

Analysis of Causes & Response Strategies of Road Traffic Accidents in Kenya

Consolata Wangari Ndung'u^{1*} Ratemo Matayo Bonface² Lydia K. Mwai³

¹School of Business, Egerton University.

²School of Business Management and Economics. Dedan Kimathi University of Technology

³School of Business, Maseno University

Abstract: Kenya has recently been experiencing an alarming road carnage involving deaths of many innocent people and this necessitated this study. The data for the study was gathered primarily through secondary sources. These sources included Kenya Road Safety, Police reports, Newspapers, internet, books, World Bank reports and other relevant sources. Practical experience and direct, observation of the roads was also provide some reasonable information. A visit will be made to some commercial motor garages in Nairobi to interact with daily users of the roads. Analysis will be conducted using descriptive statistics that will include mean values, standard deviations and frequencies among others. There are many factors contributing to increase in road traffic accident which include human (corruption,, errors of omission and commission etc), physical including (inferior materials, soil texture) and systemic factors. The conclusion is that the situation is so complex that various strategies or approaches are needed and to tackle it which may include enlighten campaign, change of attitude on the part of officials especially the police and appropriate intervention approach in order to bring the carriage to a halt or reduce it to the barest minimum. Given the importance of road transport in the social, economic and political life of Kenya as a nation, it is hardly surprising that the government has taken several policy measures in order to address the problem of road crashes. These measures have resulted from the realization that a functioning low cost road transport service supported by a good road infrastructure, as well as informed and disciplined road users, is crucial for economic development and poverty alleviation. It is largely because of this that Kenya's Economic Recovery Strategy for Wealth and Employment Creation for 2012-2017 regards transport as the third pillar of the country's economic recovery efforts.

Keywords: Response Strategies, Road accidents

I. Introduction

Road traffic crashes occur on all continents, in every country of the world. Every year they take the lives of more than a million people and incapacitate many millions more. Rapid economic development has resulted in an increase in the transport sector in Kenya. However, the increase in the transport sector has been a problem in road safety by increasing the number of road accidents. Incidences of road accidents are one of the main problems to the nation. Road accidents are one of the major contributors of human deaths in Kenya. Abdul-Kareem (2003) has stated in his book that 1.17 million deaths occur each year worldwide due to road accidents 70% of which occur in developing countries. 65% of deaths involve pedestrians, 35% of which are children.

Road safety involves three major components: the road system, the human factor and the vehicle element. These three elements are inter-linked through geo-referenced traffic events and provide the basis for road safety analyses and attempts to reduce the number of road traffic incidents and improve road safety. Road safety and road incident reduction relates to many other fields of activity including education, driver training, publicity campaigns, police enforcement, road traffic policing, the court system, the National Health Service and Vehicle engineering. Globally deaths and injuries resulting from road traffic crashes are a major and growing public health problem. The Kenyan government appreciates that road traffic injuries are a major public health problem amenable to prevention. Road Traffic accident is an unplanned occurrence of auto crash that may result in injuries, loss of lives and properties (Kual et al., 2005).

Road Traffic accidents are having a worsening effect on our society and economy. Road Traffic accidents claim the largest toll of human life and tend to be the most serious problem all over the world. Every year, according to the statistics, 1.2 million people are known to die in road accidents worldwide. Millions of others sustain injuries, with some suffering permanent disabilities. No country is spared this toll in lives and suffering, which strikes the young particularly. Enormous human potential is being destroyed, with also grave social and economic consequences. Road safety is thus a major public health issue throughout the world (World Bank, 2007a).

According to World Bank, 2007a, Road transport system is the most important mode of transportation

in Kenya and indeed in many developing countries. This is because roads connect Countries, towns, cities and villages. Road transport plays a significant role in the Kenyan economy encompassing 80% of the land transport demand. As a result of steady economic growth over the last decade, traffic on the national highways has grown by 6 to 7.5% per year.

Most inter-regional transport is still dominated by Kenyan transport companies. Public transport services are available in all areas of the country. In Kenya's public transport, the most significant transformation in recent times was the introduction of Government reforms in 2003. Key changes included: fitting of speed governors in all PSV's and commercial vehicles whose weight limit should not exceed the 3,048 kilograms; speed limit of 80 kilometres per hour; fitting of seat belts on all vehicles; employment of drivers and conductors on permanent basis; indication of route details and painting of a yellow band on Matatus for purposes of easy identification; re-testing of drivers after every two years; and approval of all driver's identification by the police and also ban on night travelling (Ministry of Transport and Communication [MOTC], 2004). The measures streamlined the industry but there is a compelling need to ascertain whether the situation is improving or deteriorating.

1.1 The Public Road Transport Industry in Kenya

In Kenya the Public road transport accounts for about 45% of the bulk goods and passenger transport services (Economic Review, 1997). This may be seen to as a result of the convenience this transport mode of service renders to its users. However, this service has its adverse share to the economy of the country, as a result of the high costs of road traffic accidents.

In Kenya, Matatu vehicles dominate the public Road Transport in Kenya The term Matatu is derived from a local Kikuyu vernacular. Over time, the Matatu industry has grown rapidly and by 2003 and Asingo, 2004, notes that the number of Matatus operating in both urban and rural areas was estimated at 40,000 They provide employment to nearly 250,000 persons and generated vast revenue for the Government in the form of charges for licenses, duty, VAT and other taxes. In addition, the industry plays a leading role in transportation of both persons and goods in both rural and urban areas.

In 2003, the newly by then formed Government of the National Alliance Rainbow Coalition took up the road safety challenge. It was focusing on specific measures to curtail the prevalent disregard of traffic regulations and mandating speed limiters in public service vehicles. Along with these measures the Government also launched a six-month Road Safety Campaign and declared war on corruption, which contributes directly and indirectly to the country's unacceptably high levels of road traffic accidents (World Bank, 2007a).

It's Unfortunate, the industry's vast growth has been accompanied by increasing road traffic accidents that have threatened the safety of Kenyan travellers. The causes of accidents include reckless driving, non-roadworthy vehicles and the poor conditions of the roads. The Ministry of Transport and Communications in October 2003 listed Legal Notice No. 161 that sought to regulate the Public Service Vehicle (PSV) sub-sector. The objectives of the Legal Notice 5 were to: reduce accidents caused by over speeding; enhance the safety of commuters; ensure responsibility, accountability and competency of drivers, conductors; eliminate illegal drivers, conductors and criminals that had infiltrated the industry; facilitate identification of vehicles and restrict their operation to authorized routes (MOTC, Transformation of Road Transport Report, 2004).

1.2 Reforms in the Public Transport Sector

Kenya loses nearly 3,000 people a year, who die as a result of road crashes According to report on statistical indicators of Public transport performance in Africa, 2010. Nearly ten times that number of people is injured annually on the roads. It is a heavy cost to them, their families, friends, colleagues and the economy. There are many factors behind road traffic crashes, but human error is the greatest, with over 85% of crashes caused by errors, such as speeding, dangerous overtaking, driving whilst drunk and poor use of the road. The government is committed to reducing the carnage on Kenya's roads.

In late 2003, the Ministry of Transport introduced new regulations to bring discipline to the public transport sector, including regulations on vehicle carrying capacity, seat belt use, speed governors and driver certification. In 2004, there was a remarkable reduction in road traffic crashes, fatalities and injuries, with fatalities falling 20% to 2,264. Since then the road transport sector has experienced many challenges requiring urgent remedy. In order to ensure this does not revert to the pre-2003 situation, the government has been seeking to revamp efforts to improve safety on Kenyan roads in a structured and coordinated manner (Ministry of Transport, 2003).

Together with other key stakeholders in Government, the transport sector and civil society, the Ministry of Transport developed a comprehensive five-year National Road Safety Action Plan and reconstituted the National Road Safety Council as the national body responsible for coordinating road safety efforts. This plan covered many aspects, from improving the road safety of children, to raising vehicle standards and drivers' skills, especially in the public transport sector, to addressing the safety needs of non-motorised transport,

including provision of infrastructure and enhancing national emergency capacity to deal with victims of road crashes. There are very many aspects related to road safety with many actors involved, hence the need for effective coordination (Ministry of Transport, 2003).

The government plays a major role in developing the regulatory and institutional framework for road safety and appropriate infrastructure for road users. The police as law enforcers play a key role but, most of all, it is the people's attitude and behaviour on the road that need to change. There is a need for more public awareness and education to persuade citizens that it is in each individual's interest and in our collective interest to obey the traffic rules in order to reduce the deaths and injuries on Kenya's roads (Ministry of Transport, 2003).

1.3 The Concept of Strategy

Many different organizations will respond differently to the changes in the environment. Strategy concerns itself with what an organization is doing in order to gain a sustainable competitive advantage (Porter, 1980). The principal concern of an organization strategy is identifying the business areas in which an organization should participate in order to maximize its long run profitability. Business strategy is essentially about two questions: what kind of business is the firm in? And, given this choice, how do firms compete? Strategic management is concerned with how firms generate and sustain competitive advantage in order to generate superior profit. In developing strategy, firms undertake three sets of activities: strategic analysis, strategic choice and strategic implementation. Typically, businesses are reported to assess their strategic position by: scanning the environment for potential market opportunities and threats then evaluating their strategic capability and, assessing the enablers and constraints of strategy. Firms differ in how they undertake these activities. In large enterprises, strategic analysis, choice and implementation are often distinct activities, carried out by different people, whereas in small firms, a single person might perform all three, often at the same time (Curran 1996; O'Gorman 2006).

Johnson and Scholes (1999) view strategy as the direction and scope of an organization over the long term, which achieves advantage for the organization through its configuration of resources within a changing environment, to meet the needs of markets and fulfill stakeholders' expectations. Goldsmith (1995) points out that strategy comprises actions employed to meet a firm's long-term objectives. Pearce and Robison (2000) have recommended three critical ingredients for the success of strategy. These are strategy must be consistent with conditions in the competitive environment, it must take advantage of existing and emerging opportunities and minimize the impact of major threats, and strategy must place realistic requirement on the firm's resources.

Strategy, according to Hill and Jones (2001) is an action that a company takes to attain one or more of its goals. More precisely, it is the action that an organization takes to attain superior performance. Strategy is the pattern of organizational moves and managerial approaches used to achieve organizational objectives and to pursue the organization's mission (Thompson and Strickland, 1993). Andrews (1971) in a more elaborative version, recognized strategy as the pattern of major objectives, purposes of goals, stated in such a way as to define what business the company is in or is to be in, and the kind of company it is to be. Johnson and Scholes (1990) view strategic responses as strategic fit and stretch. The basis of this argument is that strategy is the matching of the resources and activities of an organization to the environment in which it operates. Strategic fit is when an organization develops strategy by identifying opportunities in the business environment and adapting resources and competencies so as to take advantage. This calls for the organization to position itself to meet identified market needs-strategic fit. Stretch is the leverage of the resources and competitive advantage and/or yield new opportunities. This is achieved through differentiation based on the competencies suited to or creating market needs.

1.4 The social and economic costs of road traffic injuries

Everyone killed, injured or disabled by a road traffic crash has a network of others, including family and friends, who are deeply affected. Globally, millions of people are coping with the death or disability of family members from road traffic injury. It would be impossible to attach a value to each case of human sacrifice and suffering, add up the values and produce a figure that captures the global social cost of road crashes and injuries. The economic cost of road crashes and injuries is estimated to be 1% of gross national product (GNP) in low-income countries, 1.5% in middle-income countries and 2% in high-income countries. The global cost is estimated to be US\$ 518 billion per year. Low-income and middle-income countries account for US\$ 65 billion, more than they receive in development assistance. Road traffic injuries place a heavy burden, not only on global and national economies but also household finances. Many families are driven deeply into poverty by the loss of breadwinners and the added burden of caring for members disabled by road traffic injuries. By contrast, very little money is invested in preventing road crashes and injuries. (World Bank, 2007a).

1.5 Kenyan situation

Road Traffic accident claims the largest toll of human life and tends to be the most serious problem all over the world (Kual et al., 2005). No day passes in Kenya without one hearing of one major accident or the other and loss of human lives. Kenyan roads have indeed become death traps with their attendant consequences and effects on human lives, merchandise and peoples movement. The situation is so complex that various strategies or approaches are needed and to tackle it hence the desire for this study. Effective transport networks are key components of the investment climate enabling people and goods access to markets and reducing cost of doing business Olaleye (2010). Transport is a major sector of any nation's economy (Hillman, 1992). The significant place it holds reflects the fact that cars are generally seen as the most attractive means of travelling comfortably, quickly, privately and safely. Lorries enable speedy transfer of goods on a door-to-door basis and with the minimum of double handling. Odero, Khayesi and Heda (2003) observe that Kenya, with an average of 7 deaths from the 35 crashes that occur each day, has one of the highest road fatality rates in relation to vehicle ownership in the world. They add:

“Nearly 3,000 people are killed on Kenyan roads annually. This translates approximately 68 deaths per 1,000 registered vehicles, which is 30-40 times greater than in highly motorized countries. Road traffic crashes are the third leading cause of death after malaria and HIV/AIDS and present major public health problem in terms of morbidity, disability and associated health care costs. Despite this huge burden, road safety measures in place are ineffective, characterized by crack downs on motor vehicles following a tragic road crash”.

In Kenya the Traffic Police collect all accident data for the purpose of legal prosecution and insurance claims. The accident data P41 form filled at the Police Stations are collated and forwarded to the Roads Department, Ministry of Roads and Public Works for further processing and analysis. The Roads Department analyses the information in order to determine:

- (i) Number and type of injuries
- (ii) Cause of accident
- (iii) Classification of black spots (determined based on number of fatalities)

Based on the road accident information, the Roads Department prepares work plans for enhancement of road safety at identified black spots and other dangerous locations on public roads. This data however does not fully address hospital based information. According to the Institution of Highways and Transportation (1997), investigations into road crashes should proceed in five phases - identification of problems that are related to road transport crashes; diagnosis of their causes and situation; selection of treatment; design and implementation of remedy measures; and evaluation of the performance of the selected remedy measures. In addition, the Institution identifies four approaches to road accident response: -Single Site Action, which involves investigating specific sites or short lengths of a road, which are considered as accident black spots; Mass Action which involves the application of a particular type of remedy to locations having common accident factors; Route Action, which involves the use of a particular remedy to a length of road having above average accident rates for that particular class of road; and Area Action which is the aggregate of the remedial measures over an area.

1.6 Statement of the Problem

Road traffic accidents have been recognized as one of those adverse elements which contribute to the suffocation of economic growth in the developing countries, due to the high cost related to them, hence causing social and economic concern. One of the major challenges faced today is the improvement of the quality of service in both urban and rural transportation systems in order to make them efficient and safe. Safe roads are key to protecting our investment in the road network, reducing the cost in the network; reducing the cost of doing business in the Kenyan economy; improving the welfare of households and retaining productive personnel in institutions and enterprises. In this regard, accurate and objective road safety data is key. The importance of safety roads and other means of transport have therefore long been recognized. No day passes in Kenya without one hearing of one major accident or the other and loss of human lives. Kenyan roads have indeed become death traps with their attendant consequences and effects on human lives, merchandise and peoples movement. This calls for serious efforts that should be put, in order to incorporate methods of accurate determination of causes of Road Traffic Accident on our roads. The traffic safety problem in Kenya has obviously become more and more important day by day.

Effective transport networks are key components of the investment climate enabling people and goods access to markets and reducing cost of doing business Olaleye (2010). Transport is a major sector of any nation's economy (Hillman, 1992). The significant place it holds reflects the fact that cars are generally seen as the most attractive means of travelling comfortably, quickly, privately and safely. Lorries enable speedy transfer of goods on a door-to-door basis and with the minimum of double handling. Odero, Khayesi and Heda (2003:p.53) observe that Kenya, with an average of 7 deaths from the 35 crashes that occur each day, has one of the highest road fatality rates in relation to vehicle ownership in the world. They add:

“Nearly 3,000 people are killed on Kenyan roads annually. This translates approximately 68 deaths per 1,000 registered vehicles, which is 30-40 times greater than in highly motorized countries. Road traffic crashes are the third leading cause of death after malaria and HIV/AIDS and present major public health problem in terms of morbidity, disability and associated health care costs. Despite this huge burden, road safety measures in place are ineffective, characterized by crack downs on motor vehicles following a tragic road crash”.

Survey of literature in Africa shows that various specialists have carried out research on road safety including those of public health, general surgeons and orthopaedic surgeons (Aswoga, 1982). Though the bulk of research has been carried out by public health personnel most are based on police data (Obara, 2009.). The majority of injuries suffered following road traffic crashes are of orthopaedic concern (Odero, 1995). The traditional role of the orthopaedic surgeon in road safety in Kenya as analysed by Mulimba, 2009, which includes; Rescue from the scene of accident ,resuscitation, teaching, treatment of victims, rehabilitation and occasional research.

All have noted that Road traffic accidents as one of those adverse elements which contribute to the suffocation of economic growth in the developing countries, due to the high cost related to them, hence causing social and economic concern. They have discussed about the various strategies that ought to be adopted to bring change in the reduction of the Road Traffic Accident in Kenya and though some have looked at various ways of reacting to it, it's not exhaustive and hence this paper tries to look deeper in the various causes of accident and the response strategies Kenya can adopt in its endeavour to bring Road Traffic Accident to a halt of bare minimum.

1.7 Research Hypotheses

The research hypotheses of the study are:

H1: There is significant association between Road Traffic Accidents, causes of Accidents and Response Strategies.

1.8 Study Objective

Road transport plays a significant role in the Kenyan economy encompassing 80% of the land transport demand. As a result of steady economic growth over the last decade, traffic on the national highways has grown by 6 to 7.5% per year (The World Bank, 2007a). The situation is so complex that various strategies or approaches are needed to tackle it. It is therefore, recommended that strategies be adopted for appropriate intervention approach in order to bring down the carnage to a halt or reduce it to the barest minimum.

Kenya has recently been experiencing an alarming road carnage involving deaths of many innocent people. The study contributes to the general understanding of Causes, implications and Response strategies for Road Traffic Accident Reduction in Kenya and it will provide a detailed examination on how Kenya responds to alarming road carnage involving deaths of many innocent people. Based on the road accident information, the Roads Department who are the policy makers will be able to prepare work plans for enhancement of road safety at identified black spots and other dangerous locations on public roads also persuade policy-makers and decision- makers of the necessity to address injuries in general as a major issue, and of the importance of adopting improved approaches to road traffic safety. This study attempts to contribute to the body of knowledge on road safety.

Prevention and appropriate management of road traffic injuries must include emphasis on research on road traffic injuries and outcomes, translating effective science-based information into policies and practices that protect pedestrians, cyclists and the occupants of vehicles and finally promoting capacity building in all these areas, particularly in the gathering of information and in research. The recommendations given if considered are going to benefit the public at large on prevention of road accidents. The data can also be utilised as baseline data in future related researches.

This study will try to understand the human factors in influencing road Traffic accident Kenya because researcher wants to give some awareness to the road users, traffic police, and government. This study helps Kenyan road users to be more careful and prepare, either physically or mentally while using the roads. Kenyan roads consumers can provide precautions to avoid themselves from getting involved in road Traffic Accident. Traffic police also can put more focus on these roads and increase their patrolling. It will guide the Government to make a decision either to increase the awareness campaign to the road users. So that, the road users, traffic police, and government can gather to do some improvements to reduce road accidents and to find the best way to overcome the road accidents problem at road in Kenya.

1.9 General Objective.

The general objective is to determine the relationship between Causes, and Response strategies for Road Traffic Accident Reduction in Kenya.

More specifically, the study will be geared to attain the following objectives:

1. To examine the general trends of road accidents in Kenya
2. To evaluate the interrelationships between road accident victim categories in Kenya
3. To examine the specific trends of road accidents according to the different categories of victims
4. To evaluate the response strategies adopted over the past 7 years and estimate the impact it had on road Traffic accidents
5. To test the hypothesis that the mean difference are the same for persons killed, serious and slight injuries for the 16+ years old and that for under 16 years old groups.

Literature Review

2.1 Introduction

In October 2003, Kenya's Minister for Transport and Communications issued Legal Notice No. 161 that sought to regulate the Public Service Vehicle sub-sector. The objectives of the Legal Notice were to: reduce accidents caused by over speeding; enhance safety of commuters; ensure responsibility, accountability and competence of drivers and conductors; eliminate illegal drivers, conductors and criminals that had infiltrated the industry; and facilitate identification of vehicles and restrict their operation to authorized routes (MOTC, Transformation of Road Transport Report, 2004).

Gachuki, (2004) observes that its provisions were not new since the Traffic Act 403 section 42 (1) and (3) of 1975 specified speed limits for PSV vehicles. He observes further that it has always been mandatory for all motor vehicles to fit seat belts for the driver and front passenger seats. Similarly, Act No.10 of 1984 set out rules for drivers and conductors. He concludes that whereas the rules exist, a main weakness has been lack of their enforcement by the government. Secondly, Gachuki noted further that the rules were discriminatory in so far as they targeted only Matatus. He argued that the rules should be applied to all vehicles including private ones. The reason for his argument was that whereas Matatus caused about 19% of the accidents on Kenyan roads, private vehicles caused 25% of the accidents. He emphasized the need for a national road safety policy that applies to all road users without discrimination.

2.2 Causes of Road Traffic Accidents

Ansari et. al., 2000 noted that causes of Road traffic accidents in Saudi Arabia could be divided into: general and specific causes. General causes: 1. A large increase in the number of vehicles and expansion of road networks within and between cities. 2. Large national development projects which require the development of supporting transport systems. 3. Increased number of expatriates from different countries with different habits and culture who are unfamiliar with local driving conditions and requirements.

Specific causes: Most accidents occurred as a result of driver error. 2. Over 50% of the traffic accidents are due to excess speed and violation of signals at intersections 3. Road safety and vehicle condition contribute to accidents, particularly those on open roads. Therefore errors and negligence of drivers contribute significantly to traffic accidents throughout Saudi Arabia. Analysis of the spinal cord injury patients admitted to Riyadh Armed Forces Hospital's Spinal Unit showed 79.2% of the patients having been involved in a road accident compared to 47.7% in the USA and 36% in the UK.

2.2 Theoretical Framework

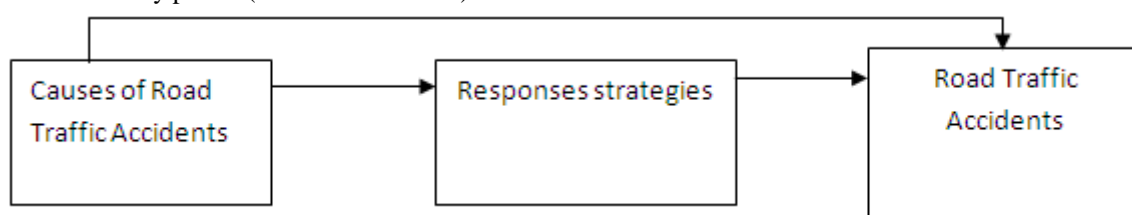
According to Asingo.P.(2007). Transport network should be understood using an integrated systems approach with structural-functional linkages as part of the larger system. The sector is important for economic development, due to its forward and backward linkages with all sectors of the economy. In both urban and rural areas, transport facilitates access to places, economic sectors and related services, including agricultural inputs. At a sub system level, road transport is viewed as a super-structure supported by two functional pillars, namely road infrastructure and road transportation. The two pillars have a common objective of promoting safe and efficient road transport. Each of them is built on some institutional foundation. The pillars should be strong, with adequate structural and functional linkages between them. The efficiency and safety of road transport depends on the strength of its supportive functional pillars, which in turn depend on the strength of their institutional foundations. The strength of each of the institutional foundations also depends on the extent to which they embrace stakeholder involvement and participation in their activities.

The sector is important for economic development, due to its forward and backward linkages with all sectors of the economy. In both urban and rural areas, transport facilitates access to places, economic sectors and related services, including agricultural inputs. At a sub system level, road transport is viewed as a super-structure supported by two functional pillars, namely road infrastructure and road transportation. The two pillars have a common objective of promoting safe and efficient road transport. Each of them is built on some

institutional foundation. The pillars should be strong, with adequate structural and functional linkages between them. The efficiency and safety of road transport depends on the strength of its supportive functional pillars, which in turn depend on the strength of their institutional foundations. The strength of each of the institutional foundations also depends on the extent to which they embrace stakeholder involvement and participation in their activities (Economic Review, 1997).

2.3 A conceptual road safety framework

A conceptual framework or model is an abstraction or simplification of reality to help us better understand real world systems, facilitate communication and integrate knowledge across disciplines (Heemskerk et al. 2003, Ford 2009). According with systems theory, i.e. open systems are viewed as interrelated components that are kept in a state of dynamic equilibrium by feedback loops (Leveson 2004). These goals are best served by models with a limited number of factors, such as the Van Wee (2009) model and three traffic safety pillars (Othman et al. 2009) models.



2.4 Road Traffic Accidents Response Strategies

Christie N, et al., 2010 notes that effective preventive strategies exist and need to be applied through multi-sectoral approaches. Many Road Traffic Accidents are preventable and the following proposed strategies can reduce reduce road deaths and serious injuries by at least 33% by 2020. A wide variety of interventions have been implemented both in the UK and elsewhere to prevent or reduce the occurrence of accidents on the road and the severity of injuries sustained which includes:

Adapting the environment: Environmental changes such as implementing area-wide traffic calming measures (e.g. speed humps, 20mph zones and speed cameras), marked pathways for cyclists, and school crossing patrols are effective in reducing road traffic accidents (RTAs) and associated injuries. Adapting the environment Changes to the road environment to reduce traffic volumes and speeds, separate cyclists from other vehicles and improve safety for pedestrians can have a positive impact on levels of RTAs and injuries. The diverse environmental and social characteristics seen between area types (e.g. urban, suburban and rural areas) mean that different locations often require different solutions. Area-wide traffic calming measures (e.g. speed humps, narrowing roads, 20mph zones or road closures) have been found to reduce traffic speeds and injuries, particularly among children. (Jones SJ et al., 2005) Research exploring the impact of environmental changes tends to focus on urban areas and there are far fewer studies investigating environmental changes in rural locations. However, rural initiatives have included (Christie N, et al., 2010).

- By-passes that divert traffic out of towns and villages;
- Improving rural routes for walkers and cyclists;
- Reviewing and reducing traffic speeds on country lanes;
- Reducing speeds at problematic junctions or locations (e.g. through the use of vehicle activated signs or rough road surfaces);
- Removing road markings (e.g. central white lines) from narrow roads;
- Designating specific country lanes as “quiet roads”, which are adapted to make them more suitable for walking, cycling and horse riding (e.g. reducing vehicle speeds, restricting access and narrowing roads). Other evaluated environmental measures to reduce RTAs include:

The use of red light cameras (these identify vehicles crossing a junction after a traffic light has turned red). There is some evidence that they can reduce right-angled collisions, but rear-end collisions have been found to increase, suggesting they may not be a successful safety measure (Erke A.Red, 2009).

• **Marked pathways for cyclists on roads.** Clearly marked lanes for cyclists on the road can reduce injury rates when compared to unmarked roads

• **The use of school crossing patrols.** In the UK, an evaluation of their use in the late 1980s suggested that they can reduce the number of accidents occurring to child pedestrians at, or near, crossing sites.

Safe routes to school initiatives. These combine different measures to create safer routes to school for children, including: better pavements; traffic calming measures; safe crossings for pedestrians and cyclists; traffic

Safety education and skills training: There is some evidence that injuries from RTAs can be reduced through education and promotional interventions that encourage the use of safety equipment (often including the

provision of discounted or free safety equipment). Less is known about the impacts of: safety education programmes for child pedestrians; driver education programmes; or road safety media campaigns, on injuries. However, these interventions can improve knowledge and safety behaviours.

Promoting the use of safety equipment

The use of safety equipment to prevent injuries from RTAs Safety equipment has an important role to play in preventing RTAs and reducing the likelihood of injury in the event of an accident. It is well known that the use of helmets for motorcyclists (Lui BC et al, 2008), and seatbelts and child car seats (booster seats) for vehicle drivers and passengers, reduce the risks of road traffic injury and fatality (Evans L.,1986). For cyclists, wearing a helmet is generally regarded as beneficial. Data from case-control studies suggests that cycle helmet use can reduce head, brain and severe brain injury by between 63% and 88% (Thompson DC et al, 2006).

A range of educational and promotional methods have been used to encourage the use of safety equipment, often with the provision of free or discounted equipment. These have included: information and lessons targeting parents and/or children; media campaigns highlighting the importance of their use; and health promotion counselling by clinicians. In general, these types of programmes have been successful in increasing the use of safety equipment (e.g. cycle helmet use among children and use of booster seats (Ehiri JE et al.,2006)

Zaza S et al(2001) notes that there is less research exploring impacts on injury. However, some evaluations have reported encouraging findings. For instance: , true case scenarios of Road traffic accidents A review of evidence for prevention injured children, demonstrations of helmet protection and information about how to wear a helmet properly. Helmets were offered to children at a low cost. Compared to a control group, self-reported helmet use significantly increased among those targeted after a five-year period from 11% to 31%. This was accompanied by a decrease in the rate of accident and emergency (A&E) attendances for cycle injuries and head injuries among children .

Safety education programmes for pedestrians

Education programmes have been used to increase an individual's ability to cope with traffic environments and so reduce pedestrian injuries. Education courses are usually targeted at children and can include items such as: how to cross a road; concepts of speed; and traffic knowledge. They have been implemented in a variety of settings (home, school or traffic environments) and have been targeted either directly at children or at children with parents or teachers.

Safety education programmes can increase safety knowledge and skills or behaviours among children (Duperrex O. et al.,2002)

Driver training / education programmes

Driver education programmes aim to increase the safety behaviours of drivers and reduce driver errors. Programmes may be provided one-to-one, within a group, or in the form of written materials (e.g. an information manual). They can be targeted at specialist groups such as those with a higher risk of accidents (e.g. those experiencing high numbers of crashes or offences), older people or novice drivers. They may also be offered to the general driving population in the form of advanced driving lessons The national driver offender retraining scheme.

II. Media education campaigns

In the UK, media education campaigns have been used to increase knowledge, and change attitudes towards, a range of road safety behaviours using television, radio, and printed materials such as newspapers, posters and magazines. Other campaigns have warned of the dangers and implications of drunk driving, drug driving, driving when tired and using a mobile phone while driving (Scottish Executive, 2010). Similar campaigns have been run in Scotland through the Scottish Executive (e.g. drink and drug driving campaigns (Scottish Executive, 2010). Although the impact of campaigns on behaviour and road traffic injuries is difficult to measure, some positive results have been reported

Addressing drink driving: Bar server training programmes can improve server behaviours (e.g. refusing service to intoxicated patrons) and reduce customer intoxication levels when there is strong support from management. There is some evidence that they can also reduce night time RTAs. The Kenya Law (Section 44 and Section 45) requires that a motor vehicle operator blood alcohol content (BAC) to be about 0.34. According to the new regulations, those found drunk while driving risk a fine of up to Sh100, 000 or a jail term of one year or both. At the same time the Mututho Law (Alcoholic Drinks Control Act, 2010) restricts drinking hours from 5 pm to midnight on weekdays and 2 pm to midnight on weekends and public holidays. In the mid-2000s the government gazetted the use of the alco-blow. The Breathalyzer where were last used in and around Nairobi before they were taken off the road in January 2006 after motorists complained that it was a violation of their

constitutional rights. Concern was raised about their proper usage owing to complaints of bribery. There were claims of the alco-blow being a cash cow for the police in roadblocks.

Multi-component interventions: Comprehensive programmes that combine strategies such as education and traffic calming measures can reduce the incidence of child pedestrian injury, particularly when a wide variety of organisations are involved.

Enforcement of legislation: Speed enforcement detection devices can be effective in reducing RTAs and associated injuries. There is some evidence that increased policing for drunk driving, including selective and random sobriety check points, can have a beneficial effect on road traffic fatalities and crashes.

3.1 Philosophy of the Study

This study employed a positivist philosophical orientation. The positivists tend to assume that a single, objective reality exists independent of what individuals perceive; they share the fundamental belief that the material world of tangible objects does not exist unperceived. They place a high priority on identifying casual linkages between and amongst variables. The positivists views involves:- (a) the observation of real world facts or phenomena,(b) the formulation of explanations for such facts or phenomena using inductive processes, (c) the generation of predictions about real world phenomena using the previously formulated explanations and deductive processes.(d) the attempted verification of these predictions through systematic, controlled experimentation or observation.

3.2 Research Design

In view of the philosophical orientation which was adopted for this study, a cross sectional descriptive survey design was adopted. Cross sectional descriptive design aimed, to describe or define a subject, by creating a profile of Road Traffic Accidents through the collection of data and tabulation of the frequencies on research variables or their interaction as indicated by Cooper and Schindler (2003).

3.3 Data Collection

The information and data for the study was gathered through secondary sources. These sources include Kenya Road Safety Police reports, Ministry of Transport Newspapers, internet, books, the Kenya bureau of Statistics World Bank reports and other relevant sources. Statistics for the years 2007-2013 was also reviewed.

3.4 Data Analysis

Data analysis was conducted using descriptive statistics that includes mean values, standard deviations and frequencies among others. According to Mugenda and Mugenda (1999) descriptive statistics enable meaningful description of a distribution of scores or measurements using a few indices or statistics. The data obtained from secondary sources will be analyzed largely qualitatively, and will be presented in a descriptive manner. Statistical data will be used only to the extent that they demonstrate the magnitude of the problem of road crashes.

III. Data Analysis, Interpretations and Discussions

4.1 Introduction

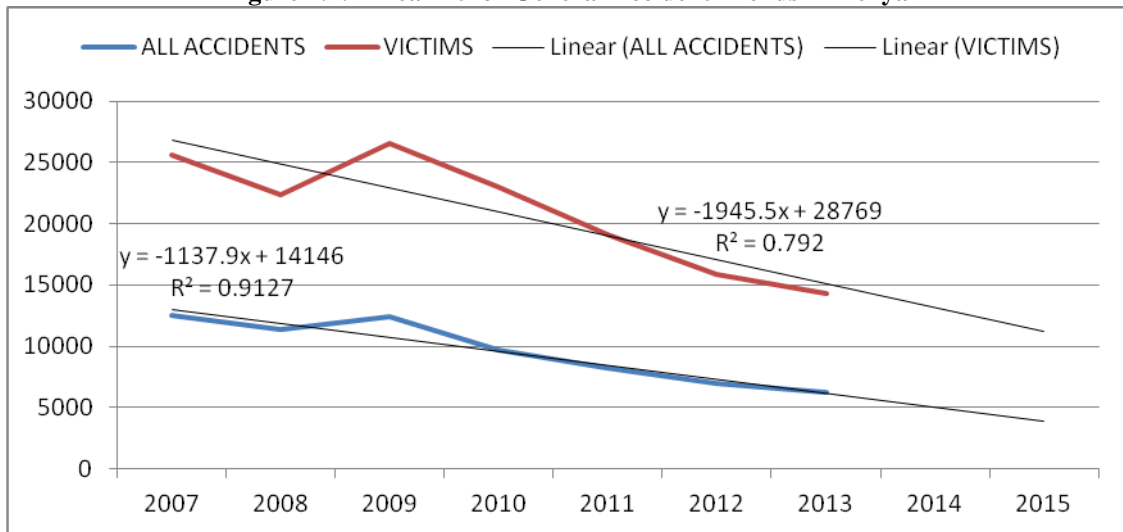
This chapter presents the data analysis results, interpretation and discussion of findings. The data was collected from secondary sources and covers a period of 7 years from 2007 to 2013,with the following being the main statistical tools: regression analysis, correlation analysis and use of charts to present the data.

4.2 General Trends of Accidents in Kenya

4.2.1 Trends of annual total number of accidents and number of victims

The study sought to find out the general trends of accident occurrences in Kenya over the years. Annualized data for the total number of accidents and total number of victims was plotted on a chart and a trend line was fitted to both data sets. The resulting chart was as shown below.

Figure 4.1: Linear fit for General Accident Trends in Kenya



From the figure above, it is quite clear that the number of accidents has generally been falling since 2007. However it can also be observed that there was a major deviation in the downward trend in year 2009 where accident levels peaked at over 12000 for that year.

The following equations represent the trend lines fitted:

For total number of accidents we had $y = -1945.5x + 28769$ with an $R^2 = 0.792$

For total number of victims we had $y = -1137.9x + 14146$ with an $R^2 = 0.9127$

Both trend lines had a goodness of fit (R^2) over 0.7 which is considered the threshold for a good fit. This indicates that the fitted line had a strong fit with the data. Both trends were on the downward side as represented by the negative gradient of the trend linear fit.

Monthly type of Accidents Reported

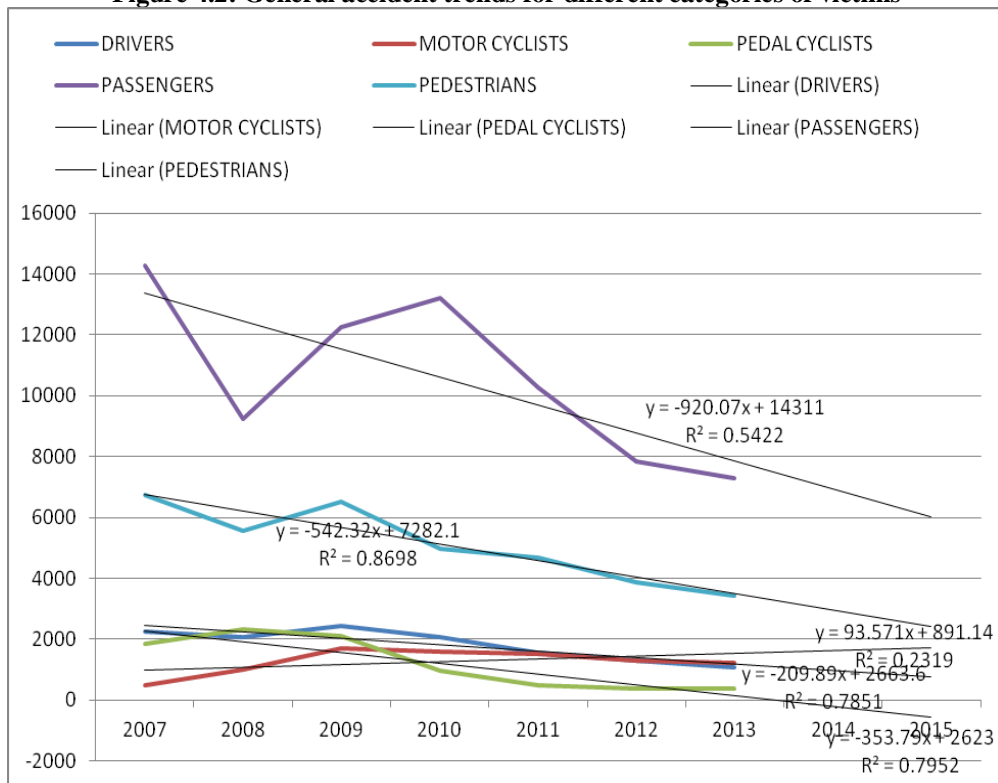
ANOVA Table below tests difference among groups of accident groups (accident, victims, drivers, motor cyclist, pedal cyclist etc) by different outcomes. The average amount of variation between groups is greater than that within groups in all the outcome variables. The $p < .05$ in all the four outcomes means that there were significant differences between the average number of accident groups and outcomes.

		Sum of Squares	df	Mean Square	F	Sig.
Fatal accidents	Between Groups	818259.156	7	116894.165	403.802	.000
	Within Groups	25474.583	88	289.484		
	Total	843733.740	95			
Serious injury accidents	Between Groups	2424897.167	7	346413.881	172.108	.000
	Within Groups	177123.333	88	2012.765		
	Total	2602020.500	95			
Slight inj.acc	Between Groups	2063797.656	7	294828.237	243.411	.000
	Within Groups	106588.750	88	1211.236		
	Total	2170386.406	95			
Total no acdcts	Between Groups	13413582.990	7	1916226.141	384.620	.000
	Within Groups	438427.417	88	4982.130		
	Total	13852010.406	95			

4.2.2 General trends of different categories of victims

The study also sought to determine the general trends for the different categories of victims of road accidents in Kenya. The victims were grouped as follows: drivers, motor cyclists, pedal cyclists, passengers and pedestrians. The chart below shows the data on a line graph with trend lines fitted to each and the corresponding equation.

Figure 4.2: General accident trends for different categories of victims



From the table above, except for motor cyclists, all other categories of accident victims have a downward trend. The following equations represent the trend lines fitted as also indicated in the chart above.

Table 4.1: Equations of trend lines for the various categories of victims

	Trend line equation	R-Square
DRIVERS	$y = -209.89x + 2663.6$	$R^2 = 0.7851$
MOTOR CYCLISTS	$y = 93.571x + 891.14$	$R^2 = 0.2319$
PEDAL CYCLISTS	$y = -353.79x + 2623$	$R^2 = 0.7952$
PASSENGERS	$y = -920.07x + 14311$	$R^2 = 0.5422$
PEDESTRIANS	$y = -542.32x + 7282.1$	$R^2 = 0.8698$

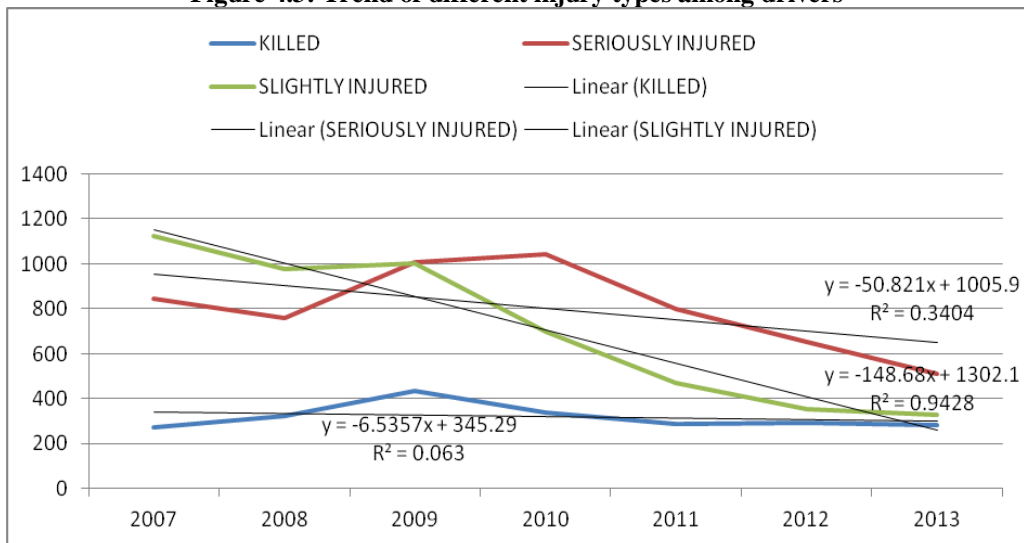
From the table above, the trend lines for drivers ($R^2 = 0.7851$), pedal cyclists ($R^2 = 0.7952$) and pedestrians ($R^2 = 0.8698$) had a very good fit while that of passengers ($R^2 = 0.5422$) had a moderately strong fit and that of motor cyclists ($R^2 = 0.2319$) had a very weak fit.

4.3 Specific trends by category of victim

4.3.1 Drivers

The study sought to establish the specific trends according to nature of injury for drivers. The chart below shows the results.

Figure 4.3: Trend of different injury types among drivers

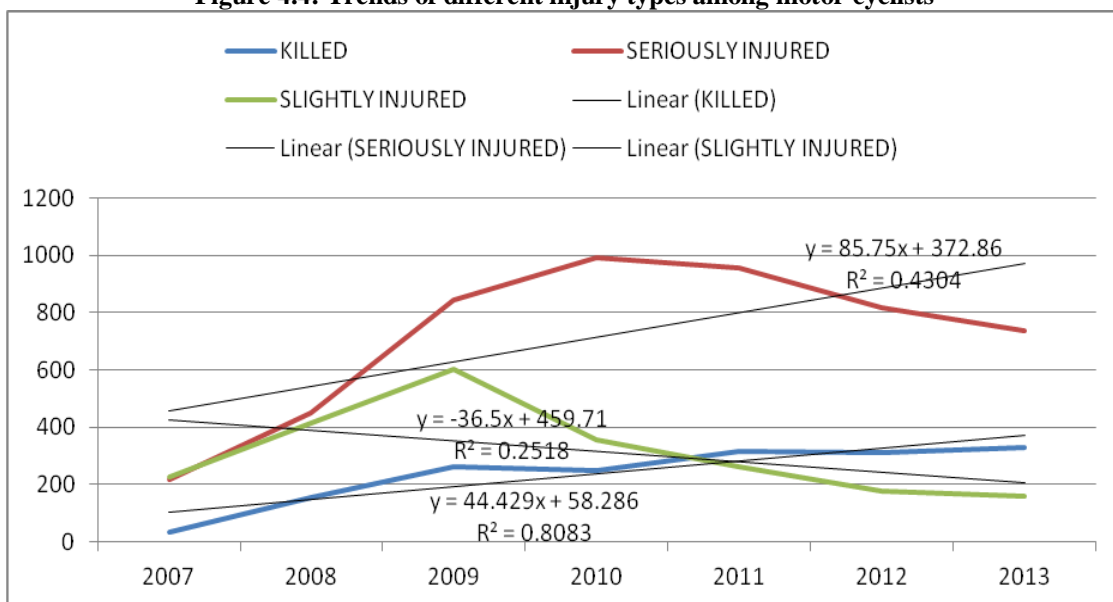


From the chart above, seriously injured generally represents the majority of driver victims followed by slightly injured and those killed. Overall the trend for slightly injured, seriously injured and those killed was downward as shown by the negative gradients of the trend lines. The number of drivers killed has however remained fairly constant over the years as shown by the near zero gradient of -6.5.

4.3.2 Motor Cyclists

The study sought to establish the specific trends according to nature of injury for motor cyclists. The chart below shows the results.

Figure 4.4: Trends of different injury types among motor cyclists

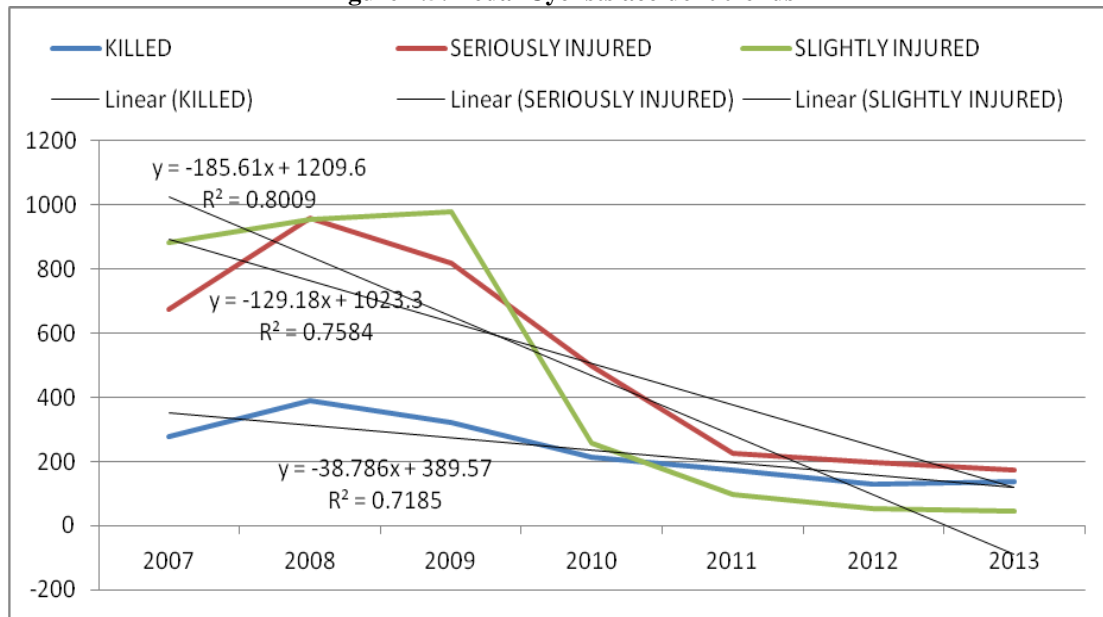


From the chart above, seriously injured generally represents the majority of motor cyclist victims followed by slightly injured and those killed. Overall the trend for seriously injured and those killed was upward as shown by the positive gradients of the trend lines. On the other hand, those slightly injured demonstrated a general downward trend.

4.3.3 Pedal Cyclists

The study sought to establish the specific trends according to nature of injury for pedal cyclists. The chart below shows the results.

Figure 4.5: Pedal Cyclists accident trends

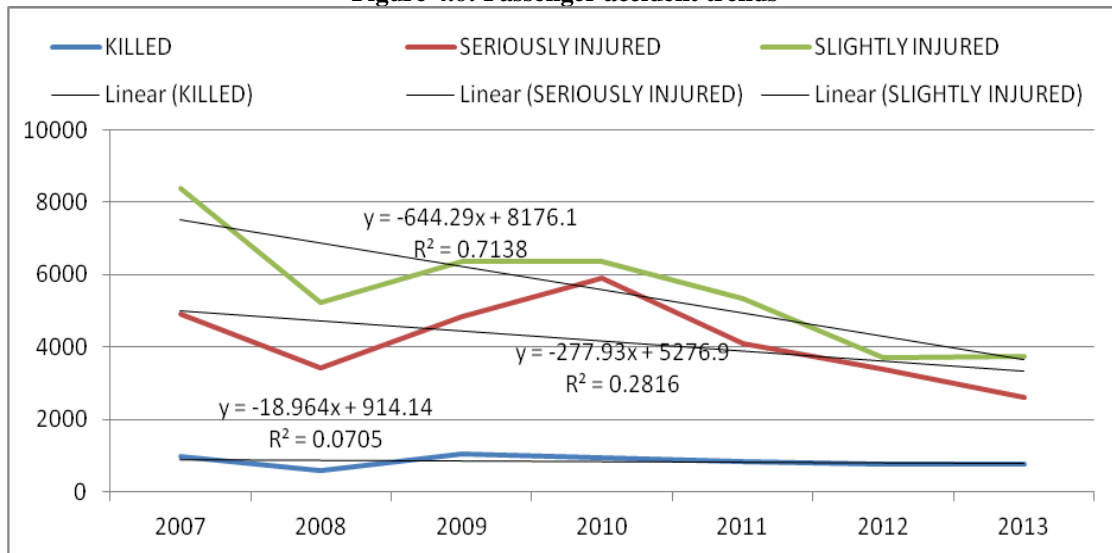


From the chart above, majority of pedal cyclist victims has kept altering between slightly injured, seriously injured and those killed. However, for the last 4 years in the study period, there has been a consistency with those seriously injured being the majority followed by those killed and finally those slightly injured. Overall the trend for slightly injured, seriously injured and those killed was downward as shown by the negative gradients of the trend lines.

4.3.4 Passengers

The study sought to establish the specific trends according to nature of injury for passengers. The chart below shows the results.

Figure 4.6: Passenger accident trends

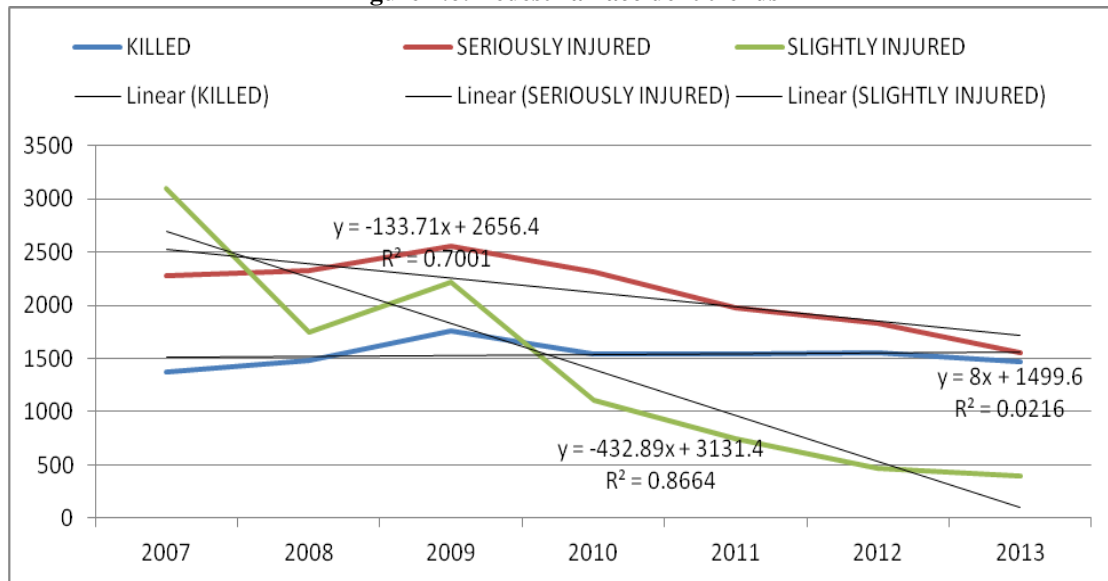


From the chart above, slightly injured generally represents the majority of passenger victims followed by seriously injured and finally those killed. Overall the trend for slightly injured, seriously injured and those killed was downward as shown by the negative gradients of the trend lines. The number of passengers killed has however remained fairly constant over the years as shown by the near zero gradient of -18.9.

4.3.5 Pedestrians

The study sought to establish the specific trends according to nature of injury for pedestrians. The chart below shows the results.

Figure 4.6: Pedestrian accident trends



From the chart above, for the past four years in the study, seriously injured generally represents the majority of pedestrian victims followed by those killed and finally those slightly injured. Overall the trend for slightly injured and seriously injured was downward as shown by the negative gradients of the trend lines. The trend for those killed has shown a small upward trend though the gradient is small indicating near constant figures of those killed over the 7 year period.

4.4 Relationship between different categories of victims and total number of accidents

The study sought to establish the interrelationships between the various categories of accident victims. Correlation analysis was used to test these interrelationships and the results were as shown in the table below.

Table 4.2: Interrelationships between various groups of accident victims

		Drivers	Motor cyclists	Pedal cyclists	Passengers
DRIVERS	Pearson Correlation	1			
	Sig. (2-tailed)				
	N	7			
MOTOR CYCLISTS	Pearson Correlation	-.066	1		
	Sig. (2-tailed)	.888			
	N	7	7		
PEDAL CYCLISTS	Pearson Correlation	.865	-.289	1	
	Sig. (2-tailed)	.012	.529		
	N	7	7	7	
PASSENGERS	Pearson Correlation	.832	-.146	.505	1
	Sig. (2-tailed)	.020	.755	.248	
	N	7	7	7	7
PEDESTRIANS	Pearson Correlation	.943	-.289	.870	.811
	Sig. (2-tailed)	.001	.530	.011	.027
	N	7	7	7	7

From the table above statistically significant correlations were found between drivers and passengers (r = .832, p = .020), drivers and pedestrians (r = .943, p = .001), drivers and pedal cyclists (r = .865, p = .012), pedestrians and pedal cyclists (r = .870, p = .011) and pedestrians and passengers (r = .811, p = .027).

4.4 Correlation between the various types of injuries

The study sought to establish the interrelationships between the various categories of injuries. Correlation analysis was used to test these interrelationships and the results were as shown in the table below.

Table 4.3: Interrelationship of various types of accident injuries

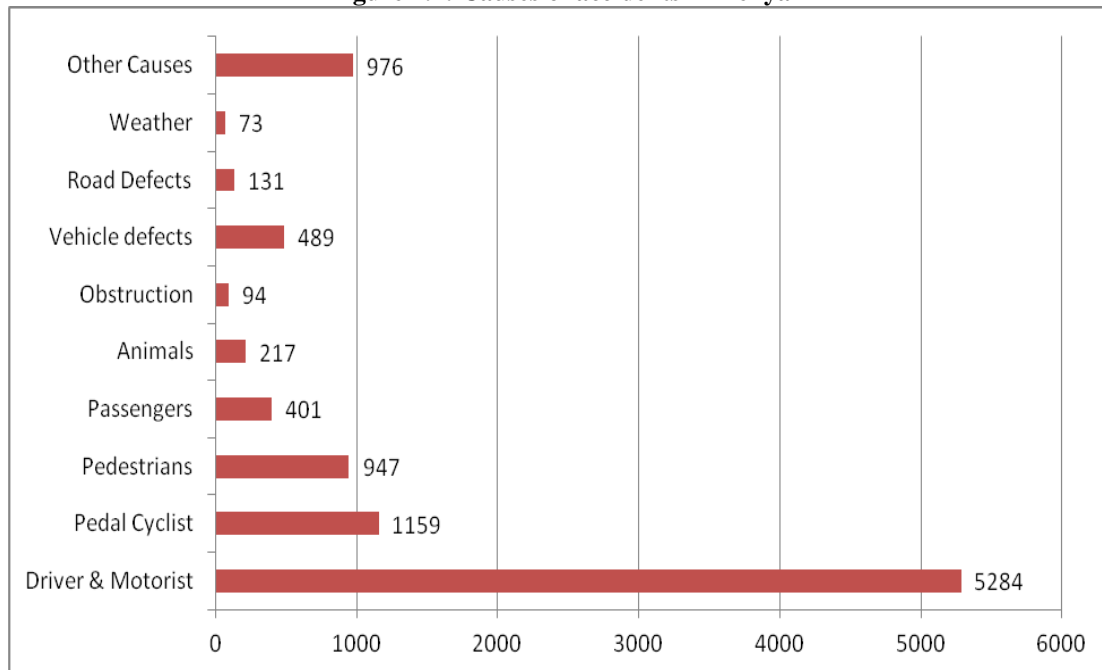
		PERSONS KILLED	SERIOUSLY INJURED	SLIGHTLY INJURED
PERSONS KILLED	Pearson Correlation Sig. (2-tailed) N	1 42		
SERIOUSLY INJURED	Pearson Correlation Sig. (2-tailed) N	.908 .000 42		
SLIGHTLY INJURED	Pearson Correlation Sig. (2-tailed) N	.772 .000 42	.936 .000 42	1 42

From the table above, the highest correlation was observed between seriously injured and slightly injured ($r = .936, p = .000$) followed by seriously injured and persons killed ($r = .908, p = .000$) and finally slightly injured and persons killed ($r = .772, p = .000$). All the correlations were found to be statistically significant ($p < .05$). The implication of these results is that the various categories of accident injuries have near equal likelihood of occurring at any given time.

4.5 Causes of accidents in Kenya

The study sought to examine the various causes of accidents in Kenya. The causes of accidents for the year 2013 were as displayed in the chart below.

Figure 4.7: Causes of accidents in Kenya

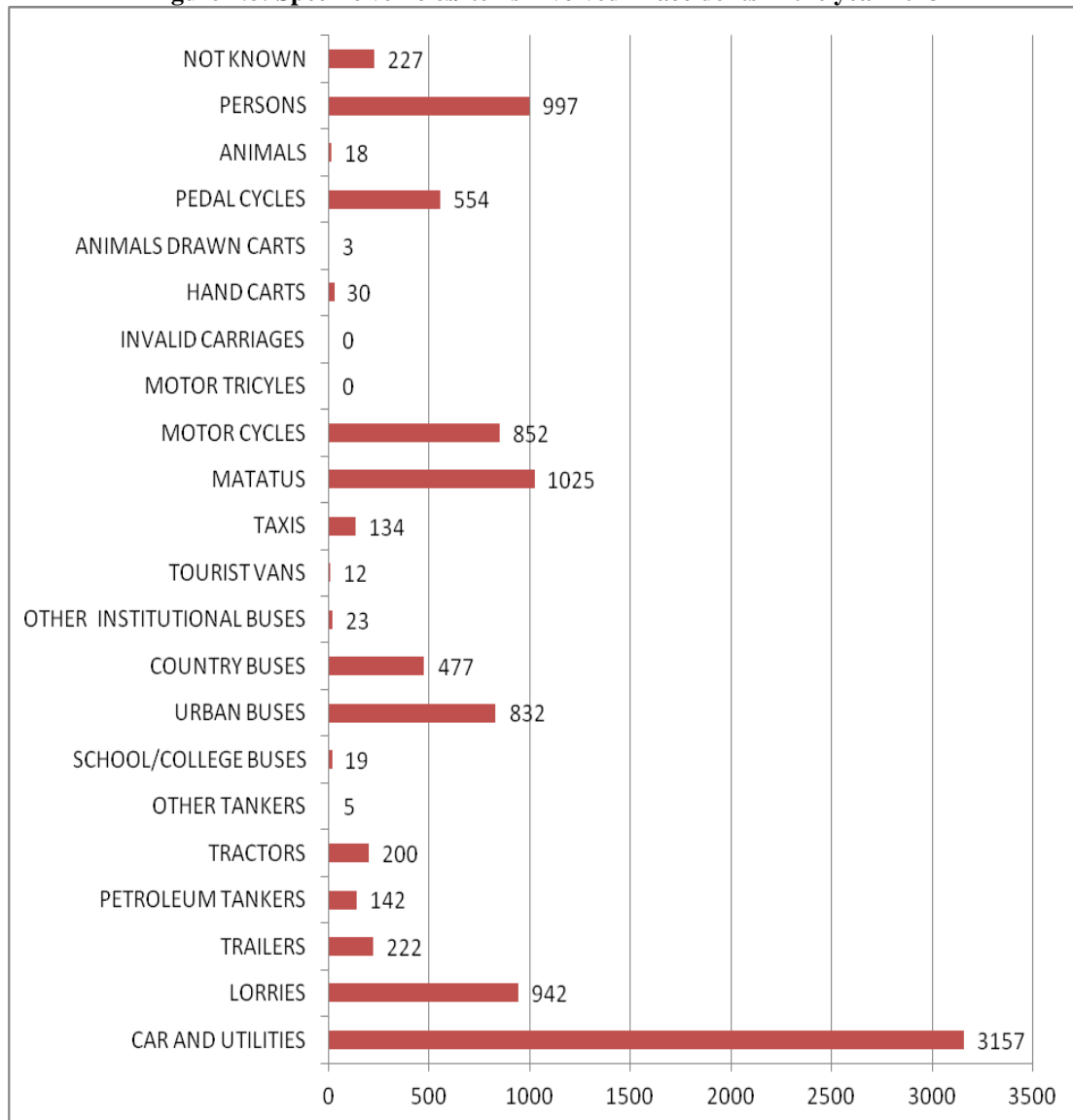


From the figure above, most accidents were attributed to drivers and motorists (5284), followed by pedal cyclists (1159), other causes (976) and pedestrians (947). The implications of these findings is that remedial measures must focus on the main causes of accidents as this will have a high impact in accident reduction.

3.5. Specific vehicles/items causing accidents (Perceived)

The study sought to evaluate the specific types of vehicles/items involved in road accidents over the year 2013. The figure below shows the findings.

Figure 4.8: Specific vehicles/items involved in accidents in the year 2013

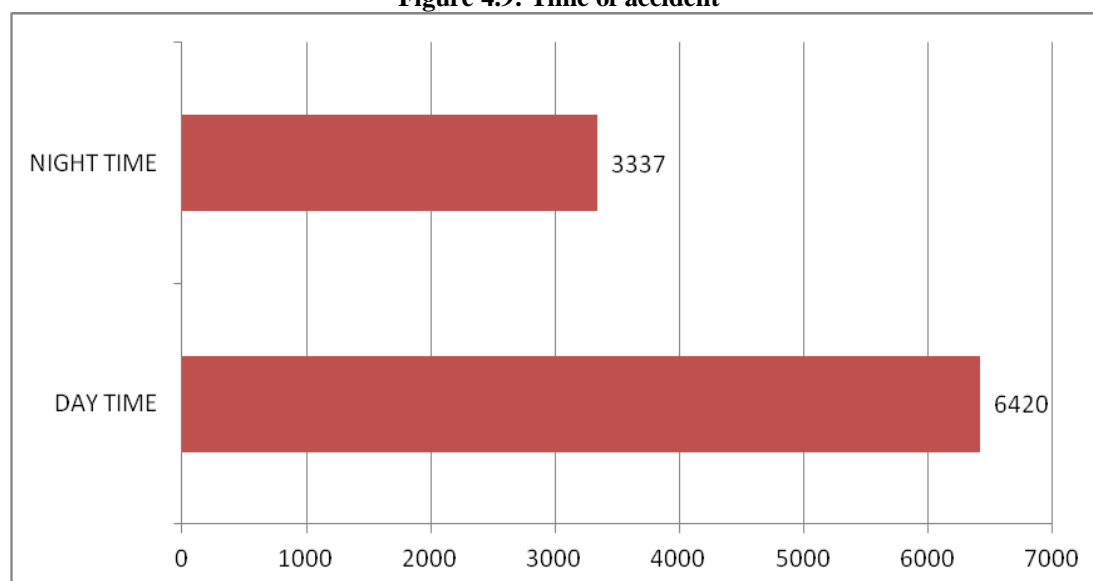


From the chart above, most accidents involved car and utilities (3157), matatus (1025), persons (997), lorries (942), motor cycles (852), urban buses (832) and pedal cyclists (554). These constitute the main vehicles involved in road accidents in the year 2013.

4.5.2 Time of accident

The study sought to establish the times when the accidents took place, that is whether at night or at day time. The figure below shows the results.

Figure 4.9: Time of accident



From the chart above, majority (6420) accidents took place during daytime and nearly half as much (3337) took place at night.

Table below shows the average number of accidents outcomes by the age group.

Table 4.4: Average Difference in Age Group by Accident Type

Ages		N	Mean	Std. Deviation
PERSONS KILLED	Over 16 yrs	8	334.25	179.031
	Under 16 years	8	47.63	28.056
SERIOUSLY INJURED	Over 16 yrs	8	1051.25	600.829
	Under 16 years	8	114.63	80.014
SLIGHTLY INJURED	Over 16 yrs	8	1108.00	687.845
	Under 16 years	8	109.38	74.885

Generally, the mean persons killed, serious and slight injuries for the 16+ years old are higher than for under 16 years old groups.

From the t-test, we reject the null hypothesis (that the mean difference are the same). This means that there was enough evidence to suggest a significant difference between the average accident outcomes of the two age cohorts).

5.1 Introduction

This chapter represents the summary, conclusion and recommendations from the finding. The overall purpose of the study was to identify causes & response strategies of road traffic accidents in Kenya. The study established that there are various response strategies that Kenya has adopted due to rising road carnage and has been experimenting various available options.

5.2 Summary of findings

Results indicated that serious effort at addressing road safety must proceed from two related questions. First, what causes road crashes? Secondly, who are the greatest casualties of road crashes? With regard to the first question, available data show that for a long time, motor vehicle drivers have been the greatest cause of road crashes in Kenya, followed by pedestrians, cyclists and passengers respectively this study agrees with a study of road crashes in Leeds, United Kingdom, Carten, et al (1989) who observed that the main problem among drivers which lead to crashes include failure to give way, lack of anticipation, loss of control and improper overtaking. They noted that the underlying reason for all this is basically over speeding, not keeping safe distance, obstruction by parked vehicles, overloading, slippery roads, poor visibility and wrong judgments.

The study established that these problems are equally serious in Kenya. Indeed, Kenyan drivers cause crashes largely because of behavioural and attitudinal problems. These problems include failure of drivers to give-way to fellow drivers and other road users and improper overtaking; lack of anticipation, wrong judgments and loss of control while driving; not keeping safe distance and making unwarranted emergency brakes; careless driving, over speeding and violation of speed limits; influence of toxic substance; Stress and fatigue due to long

hours of work in the quest to meet daily collection targets set for them by PSV vehicle owners; failure to detect mechanical defaults in their vehicles; and obstructive parking. Related to this, there is suspicion and mistrust among various categories of drivers. While matatu drivers are viewed as crooks, they regard other drivers as amateurs and always try to show them that they have superior driving skills. Generally, these behavioural and attitudinal problems are more acute among PSV drivers. It has been established that another problem is driver training, examination and certification in Kenya where there is a weak legal framework for driver training and certification.

According to the Kenyan legislation, prospective motor vehicle drivers receives driving training from any registered driving school or from any private individual who holds a driving license for at least the class for which one wants to be trained as a driver, this means that any one holding a driving license can train others how to drive. There is neither set standard curriculum nor set textbooks for drivers. There is also no requirement for proof of good health before one enrolls for driving training.

In terms of accident casualties, available data shows that pedestrians and passengers are the two greatest casualties as IHT (1997) observes, pedestrians are the most vulnerable road users, making over half of the deaths in the urban areas. In Kenya, pedestrians generally cause crashes due to ignorance of road traffic signs and signals, influence of alcohol and other toxic substances, wrong judgments, and general lack of anticipation. Passengers cause a significant percentage of road crashes. First, some passengers do insist on alighting from vehicles at some dangerous places like roundabouts, sharp bends or in the middle of the road. As a result, an on-coming vehicle may crash them, or the vehicle they are alighting from may be hit by another vehicle. Similarly, an on-coming vehicle may ram into another vehicle or swerve off the road as it tries to avoid hitting the alighting passenger or the vehicle the passenger is alighting from.

Passengers also attempt to alight from a moving vehicle, as a result of which they may sustain injuries. Thirdly, some passengers and prospective passengers also induce drivers to violate traffic rules for example, by shunning slow moving vehicles and urging drivers to speed up, or even by waiting and waving for vehicles to stop and carry them in non-bus stops. Finally, some passengers who sit on the co-driver's seat engage the drivers in distractive talks that make them loose concentration and cause crashes. Notable among the latter category include nagging spouses, drivers' 'long time lost friends' and female passengers.

More crashes occur during daytime than at night. This is probably because there are fewer activities at night than daytime. However, accident risks are as high at night as they are daytime. While there are more road users daytime, problems of visibility are more acute at night.

Government of Kenya through the ministry of Transport and Communications started to address the issue of road safety by the introduction of the Legal Notice No. 161 of October 2003, which amended the Traffic Act Cap 403 of the Laws of Kenya. The Notice provided that every motor vehicle shall be fitted with seatbelts in every sitting position. Driving a motor vehicle without a safety belt is therefore an offence under the Act, which attracts a penalty. It is also an offence for any one including the driver not to put on a safety belt while inside a moving vehicle. The Act prescribes a fine for every person inside a moving vehicle who does not put on a safety belt.

Every Public Service Vehicle owner is required to employ a driver and a conductor on permanent basis and to pay them monthly salaries as opposed to daily wages that they were receiving prior to these regulations. It was hoped that this would prevent vehicle owners from imposing unrealistic daily targets that force the vehicle crew to make many trips and work late into the night to meet. It is this setting of targets that explains the tendency by matatus for example to always be in a hurry, carry excess passengers, and defy established traffic rules in their madness rush for passengers.

Vehicles with tare weight exceeding 3,048 kilograms shall be fitted with a speed governor. The speed governor shall be of the type approved by the minister for transport, and must be adjusted in such a way that at no time can the vehicle fitted with it move at a speed exceeding 80 km/hr. This measure is aimed at ensuring the safety of both the passengers and pedestrians and enabling the drivers to be firmly in control of the vehicle at all times.

The Public Service Vehicles on both sides should be painted with the yellow band, shall be painted a dark colour of sufficient contrast as to allow the continuous yellow band to be visible at the said distance. While at the surface value this requirement might sound aesthetical, it aimed at making public service vehicles clearly distinguishable, and ensures that unauthorized vehicles do not carry passengers as this exposes such passengers to risk of accident.

Public Service Vehicle owners are required to indicate their names and address on the body of the vehicle. In addition, they are required to indicate the registered route applied by the vehicle, licensed passenger carrying capacity, and tare weight. Public Service Vehicle drivers and conductors are required to wear uniforms as well as special identification badges issued by the Registrar of Motor Vehicles. The drivers are supposed to display their photographs where all passengers can see them.

5.3 Conclusion

The objective of this study was to identify causes & response strategies of road traffic accidents in Kenya. There is a need for improved driver training and testing which agrees with Chitere (2004) who established that more often the prospective drivers begin as touts and learn from those who already know how to drive. They then go to driving schools mainly to book driving test. Furthermore, drivers tend to work for long hours, in some cases up to 13 hours a day for seven days a week. They are also paid low wages on daily basis, and operate on daily collection targets set for them by vehicle owners. So the Government has tried to pass the law on this but implementation should be followed.

The measures being taken by the government shows the commitment and determination to address road safety issues. The government has initiated several legal, policy and institutional reforms in her quest to address both road infrastructural problems and transportation issues. The measures being implemented do not seem to have correctly diagnosed the root cause of road crashes in Kenya. While it increasingly becoming evident that human behaviour and attitude significantly contribute to road carnage, neither the past road safety measures or the prescriptions of the Legal Notices adequately address the behaviour and attitude of road users and regulators. Change of behaviour and attitude of road users and regulators has great potential of reducing road crashes. A vehicle can be mechanically sound but unless the users and the regulators observe and respect road transport regulations, the fight against carnage remains a mirage.

In dealing with the behaviour and attitude of road users, experience in Kenya shows that road users are aware of the rules relating to road use, but do not apply them unless there is an enforcement officer within sight. Lack of compliance with legal requirements is a major problem in most developing countries, including Kenya. Unless road users respect and observe traffic rules and regulations, the noble goals and objectives of road safety policies will be difficult to achieve. It is therefore necessary to study what motivates road users to develop such a high propensity to flout regulations and traffic rules.

This study has attempted to contribute to the body of knowledge on road safety. It is hoped that it will inspire and facilitate increased cooperation, innovation and commitment to preventing road traffic crashes in Kenya and around the world. Road traffic crashes are predictable and therefore preventable. In order to combat the problem, though, there is a need for close coordination and collaboration, using a holistic and integrated approach, across many sectors and many disciplines. While there are many interventions that can save lives and limbs, political will and commitment are essential and without them little can be achieved. The time to act is now. Road users everywhere deserve better and safer road travel.

5.4 Recommendations for Policy and Practice

Based on the findings the capacity and competence of the driving schools has also been a major concern. Most driving schools are not properly equipped and staffed to provide effective training. At the same time, driver testing also lacks in rigor and can easily be passed even by a very weak candidate. This is partly because there are very few driving test examiners. There is need to reorganize the training of drivers. Most attention and focus is usually directed towards how the PSV drivers are trained. However, it should be noted that the training of drivers for smaller vehicles is no better. In fact, rarely do trainees leave the driving schools competent to drive on their own. Hence there is need for regularized training and thorough inspection of the driving schools.

Government should also develop and enforce vehicle standards through regular inspection of vehicles; developing training curriculum for drivers, traffic law enforcement agents and other road users and establishing and enforcing regulatory framework and undertaking public awareness.

Investigation and reporting of road crashes needs to be strengthened to ensure accuracy of reports and to transform the reports into inputs to be processed for the purposes of addressing road safety concerns. Currently there is a very weak link between the police who collect accident data and the policy makers who need the data to design appropriate response mechanisms for the problem of road safety.

There is need to understand the volume of traffic deaths, injuries and crashes, but also of which road users are most affected; in which geographic areas the greatest problems are found; what risk factors are contributing; what road safety policies, programmes and specific interventions are in place; what institutional structures are addressing the road traffic injury problem; and what their capacity is. Intermediate outcome measures – such as mean speeds, rates of seat-belt wearing, and rates of helmet wearing – can also be useful and can be obtained through simple surveys.

Involvement of Various stakeholders, including the wider community. Awareness, communication and collaboration are key to establishing and sustaining national road safety efforts. National efforts will be boosted if one or more well-known political leaders can actively champion the cause of road safety for instance using the President or the Vice President.

5.5 Limitations of the Study

During the study a number of limitations were encountered, the researcher was not able to prescribe how Kenya ought to adapt to curb the accidents because little attention is given to the conditions that make such adaptations possible and influence the occurrence of accidents.

The researcher was not also able to know yet whether particular adjustments like introducing alcohol or changing the time to travel lay the foundations for improving from Road Traffic Accident Occurrence. The study focused on Kenya, there are specific factors such as size, which may not be universally applicable to all therefore the finding of this research may have some variation.

5.6 Suggestions for Further Studies

This study was only done in Kenya. The study can be conducted in other nations facing may be similar challenges and see whether its applicability is to all.

There was very little analysis elaborating why Kenya choose to adopt any specific response strategy, the conditions enabling or constraining each strategy, or the connections between the response strategy and reduction of Road Traffic Accidents in the short run so, a study can be conducted to elaborate why Kenya choose to adopt certain response strategies and those enabling or constraining of the same.

References

- [1]. A review of evidence for prevention 1914. Towner E, Mytton J. The prevention of unintentional injuries in children. *Paediatrics and Child Health*, 2009, 19:517- 521.
- [2]. Asingo, P.O. (2004) The Institutional and Organizational Structure of Public Road Transport in Kenya. (IPAR) Discussion Paper No. 050
- [3]. Aswoga, S.E. Motorcycle accident casualties and the use of crash helmets. *East Afr. Med. J.* 1982;**59**; 550-664.
- [4]. Bunn F et al. Area-wide traffic calming for preventing traffic related injuries. *Cochrane Database of Systematic Reviews*, 2003. Issue 1, Art. No.: CD003110. DOI: 10.1002/14651858.CD003110.
- [5]. Chitere, P.O. (2004) Maturu Industry in Kenya: A Study of the Performance of Owners, Workers and their Associations and Potential for Improvement. IPAR Discussion Paper No. 055.
- [6]. Christie N, Dale M, Lowe C. Road safety research report No. 32: child road safety in rural areas – a critical review of the literature and commentary. Available from <http://www.dft.gov.uk/rmd/project.asp?intProjectID=10071>, accessed 23rd July 2010.
- [7]. Department for Transport. Rural road safety demonstration project. Available from <http://www.dft.gov.uk/pgr/roadsafety/dpp/rural/>, accessed 23rd July 2010.
- [8]. Duperex O, Roberts I, Bunn F. Safety education of pedestrian for injury prevention. *Cochrane Database of Systematic Reviews*, 2002. Issue 2. Art. No.: CD001531. DOI: 10.1002/14651858.CD001531.
- [9]. Ehiri JE et al. Interventions for promoting booster seat use in four to eight year olds travelling in motor vehicles. *Cochrane Database for Systematic Reviews*, 2006: CD004334. DOI: 10.1002/14651858.CD004334.pub2
- [10]. Evans L. The effectiveness of safety belts in preventing fatalities. *Accident; Analysis and Prevention*, 1986, 18(3):229-241.
- [11]. Gutierrez N et al. Pedestrian and bicyclist safety effects of the California safe routes to school programme. UC Berkely: Safe Transportation Research and Education Centre, Institute of Transport Studies, 2008
- [12]. GOK (2001) Medium Term Expenditure Framework: Report of the Sector Working
- [13]. GOK (1994) A Study for the Preparation of A Road Investment & Traffic Improvement Program for Nairobi, Mombasa, Kisumu and Eldoret. Government Printer, Nairobi. GOK (2003) Economic Survey. Government printer, Nairobi.
- [14]. GOK (2004) Recommendations on Integrated National Transport Policy. Government Printer, Nairobi
- [15]. Jones SJ et al. Traffic calming policy can reduce inequalities in child pedestrian injuries: database study. *Injury Prevention*, 2005, 11:152-156. Road traffic accidents
- [16]. Hamilton K, Kennedy J. Rural road safety. A literature review. Available from <http://www.scotland.gov.uk/Resource/Doc/55971/0015841.pdf>, accessed 23rd July 2010.
- [17]. http://www.direct.gov.uk/en/Motoring/DriverLicencing/EndorsementsAndDisqualifications/DG_178859, accessed 23rd July 2010
- [18]. IHT (1997) Transport in the Urban Environment. Mcrimmon Printers, London
- [19]. Issue 4. Art. No.: CD001855. DOI: 10.1002/14651858.CD001855 Zaza S et al. Reviews of evidence regarding interventions to increase use of child safety seats. *American Journal of Preventive Medicine*, 2001, 21(4S):31-47.
- [20]. Kual A, Sinha VS, Pathak YK, Singh A, Kopoor AK, Sharma S, Singh S (2005). Fatal Road Traffic Accidents, Study of Distribution, Nature and Type of Injury, *JIAFM*. 27(2):71-78
- [21]. Lui BC et al. Helmets for preventing injury in motorcycle riders. *Cochrane Database of Systematic Reviews*, 2008, 23. Issue 1. Art. No.: CD004333. DOI: 10.1002/14651858.CD004333.pub3
- [22]. Mulimba, J.A.O. Key note address to the Kenya Orthopaedic Association, 4th Annual Scientific Conference, Eldoret, Kenya March. 2009. Kenya Roads Board.
- [23]. Obara R. Motorcycle injuries in low and middle income countries experiences with in Kisumu municipality RTIRN Regional Workshop on motorcycle injuries, Nairobi, Kenya June 23, 2009.
- [24]. Odero, W. and Kibosia, J.C. Incidence and characteristics of injuries in Eldoret, Kenya. *East Afr. Med. J.* 1995; **72**; 706-710.
- [25]. Scottish Executive. Festive drink and drug driving campaign. Available from: <http://www.scotland.gov.uk/News/Releases/2009/12/07140600>, accessed 26th July 2010
- [26]. Thompson DC, Rivara FP, Thompson R. Helmets for preventing head and facial injuries in bicyclists. *Cochrane Database for Systematic Reviews*, 2006.