) ( )

21.Below is a list of factors believed to be causes of RTA's in Kenya. Look at them carefully and rate each factor according to your own assessment using the levels indicated. Tick only once for each item against the level of importance.

Variable	Your assessment as a course of RTA	
	Very important (2)	**Less important (1)**
a) Over speeding		
b) Overloading		
c) Lack of separate/Adequate paths for cyclists and pedestrian.		
d) Pedestrian not obeying traffic rules		
e) Lack of/inadequate road safety education		
f) Witchcraft		
g) Disturbance of driver by:		
1g) { } Loud music		
2g) { } Use of mobile phone.		
3g) { } Passengers talking to driver.		
h) Age 1h) ( ) Underage driver		
2h) ( ) Elderly driver.		
i) Bribing of police		

22.What was the extent of your injuries?.....

23.If in-patient; a) how long have you been in the hospital? 1.Less than a month ( )

2. One to three months ( ) 3. More than three months ( ).

b) How long do you anticipate to stay? 1. Less than a month ( ).

2. one to three months ( ) 3. More than three months ( ).

24.You are travelling to an important meeting and are needed urgently. Would you;

a. Want the driver to bribe police to avoid delays? 1.( ) Yes 2. No ( )

b. Board an overloaded vehicle? 1.( ) Yes. 2. No ( )

c. Want the driver to overspeed? 1.( ) Yes. 2. No ( )

PRACTICE ASSESSMENT

25.If there was a separate path for pedestrians and it was congested,and there is no car on the main road would you walkj on the main road? 1. Yes ( ) 2.No ( ).

26.If the light for pedestrians to cross has not shown, yet there are no cars passing, would you [redacted] cross? 1. Yes ( ) 2.No ( ).

27. Do you like to board cars with loud music? 1. Yes ( ) 2. No ( ).

28. Do you convass with driver while en route? 1. Yes ( ) 2. No ( ).

ATTITUDE ASSESMENT.

29. According to you is age of the driver a factor in RTA's? 1.Yes ( ) goito 30 2. No ( ).

30.If yes how?.....

31.What do you perceive to have been the cause of the accident? ----------

32.Do you believe that the communities living along major highways should be taught or enlightened on skills of first aid? 1. Yes ( ) 2.No ( )

33. Do you think lack of motivation, appreciation and recognition of drivers could be a factor in RTA's? 1. Yes ( ) 2. No ( ).

34. If yes what do you think can be done to improve this?.....

35. What do you believe can be done to curb the practice of bribing police? .....

.....

36. Are there any tradiditional beliefs in your community that are believed to be factors in RTA's? 1. Yes ( )go to 37 2. No ( ).

37. If yes which ones?.....

38 Has this accident affected your life in any way? 1. Yes ( )go to 39 2. No ( ).

39.If yes which way?.....

40. What do you believe to be the main causes of accidents in this area? (state five)

.....

41.What do you believe could be done to curb the occurrence of RTA's in Kenya? (State five)

APPENDIX II.

DRIVER'S QUESTIONNAIRE

INTRODUCTION Code number..... Stage/route number.....

The purpose of this study is to investigate the knowledge and practices of accident victims and drivers on road traffic accidents. This can be achieved if you are honest with the information you give which will be confidential and used for the purposes of this study only.

DEMOGRAPHIC DATA.

1. Sex: 1. Female ( ) 2. Male ( )
2. Age in years ( )
3. Highest education level
   a) Never been to school 1. ( )
   b) Still in school 1. Secondary ( ) 2. Tertiary ( )
   c) Secondary school 1. Dropped ( ) 2. Finished ( )
   d) College 1. Dropped ( ) 2. Finished ( )
   e) University 1. Dropped ( ) 2. Finished ( )
   f) Primary 1. Dropped ( ) 2. Finished ( )
4. What is your occupation? ----------
5. Category of Driver: 1. Private car driver ( ) 2. Public service vehicle driver ( ).
   3. Non-public service vehicle driver ( ) 4. Owner driver. ( )

KNOWLEDGE ASSESSMENT

6. Have you been involved in a RTA while driving? 1. ( ) Yes / go to 7 2. No ( )
7. If yes how many? 1. Less than five ( ) 2. More than five ( ).
8. What were you involved in? (most current) . 1. ( ) Vehicle roll over
   2. ( ) Vehicle to vehicle 3. ( ) Your vehicle hit from behind by another vehicle.
   4. ( ) Vehicle to passenger, pedal or motor cyclist.
9. Were any fatalities? 1. Yes ( ) go to 10 2. No ( ).
10. If yes how many? .....
11. What was the cause of the accident? ----------

    ----------.
12. What type of journey was it?
    1. ( ) Long distance. (Over 160 Km) 2. ( ) Short distance. (Less than 160 Km)

13. Name and place where accident occurred. ----------

14. What time did the accident occur?

a) During the day 1. Morning hours ( ) 2. Late hours ( )

b) During the night 1. Early hours ( ) 2. late hours ( )

15. How long have you been driving? 1. ( ) Less than one year 2. ( )One to two years

3. ( ) Three to five years. 4. ( ) More than five years.

16. Do you have a driving license? 1. ( ) Yes 2. ( ) No

17. Below is a list of factors believed to be causes of RTA's in Kenya. Look at them carefully and rate them according to your own assessment using the levels indicated. Tick only once for each item against the level of importance.

Variable	Your assessment as a cause of RTA.	
	Very important (2)	**Less important (1)**
a) Potholes		
b)Narrow roads		
c) Livestock on the road		
d) Lack of clear road signs and warnings		
e) Over speeding		
f) Breaking of traffic rules		
g) Long hours without rest		
h)Lack of separate/adequate paths for cyclists & pedestrians		
i) Stationary vehicles on the roads		
j)Driver under influence of alcohol and drugs		
k)Pedestrian not obeying traffic rules		
l)Overloading		
m) Vehicles that are not road worthy.		
n) Inexperienced drivers		
o) Lack of adequate road safety education		
p) Use of mobile phones while driving		
q)Witchcraft		
r) Faulty/substandard vehicle spare parts.		
s) Bribing of police.		

t) Loud Music

PRACTICE ASSESSMENT

18. As a driver, would you stop to assist a pedestrian, pedal or motor cyclist you have hit?

1. ( ) Yes 2. ( ) No (go to19).

19. If no, why? 1. ( ) Afraid of mob justice and stoning 2. ( ) Would alert the police first

3. ( ) Does not want to take up any responsibility 4. ( ) Does not know what to do.

20. Would you report an accident you have caused to the police? 1. ( ) Yes 2. ( ) No /go to 21

21. If no why?.....

22. What is your average speed while driving? 1. ( ) 0-40 Km/h 2. ( ) 45-90 Km/h

3. ( ) 95-120Km/h 4. ( ) Over 120 Km/h

23. Do you consume alcohol? 1. ( ) Yes (go to 24) 2. ( ) No

24. If yes, do you drive while drunk? 1. ( ) Yes 2. ( ) No

25. Do you have a mobile phone? 1. ( ) Yes (go to 26) 2. ( ) No

26. If yes, how often do you use it while driving? 1. ( ) Many times

2. ( ) Switch it off. 3. ( ) Pull over to answer a call.

27. Do you service your vehicle? 1. ( ) Yes (go to 28.) 2. ( ) No

28. If yes, how often? 1. ( ) Weekly 2. ( ) Monthly 3. ( ) Yearly

29. Do you carry excess passengers (overload)? 1. ( ) Yes (go to 30) 2. ( ) No

30. If yes, are there any health risk you believe these passengers are at a risk of?

1. ( ) Yes (go to 31) 2. ( ) No

31. If yes, which ones? (State two)

---

32. Do you have a first aid kit in your car? 1. ( ) Yes (go to 33) 2. ( ) No

33. If yes, do you ever refill it and dispose off any expired drugs? 1. ( ) Yes 2. ( ) No/go to34

34. If no why?.....

35. Have you ever used at any one time? 1. Yes ( ) 2. No ( ).

36. Do you bribe police 1. Yes ( )/go to 37 2. No ( ).

37. If yes why?.....

38. What do you believe can be done to curb this practice.....

.....

39. On what basis are you paid 1. Daily ( ) 2. Weekly ( ) 3. Monthly ( ).

40. How much do you earn in Ksh if paid on;

a). Daily..... b). Weekly..... c). Monthly.....

41.What time do you; a).Start work in the morning 1.4am-7am ( ) 2. 7.30am-9am ( )
3.Before 4am ( )

b) Close work in the evening 1.6pm-8pm ( ) 2.8.30pm-10pm ( )
3.past 10pm ( )

42.How many days do you work per week? 1. 1-3 days. ( ) 2.4-6 days ( ) 3. 7 days ( )

43. Do you go for any offs? 1. Yes ( ) 2. No ( ) go to 44

44. If no why?.....

45. In your career as a driver;

a) Whats the longest time you've driven one particular vehicle? 1.less than one year ( )
2.one to four years ( ). 3 more than four years ( ).

b) Whats the shortest time you've driven one particular vehicle? 1. less than one month ( )
2. one month to one year ( ). 3. More than one year. ( ).

ATTITUDE ASSESMENT.

46. Do you think the public needs to be educated on issues pertaining RTA?
1. ( ) Yes 2. ( ) No

47. Would you advocate for the matatu operators to be enlighted on first aid skills?
1. ( ) Yes. 2. ( ) No.

48. Are there any spare parts you believe could be faulty/substandard and can be factors in RTA's? 1. ( ) Yes/ go to 49. 2. ( ) No.

49. If yes which ones?.....

50. Do you think there is a model(s) of cars that is more vulnerable to RTA's?
1. ( ) Yes. 2. ( ) No.

51. If yes which one(s)?.....

52. Why do you think the model is vulnerable to accidents?.....

53. Would you advocate for a proffessional association of drivers? 1. Yes ( ) 2. No ( ).

54. Do you think grading of drivers according to their conduct by an organisation would help reduce RTA's? 1. Yes ( )/go 55. 2. No ( ).

55. If yes how/why?.....

56. Do you think lack of recognition,motivation and appreciation of drivers could be a factor

in RTA's? 1. Yes ( )/go to 57. 2. No ( ).

57. If yes how can this be improved?.....

58. Are there any traditional beliefs in your community that are believed to be factors in RTA's? 1. Yes ( )/go to59. 2. No ( ).

59. If yes which ones?.....

60. What do you believe to be the main causes of accidents in KENYA?(state five)

.....

.....

.....

61. What do you believe could be done to curb RTA's in Kenya? (State five).

APPENDIX III.

FOCUS GROUP DISCUSSION.

As members of the traffic police department, you interact a lot with drivers and witness/ assist accident victims in the course of your duty.

The information you give will be held in confidence.

1. It has been noted that majority of the police in the traffic department collect bribes from vehicles and especially the PSV, what can you give as the main reason for this.
2. In your opinion are there activities that you engage in, in the course of your duty that could perhaps contribute to occurrence of RTA's in Kenya.
3. As a police force, what measures do you take to try and reduce the occurrence of RTA's in the country?
4. What should be done to curb the practice of bribing police?
5. What do you believe to be the main causes of RTA's in the country?
6. What do you believe can be done to curb RTA's in Kenya.

APPENDIX IV

RESEARCH AUTHORISATION BY MINISTRY OF EDUCATION.

MINISTRY OF EDUCATION, SCIENCE AND TECHNOLOGY

Telegrams: "EDUCATION", Nairobi
Telephone: Nairobi 334411
When replying please quote
Ref. No. MOEST 13/001/32C 157/2
and date

JOGOO HOUSE "B"
HARAMBEE AVENUE
P.O. Box 30040
NAIROBI

13th August, 20..02

Roseline Kaari Ndwigah
Kenyatta University
P.O. BOX 43844
NAIROBI

Dear Madam

RE: RESEARCH AUTHORISATION

Following your application for authority to conduct research on 'A cross Sectional study of Accident Victims and drivers, Knowledge and practices on road traffic Accidents in Nairobi Province and its surrounding, I am pleased to inform you that you have been authorised to conduct research in Nairobi for a period ending 30th August, 2003.

You are advised to report to the Provincial Commissioner and the Provincial Director of Education Nairobi before embarking on your research project.

You are further expected to deposit two copies of your research findings to this Office upon completion of your research project.

Yours faithfully

A. G. KAARIA
FOR: PERMANENT SECRETARY/EDUCATION

CC
The Provincial Commissioner
Nairobi

The Provincial Director of Education
Nairobi

APPENDIX V

RESEARCH AUTHORISATION BY MOH THIKA DISTRICT HOSPITAL.

4/9/2002 Approved Dr. Gathu

ROSELINE KAARI NDUNGAH,
KENYATTA UNIVERCITY,
P. O. BOX 43844,
NAIROBI.
4/09/2002.

TO,
MEDICAL SUPERITENDANT,
THIKA DISTRICT HOSPITAL,
THIKA.

5/9/2002
Approved
Surgeon Covering Hospital
to assist in areas to be
covered
P. O. Box 27. THIKA.

Dear Sir/Madam,

REF: PERMISSION TO CARRY OUT RESEARCH.

I am a Masters of Public Health and Epidemiology student of Kenyatta University seeking Permi to carry out a research in your hospital. My research title is "A cross-sectional study of Accident victims and drivers on RTA in Nairobi and its surroundings.

I hereby seek permission to interview road accident victims both in the in and out patient departments and also review of Casualty records for the past three months to acertain the number of road accident victims treated in the hospital for the period. It is my sincere hope that you will grant my request.

Yours faithfully.

ROSELINE KAARI

APPENDIX VI

RESEARCH AUTHORISATION BY MOH MACHAKOS HOSPITAL.

MINISTRY OF HEALTH

elegrams: "MEDICAL", Machakos
elephone: Machakos 21685
hen replying please quote
ef. No. M.15/
and date

MACHAKOS GENERAL HOSPITAL
P.O. Box 19
MACHAKOS

7th September, , 20 02

All Consultants

Medical Officer of Health

Senior Nursing Officer In-charge,

Records In-charge.

RE: RESEARCH WITHIN THE HOSPITAL

Roseline K. Ndwiga, a MPH student at Kenyatta University has been authorised to carry out research within the hospital. She will be interviewing victims of road traffic accident. She will start on 9th September, 2002 for a period of 3 months.

Please accord her the necessary assistance.

Dr. K. Kilonzo
Ag. Medical Superintendent
MACHAKOS GENERAL HOSPITAL.