TRAFFIC MANAGEMENT AND ROAD SAFETY IN KISUMU COUNTY,

SOUTH WESTERN KENYA

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A DISSERTATION SUBMITTED TO THE DIRECTORATE OF HIGHER DEGREES AND RESEARCH IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF A DOCTOR OF PHILOSOPHY IN MANAGEMENT SCIENCE (PUBLIC ADMINISTRATION AND MANAGEMENT) OF KAMPALA INTERNATIONAL UNIVERSITY

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DECLARATION

I, SILAS OLOO MC'OPIYO, declare that this dissertation is my original document. It has never been submitted for any award in any institution of learning.

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APPROVAL

This dissertation titled; "**Traffic management and road safety in Kisumu County, South Western Kenya"** has been written by Silas, O. Mc'Opiyo under our supervision. It is now ready for submission with our approval as the University supervisors.

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DEDICATION

I dedicate this Dissertation to the Kenya National Police Service Officers countrywide and the people of Kenya at large. They may, if deem it fit in future, to continue with further research of finding lasting solutions to the Road Safety challenges in the Country not covered now in my research.

Silas Oloo Mc'Opiyo, EBS, OGW

KAMPALA INTERNATIONAL UNIVERSITY

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Silas Mc'Opiyo Oloo, EBS, OGW

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ACRONYMS

AAK	Automobile Association of Kenya
AAPDARS	African Action Plan for the Decade of Action for Road Safety
ACAS	Automotive Collision Avoidance System
ACC	Assistant County Commissioner
ACCS	Adaptive Cruise Control Systems
ADI	Aubrey Daniels International
AFAB	Anti-Fatality Air Bag
AKI	Association of Kenya Insurers
APDK	Association for the Physically Disabled of Kenya
ARLDA	Automatic Road Lane Deviation Alerts
ASBS	Automatic Speed Brake Systems
ASIRT	Association for Safe International Road Travel
ASLs	Automatic Speed Limit Adaptors
BBS	Behaviour-based safety
CAC	Cronbach Alpha Coefficient
CBD	Central Business District
CC	County Commissioner
CEC	County Executive Committee
CPC	County Police Commander
CWA	Commuter Welfare Association
DCC	Deputy County Commissioner
DfT	Department of Transport
DMC	Dangerous Mechanical Conditions
DRSEAI	Directorate of Road Safety Enforcement and Accident Investigations
DSA	Driving Standards Agency
EACC	Ethics and Anti-Corruption Commission
EFM	Electronic Fatigue Monitoring
ESC	Electronic Stability Control
EU	European Union
FCT	Federal Capital Territory

FCW	Forward Collision Warning
FGD	Focus Group Discussion
FSDDs	Fatigue and Sleep Detective Devices
FTA	Finnish Transport Agency
FY	Financial Year
GDP	Gross Domestic Product
IATSS	International Association of Traffic and Safety Sciences
IEA	Infotrack East Africa
IESD	Infrastructure and Economic Services Division
IJEIMS	International Journal of Enterprise Innovation Management Studies
IPAR	Institute of Policy Analysis and Research
ISA	Intelligent Speed Adaptation,
ISAs	Intelligent Speed Adaptor
ITF	International Transport Forum
KARA	Kenya Alliance of Resident Associations
KCG	Kisumu County Government
KIA	Kisumu International Airport
KIARA	Kenya Inter Agency Rapid Assessment
KIPPRA	Kenya Institute for Public Policy Research and Analysis
KIPPRA	Kenya Institute for Public Policy Research and Analysis
KNBS	Kenya National Bureau of Statistics
KPSA	Kenya Private Sector Alliance
KRA	Kenya Revenue Authority
KSI	Killed and Seriously Injured
LDTDU	Long Distance Truck Drivers Union
LDW	Lane Departure Warning
LKAs	Lane Keeping Assists
MA	Motorist Association
MADCOA	Matatu Drivers and Conductors Association
MCA	Members of County Assembly
MDP	Ministry of Devolution and Planning.

MOA	Matatu Owners Association,
MRA	Multiple Regression Analysis
MSG	Maximum Speed Governors
MWA	Matatu Welfare Association,
NCG	Nakuru County Government
NRSTSW	National Road Safety Trust and Safe Way
NTPRC	Nyanza Traffic Police Regional Coordinator
NTSA	National Transport and Safety Authority
OCPD	Officer Commanding Police Division
OCS	Officer Commanding Police Station
OECD	Organization for Economic Co-operation and Development
PAI	Population Action International
PAI	Population Action International
PDDD	Preventive Drunk Driving Device
PPE	Personal Protective Equipment
PPMCC	Pearson's Product Movement Coefficient Correlation
PWDs	Persons with Disabilities
RDCW	Fatigue Monitoring, Road-Departure Crash Warning System
RHSA	Road Health and Safety Agency
RTI	Road Traffic Injury
RTMA	Rural Transport Management Authority
SACCOs	Savings and Credit Co-operatives
SBL	Seat- Belt Locks
SCOM	Safaricom
SD	Standard Deviation
SFWS	Sleep and Fatigue Warning Systems
SID	Society for International Development
SIDA	Swedish International Development Cooperation Agency
SPSS	Scientific Package for Social Scientists
TAWU	Transport and Allied Workers Union
TRLTI	Transport Research Laboratory and Training Institute

TSRGD	Signs Regulations and General Directions
UK	United Kingdom
UKDfT	United Kingdom Department of Transport
UNDARS	United Nations Decade of Action for Road Safety
UNECA	United Nations Economic Commission for Africa
USIU	United States International University
UTMA	Urban Transport Management Authority
VSA	Vehicle Standards Agency
VSG	Vehicle Safety Garget
WHO	World Health Organization

ABSTRACT

Road safety in Kisumu County has been problematic especially in rural areas despite the existence of a potentially enabling road safety policy mirrored in Kenya's Integrated National Transport Policy. Aware of the relevance of road traffic management as a conduit of policy implementation, this study sought to investigate and explain road safety concerns, which in Kenya had attracted a lot of public opinion as well as scholarly debate. The purpose of this study was therefore to examine the influence of road traffic management on road safety in Kisumu County, South Western Kenya. The study specifically focused on examining the influence of traffic information, the effect of driver support and the significance of traffic control on road safety in the county. The study adopted an exploratory and descriptive correlational research design based on the quantitative and qualitative approach. The target population of study was 1919 people categorised in different subgroups. A sample of 365 respondents was selected using purposive and stratified random sampling strategies. Questionnaire, Interview Guide, and Focus Group Discussion guide were used for data collection. Data was analysed using quantitative and qualitative methods. Quantitative analysis included descriptive tools as well as inferential statistics of Pearson's correlations co-efficiency and multiple linear regression. The study findings indicate that road safety was generally low in rural Kisumu and relatively high in urban Kisumu. The findings further show that such levels of road safety were attributed to discrepancies in traffic information, driver support and traffic control that varied between the two areas in the county. Particularly, traffic information was inadequate in most of rural Kisumu and fairly sufficient in urban Kisumu, respectively. Driver support was less sufficient in most rural areas and fairly sufficient in urban areas. Road traffic control was less effective in rural areas and fairly effective in urban areas of the county. According to findings, traffic information predicted 40.3% of road safety in rural Kisumu and 41.3% in urban Kisumu. Driver support predicted 41.7% of road safety in rural Kisumu and 44.9% in urban Kisumu. Traffic control predicted 50.8% of road safety in rural Kisumu and 56.2% in urban Kisumu. It was generally found out that Traffic Management in rural areas predicted 50.5% and in urban areas it predicted 56.7% of Road Safety, respectively. It was therefore recommended that Kenya's State Departments for Transport and Infrastructure, Kisumu County Government, and the private sector should improve on road signages, enhance sensitization on road safety, improve quality of driving schools, promote use of intelligent vehicle safety gargets, consistently maintain roads, phase out vehicles in dangerous mechanical conditions, designate enough road sideways for fragile road users and empower relevant state agencies to fight corruption in the roads transport sector.

CHAPTER ONE
INTRODUCTION

1.0 Introduction

Road traffic management is undeniably significant for road safety because it is essential for improved road use (De Souza *et al.*, 2017). Such a significance will however be reflected in practice only when traffic management strategies designed to effect the road safety policy are effectively implemented (Taiwo, 2016). This is possible but could also be hardly consistent in contexts like Kisumu County where road transport appears complex. Than any other county in Kenya, Kisumu County is hub to a multiplicity of transport systems in the country. It is a port city at the shores of Lake Victoria, hosts an international airport and a railway station famous in the history of the East African Railway. All these are dependent on the road transport system for connectivity to the rest of Kenya and the world (Kisumu County Government, 2018; Onyango, 2018).

The transport system has, beside a rapid population growth, presented an administrative headache to local county government as road traffic management became complex yet it had to be handled in a fashion that enables efficacious control of highly likely road safety risks (National Transport and Safety Authority, 2015; Population Action International, 2018). The 2009 Population and Housing Census (KNBS, 2013) showed that the total population in the county was 968,406. According to recent estimates, the population size has since increased to 1,224,531 people in 2018 and 1,256,786 people in 2019 (KCG, 2019). All these are road users, whose population growth rate surpasses the county's road network development, despite some significant road infrastructural additions especially in Kisumu City (PAI, 2018).

Although there are several previous studies related to road safety, almost none covers the implications of road traffic management in the county in recent times, more so in scholarly research (Amulla, 2018; Gichaga, 2016; Manyara 2016; Murimi, 2013; Nyachieo, 2015; Ndung'u, Ratemo, Mwai, 2015; NTSA; 2015; Taiwo, 2016). In the absence of a related scholarly analysis, research on the road transport complexity in Kisumu County was timely. For this reason, this study was essential for which chapter one presents the background to the study, statement of the problem, purpose of the study, specific objectives

of the study, research hypotheses, significance and scope of the study and operational definition of key terms.

1.1 Background to the study

The background to the study covers the historical perspective, theoretical perspective, conceptual perspective and the contextual perspective.

1.1.1 Historical perspective

The roots of contemporary road traffic management can be traced from the first formal road safety policies dating back to 17th century of road transport transformation. The British transport policy of 1663 was one of the first formal documented road safety policies in world history (Bellis, 2015; Wellings, 2002). Such policies were consistently made because of roads, which progressively evolved and came with more road safety risks (Bellis, 2015; Leonard, 2004). For long, road safety policies have been perceived essential and meant to particularly buttress traffic management and counter emerging risks to road safety (Leonard, 2004).

Traffic management has largely since the ancient roads been a basic social obligation of public administration. The earliest formal road safety management came with the first improved ancient roads, which included the 4000 BC stone-paved streets of Ur in present Iraq and timber roads made in the then swampy Glastonbury, England (Bellies, 2015). Better traffic management was underscored in the advent of modern tarmac roads which evolved with subsequently better engineering technology as measure of road safety. Following a long episode of poor roads, methods to make good macadam roads with tar were introduced by John Henry in 1834 (London County Council, 1994).

Macadam roads were only used by horses and carriages or coaches, and could not be used by subsequent higher-speed motor vehicles. So, the tar-grouted macadam was later improved by a British civil engineer, Edgar Purnell Hooley, in 1901 into tarmac roads to host automobiles (Harrison, 2004; Hooley, 1904; Morton, 2002). Road use revolution in Europe and North America made leaders to formally adopt road policy actions that would bolster road efficiency and safety (Hobbs, 2015).

In most of pre-colonial Africa, road safety was unrealizable until the colonial and post-colonial times (Emmenegger, 2012; Ndegwa, 2003; Njoh, 2005; Sunderland, 2012). It was unattainable in the precolonial era in much of the continent because roads were mostly unplanned (Emmenegger, 2012) with exception of some well organised kingdoms, for example Buganda Kingdom in the present Uganda (Sanghamitra and Green, 2012), and the Asante in present Ghana (Gareth, 2006; GhanaWeb, 2012).

Though formal road construction became widespread in early 1900s in most of colonial Africa (Sunderland, 2012), better road traffic management started with initial post-colonial road policies in the late 1950s and early 1960s. This excluded countries like Ethiopia, South Africa et cetera, that were never affected by mainstream colonialism and thus, had well gazetted roads and traffic policies earlier or later (Njoh, 2005). Road traffic management became local governments' shared responsibility with the decentralisation of public administration in much of Africa since the 1980s (Ndegwa, 2003).

In the past 50 years in Kenya, road traffic safety management has evolved through successive road policies. This started from the 1965 Sessional Paper No.10 drafted just after independence, to the structural adjustment era, and currently to the New 2010 Constitutional epoch. The more recent constitutional dispensation emphasizes devolution for much of social service delivery including road transport (Ministry of Roads, 2012). Decentralisation of the road transport service has been most consistently pursued policy strategy in Kenya's post-independence era despite changing government regimes.

Kenya attained her independence in 1963, and the immediate government moved to lay the foundation for the country's rapid economic growth (Manyara, 2016). One of the policy strategies was decentralising road infrastructural development which has over the years successfully led to increase in the road volume in most of the country including Kisumu County. For instance, nationally the total length of public roads increased from 41,941 km in 1963 to 46,600km in 1972 and to the current 178,000 km (Manyara, 2016; SoftKenya, 2015; Wasike, 2001).

1.1.2 Theoretical perspective

This study was anchored on the total safety culture theory, the behavioural theory and the systems theory as the theoretical framework of analysis. It was however underpinned by the total safety culture theory because it was the most binding. The theory was largely developed by E. S. Geller in 1994. It integrates three principles of behavioural values, the classical approach and an actively caring model (Geller, 1994; Guldenmund, 2010; Rakowska, and Szubielska, 2013). Based on the three theoretical paradigms, there has been a shift from risk-tolerant to risk averse and from reactive to proactive approach in the pursuit of safety in road transport (Marsh, 2014).

The behavioural perspective of total culture recommends for reactionary strategies against safety risks, the classical approach routes for both reactionary and proactive actions, while the actively caring model calls for proactive steps to counter safety threats (Cole, Stevens-Adams and Wenner, 2013; Marsh, 2014). Total safety culture theory was perceived applicable and underpinning for the current study by virtue of its varying perspectives, all of which were relevant to the research problem. Besides, its postulations mirror the behavioural theory and systems theory in some respects.

The behavioural theory, often referred to as behaviour-based safety (BBS) is hinged on seven basic principles; intervention, identification of internal factors, motivation to behave in the desired manner, focus on the positive consequences of appropriate behaviour, application of the scientific method, integration of information, planned interventions (Sulzer-Azaroff, 1978; 1982). The theory was relevant for research on road traffic management as an intervention and road safety as a function of desired road use and well-being in the road transport system. The systems theory views traffic safety as a control problem. It suggests that safety events in the transport sector are associated with the sufficiency of control (Rasmussen, 1997; Reason, 1990). In this theory, control was conceptualized in the current study as road traffic management, which in Kenya is equally the mandate of county governments as partners in promoting road safety.

1.1.3 Conceptual perspective

Road traffic management refers to the planning, organizing, coordinating, monitoring and control or influencing of traffic to achieve efficiency and safety in the road transport system

(Peden et al., 2004; Winder, Brackstone, Delle, & Antognoli, 2009). Adebisi (2004) also refers to road traffic management a package of policy actions designed to optimize the available road network in a well-focused manner that improves the usefulness of existing facilities with respect to the needs of road users, road safety promotion and natural environment protection. Hobbs (2015) defines road traffic as land bound movement of people and goods from one location to another.

In the context of this study, road traffic management is a function of a set of activities, which according to the Finnish Transport Agency (FTA, 2010), are intended to effectively implement the road safety policy. Such activities are also regarded as a package of measures jointly or selectively used to address traffic and road safety issues (Adebisi, 2004). The activities, basing on the Finish Transport Authority (2010), include traffic information, driver support systems, traffic control, incident management, demand management, and monitoring systems, as well as fleet and transport management all of which are aimed at promoting road safety. This study was however limited to the first three activities as parameters used to measure the efficacy of road traffic management.

Road traffic information according to Arnau-Sabatés, Garcia, Muñoz and Capdevila (2013) refers to the package of all informative systems required to enable effective and safe road use. Truls, Terje and Rune, (2012) define driver support as adoptable road practices and mechanical fittings used to promote driving efficiency and safety on the road. According to Hu, Zhou, Zhao and Liu (2005), road traffic control involves regulating and re-directing road use to ensure compliance with set road use standards. The three road traffic management activities were covered due to the road use needs for which according to NTSA (2015) road use information, driving support and regulation were the most priority public concerns in Kisumu County. The study was also restricted to the three activities because of the desire for in-depth and manageable research analysis.

The land bound movements typically occur along a road facility or pathway. This study was focussed on public roads, and according to the Kenya Ministry of Roads (2012), a public road means a highway, lane, footway, and alley or passage managed by government and used as a means of access to two or more locations. Users travelling on such road networks may include pedestrians, cyclists, motorists and their passengers, as well as

passengers of on-road public transport, mainly buses and trams. Use of automobiles includes passenger transport, and freight. Passenger transport may be public, where operators provide scheduled services, or private (Bardi and Novack, 2006; ITR, 2008).

The International Transport Forum (2008) defines road safety as the incidence of reduced risk of serious injury and fatality of road users. It is broadly defined by the Finnish Transport Agency (2010) defines road safety as a function of desired effects of traffic management. These include traffic compliance, basic safety, predictability, reliability, elimination of incidents, attractiveness of pedestrian and bicycle traffic and public transport, controllable growth in passenger car traffic, limited effect on climate change, travel by the elderly and reduced number of injuries and deaths (FTA, 2010; Madel, n.d; Olaogbebikan and Ikpechukwu, 2013). In this study, road safety was perceived as a combination of intermediate and final outcomes of road use.

The intermediate outcomes in this research included traffic rules compliance, basic safety, reliability, as well as enabling of marginal and complex road users. The final outcomes included road injury and fatality rates (Luukkanen, 2003). However, of more interest in this study were traffic regulations compliance, basic safety, predictability and reliability, elimination of incidents, attractiveness of pedestrian and bicycle traffic and public transport, travel by the elderly and reduced number of injuries and deaths. These, according to Kenya's road transport policy (MOR, 2012) are the basis of best practice in road traffic management and fundamental road safety indicators. Best-practice strategies of managing road traffic focus upon the prevention of serious injuries and fatal crashes in spite of human fallibility (ITF, 2008). Road traffic management is thus essential for improved road use as it incorporates measures that are part of the road transport policy actions and implementation (FTA, 2010).

1.1.4 Contextual perspective

Road safety in Kisumu County remains an illusion more especially in rural areas despite the existence of a potentially enabling road safety policy. Kenya's road safety strategy mirrored in the integrated national transport policy (MoR 2012) and national road safety action plan (NTSA, 2015) was fashioned to propel road traffic management. The most

fundamental aspect of the policy strategy entrenched in the national constitution of 2010 was the devolution of public service delivery including road transport. This is specified in Article 6 of the Constitution which provides for a devolved system of government that led to the creation of 47 county governments in Kenya including Kisumu County (KIPPRA, 2017; Othieno, 2011). As a devolved government, Kisumu County is found in Kenya's South-western region. It is a transportation hub connecting passenger and goods road transport routes linking Kenya to Uganda, North-western Tanzania, Burundi, Rwanda, Southern Sudan, and Eastern Democratic Republic of Congo (ASIRT, 2014).

The county hosts Kisumu City, which is the nucleus of transport systems in South Western Kenya and the third major city in the country after Nairobi and Mombasa cities both of which are devolved counties too. Kisumu County has several paved roads, the major one being the Nairobi- Busia road, with a branch at Kisian heading to Bondo. Important roads are paved with asphalt. County roads are mostly murram but provide all weather movement all year around. Public transport services are provided by min-buses commonly known as Matatus, and buses mainly operating under SACCOs or franchises. Bicycles and motorcycles including *Boda bodas* and tricycles (*Tuk-tuk*) also exist in significant quantities for shorter distance travels (KIARA, 2014). More details on the county's transport system multiplicity and road transport dominance are specified in Appendix 2.

As a county government, Kisumu contributes to a rich institutional framework that should have otherwise been used to closely and reliably administer the road safety policy (KIPPRA, 2017; Infotrack East Africa, 2014; Othieno, 2011). The policy harmonizes and defines the obligations of counties in the road sub-sector, Kisumu County inclusive. This derives from Article 186(1) of the constitution on the functions of the national and county governments as set out in the Fourth Schedule. One of the functions of the national government is to provide counties with technical assistance and capacity building. County governments have a duty to closely support and engage in traffic management for local road safety promotion (Ministry of Roads, 2012; NTSA, 2017). The current study purposively zeroed on Kisumu County for in-depth research analysis, and because of its perceived fragility as a transport hub.

Particularly, the county was also investigated due to its worrying rates and trends in road safety performance in recent times (NTSA, 2018). Road use in Kisumu County remains risky and far from safe. Previous reports suggested that road safety risk in the county was persistently high. In recent years, road fatality was estimated at 31.3 per 100 000 people (ASIRT, 2014; NTSA, 2018; Regional Traffic Police Service, 2015). Although this was mere estimates, it compared unfavourably with the national road safety analysis. WHO (2016) reported that the annual road traffic fatality rate for Kenya stood at 28.2 per 100 000 people. This moreover ranked higher than the African Region estimated at 24.1 per 100 000 population and was the 42nd highest in the world.

Kenya's NTSA report on Kisumu County's road safety performance in recent years presented more questions than answers. Most prominently, the report presents daunting statistics on road accidents as compiled by the Directorate of Road Safety Enforcement and Accident Investigations (DRSEAI) (NTSA, 2018). It specifies the fatality rate, level and victims of the accidents, all of which are summarised in Table 1.1.

Table 1.1

Accidents in Kisumu County from 2013 to 2018

Year	**2013**		**2014**		**2015**		**2016**		**2017**		**2018**		**Total**	
	No	VT	No	VT	No	VT	No	VT	No	VT	No	VT	No.	VT
Fatal accidents	142	169	151	175	140	165	120	155	113	145	142	165	808	974
Serious accidents	91	133	78	109	57	133	50	105	55	128	103	175	434	783
Slight accidents	25	179	18	149	21	125	13	166	27	95	37	179	141	893
Total accidents	**258**	**481**	**247**	**433**	**218**	**423**	**183**	**426**	**195**	**368**	**282**	**519**	**2650**	

Source: NTSA (2018) Legend: VT= Victim

According to the statistics in the table above, there were varying levels of road accidents in Kisumu County, namely slight accidents, serious accidents and fatal accidents. Each of these has had significant prevalence rates throughout the years since 2013. Road accidents temporarily reduced only between 2013 and 2016. The drop was not significant though. The trend instead took an upturn with accidents surging to the highest ever in 2018. Apart from the table, it was also reported that Kisumu County had been leading in road fatalities in South Western Kenya (Aoya, 2017).

DRSEAI reported that during this period, Kisumu County led with almost 50% of regional road fatalities in South Western compared to the rest five sister counties (NTSA, 2018). The other counties include Siaya County, Homa Bay County, Kisii County, Migori County and Nyamira County (KCG, 2013; MDP, 2013). In Kisumu County, motor vehicles were reported to be the leading killers on the roads, with private vehicles contributing 34%, followed by heavy commercial vehicles at 23% and Public Service Vehicles at 20%. The rest 27% of the road fatalities were caused by cyclists especially motorcycles (NTSA, 2018).

DRSEAI attributed road fatalities in Kisumu to poor road use and estimates show that out of 10 drivers for all motorized vehicles, 7 often drive carelessly and more than half of the pedestrians, three quarters of 10 motorcyclists and more than three quarters of 10 bicyclists hardly adhere to traffic regulations. The most vulnerable road users in Kenya and Kisumu County in particular are children, pedestrians, cyclists and the elderly. This vulnerable group accounts for 57% of the deaths resulting for road accidents (NTSA, 2018; Ogendi *et al.,* 2013). Like the rest of Kenya, the cost to the county economy in Kisumu from road traffic injuries was in excess though not accurately verified. At national level, the excess stood at US$ 50 million, exclusive of the actual loss of life (WHO, 2016). Nevertheless, much of road risk reports above was generalised and not exhaustive; therefore could not provide specific and realistic explanation of road safety in Kisumu County.

Previous scholarly work covered road traffic management as well as road safety (Amulla, 2018; Kipkosgei, 2009; Manyara, 2016; Murimi, 2013; Nyachieo, 2016; Onyango, 2018; Othieno, 2011), but it was short of clear evidence. There was never similar research about Kisumu County; neither did the existing scholarly literature offer a logically accurate analysis of the contribution of county governments to management of traffic as a cornerstone for road safety policy implementation. Yet the road transport sector is a potential vehicle to Kenya's Vision 2030, which seeks to transform the country into middle income economy (Ministry of Roads, 2012; NTSA, 2018). Therefore, this research was essential to address the existing knowledge gaps with a bias on Kisumu County.

1.2 Statement of the problem

Kenya's national road safety policy instruments present a traffic management strategy fashioned to propel efficient and safe road use. The instruments include the integrated national transport policy and national road safety action plan (MoR, 2012; NTSA, 2015). Nonetheless, desirable road safety targets in Kisumu County were hardly achieved more especially in rural areas owing to operational gaps of some traffic management actions related to traffic information, drive support and traffic control. The policy strategy offers a potentially enabling road safety mechanism of shared responsibility between national and county governments but Kisumu County lags behind expectation. The county leads in road fatalities in South Western Kenya despite its constitutional mandate to effectively steer policy actions aimed at addressing local road safety needs. This mandate is provided for under Article 6 of Kenya's recent constitution of 2010 (Aoya, 2017; KIPPRA, 2017; NTA, 2018; Othieno, 2011).

Road safety in the county had for long been a major public administration headache. As of end of 2017, South Western Kenya recorded 303 deaths, and Kisumu County was leading with almost 50% compared to the rest of the region (NTSA, 2018). Motor vehicles in the county were the leading killers, with private vehicles contributing 34%, followed by heavy commercial vehicles at 23% and PSVs 20%. The rest 27% of the road fatalities were caused by cyclists particularly motorcycles. The road safety risk in the county was high at an annual road fatality rate of 31.3 per 100 000. This compared unfavourably with national fatality estimates of 28.2 per 100 000 (ASIRT, 2014; WHO, 2016).

The Directorate of Road Safety Enforcement and Accident Investigations (DRSEAI) blamed road fatalities on wrong road use. Estimates on Kisumu County showed that out of 10 drivers of all motorized vehicles, 7 often drove carelessly and more than ½ of the pedestrians, three quarters of 10 motorcyclists and more than three quarters of 10 bicyclists hardly adhered to traffic regulations (ASIRT, 2014; NTSA, 2018; Regional Traffic Police Service, 2015). According to WHO (2018), such wrong road use could be attributed to poor road traffic management actions despite lack of proof in most previous road safety scholarly analysis (Amulla, 2018; Asingo and Mitullah, 2007; Kipkosgei, 2009; Manyara, 2016; Murimi, 2013; Nyachieo, 2015; Onyango, 2018; Othieno, 2011). Moreover, such

analysis could not contextually represent the link between traffic management and road safety particularly in Kisumu County. Therefore, in the absence of specific scholarly attention about the county, this study was timely to address the existing research lacuna and iron out such paradoxes.

1.3 Purpose of the study

The purpose of the study was to examine the influence of road traffic management on road safety in Kisumu County, South Western Kenya.

1.4 Specific objectives of the study

To achieve the research purpose, the study sought to:

1. Examine the influence of traffic information on road safety in Kisumu County in South Western Kenya.
2. Ascertain the effect of driver support on road safety in Kisumu County in South western Kenya.
3. Assess the effect of traffic control on road safety in Kisumu County in South western Kenya.

1.5 Research hypotheses

1. There is no significant influence of traffic information on road safety in Kisumu County in South western Kenya.
2. Driver support does not significantly affect road safety in Kisumu County in South western Kenya.
3. Traffic control does not significantly affect road safety in Kisumu County in South western Kenya.

1.6 Significance of the study

The study is perceived to be significant in the following ways:

1. The study findings provide useful information to Kenya National government about the performance challenges of road traffic management in Kisumu county government. As a partner with county governments in road transport policy implementation, the National government may be motivated to find out what happens in other counties in the country.

It can also make interventions that supplement county government efforts to improve or maintain quality of the road transport system.

2. The county governments of Kisumu and South western Kenya at large may also learn about the real experiences of local road users. Where there are challenges, county governments may come up with more appropriate interventions to enhance traffic management and improve road safety.
3. Other social institutions like civil society can also benefit from the study findings regarding road traffic and safety needs. Civil society in particular will have a clear picture of road use risks and outcomes for which it may act accordingly to supplement any government efforts aimed at making the road transport system a better sector that promotes human life.
4. As result of the study findings, local communities and other road users are likely to comprehend their role not only as users but also as partners in road transport sector. Such common stakeholders may access the study findings through local leaders, right from lower county governments to the county level. They can also access the study through internet. When well informed on the plight of local road safety, they may contribute to best practice in road traffic management.
5. Body of knowledge. The findings of the study have contributed to the body of knowledge about road transport sector. This can be used for future research and other scholarly needs and work.

1.7 Justification of the study

Having reviewed previous research on issues related to road safety in Kisumu County, it was realised there was a significant knowledge gap to address (Amulla, 2018; Murimi, 2013; Nyachieo, 2015; Ndug'u, Ratemo, Mwai, 2015; Onyango, 2018), particularly with regard to linking traffic management and road safety. Amulla, O. W. (2018) carried out an observational survey on selected safety indicators among commercial motorcyclists in Kisumu city. It was reported that due to the high rate of injuries to motorcyclists, estimated at approximately 60% in the city, key safety interventions were reportedly enforced by authorities. These included restriction on the number of pillion riders, and obligatory use of personal protective equipment (PPE) such as helmets and reflective jackets. It was however noted that, despite clear legislation about such interventions, enforcement was a

major challenge. According Amulla, it was therefore not surprising to observe that a few (5.8%) of the motorcyclists in Kisumu City had helmets but did not wear them, the majority (72.1%) did not have such protective gears, and only 22% wore reflective jackets.

It was also less startling that nearly one fifth of the motorcyclists carried two or more pillion riders and over 99% of the pillion did not have helmets. It was generally confirmed that all this was due to poor compliance with traffic (Amulla, 2018). This survey was conducted in Kisumu County but it was limited to Kisumu City. It was about road safety but only focused on motorcyclists or *Boda bodas*. Moreover, it left out tricyclists, the *Tuk-tuk.* And it only covered enforcement of traffic rules as one of the strategies of traffic control, which itself was just one of the three variables of traffic management this study sought to investigate. There was therefore a lot more to research about; the whole of Kisumu County and not just Kisumu City, all road users than just *Bod bodas*, and more parameters of traffic management than only traffic rules enforcement. Analysis of the level road safety in Amulla's (2018) survey tackled just a few safety indicators thus leaving room for more analysis.

Onyango, G.M. (2018) conducted a study on urban public transport in informal settlements, focusing on experiences from Kisumu City. The study reports that Kisumu City attracted a massive growth of informal settlements forming a belt around the urban core with more than half of the city's population. These settlement areas were unplanned and this contributed to very poor road infrastructure development characterised by narrow and unpaved murram or gravel roads. The poor state of infrastructure limited opportunities for regular urban transport minibuses providing transport for majority of the urban poor living in such informal settlements.

As a result, 'less efficient' alternatives were devised to cope with the infrastructural development gap. The most common alternatives included use of motorcycles and bicycles which were neither effective in providing public transport nor friendly or safe to road users especially pedestrians who formed majority of the population in such unserviced settlements. The study further indicates that this led to high rates of accidents leading to minor, serious and fatal injuries (Onyango, 2018). This study is relevant to road safety management but it was limited to urban transport and Kisumu City in particular, yet so

much was not known about rural transport and the rest of Kisumu County. Besides, the findings are sweeping and narrow with regard to road safety dynamics. There was thus need for a countywide research that captures specific facts in a broader and quantitative and qualitative fashion.

Murimi, L. (2013) investigated the determinants of severity of road accidents involving buses along Kenyan roads, taking Nairobi - Kisumu highway in Kenya a case study. The study was purely qualitative and thus involved the use of open ended interviews and documentary reviews for data collection from Kenya's insurers. It found out that speed and availability of roll over protection bars were the major determinants of road accident severity. It was also noted that most passengers could not strap their seat belts while travelling in a bus and few bus crews encouraged them to do so. The few buses installed with roll over protection bars recorded very few fatalities compared to the buses without. The study also revealed that there was insufficient data recorded and documented in regard to alcohol abuse by drivers involved in road accidents (Murimi, 2013). Further research was therefore required on this particular traffic offense. There was also need for a bi-approach research on other highways and county roads in Kisumu County to supplement Murimi's qualitative analysis on Nairobi- Kisumu highway.

Nyachieo, G. M. M. (2015) researched on the socio-cultural and economic determinants of *Boda boda* motorcycle transport safety in Kisumu County, Kenya. The field survey particularly conducted in Kisumu East sub-county using the questionnaire, interview and focus group discussion guides. The study specifically sought to investigate the demographic characteristics of riders; to examine level of formal rider training among *Boda boda* riders; their safety knowledge; attitudes and behaviour; style of pillion sitting as well as motorcycle ownership and determine how all these factors influenced *Boda boda* safety in Kisumu East Sub County. The study findings revealed that, majority of the riders were young with secondary education, the majority (62.2%) were not formally trained to ride, and most (66.5%) of them had low levels of motorcycle knowledge. It was also found out that *Boda boda* speeds were not regulated. Besides, about 65% of the riders had one helmet but rider helmet use was low among some (34%) of them.

It was further established that more than half (56.2%) of the riders did not own the *Boda bodas* they operated and many riders engaged in bad riding behaviour most of the time. It was also observed that passenger sitting style on *Boda boda* was a gendered cultural issue. Unsurprisingly, the rate of accident involvement was high at 40.3% of the riders. The chi-square analysis indicated that formal rider training had no statistical significant relationship with accident involvement while binary logistic regression showed that motorcycle ownership lowered the odds of being involved in accidents by 57%. Other inferential analyses showed that the rest of the factors under review had significant effects on *Boda boda* safety (Nyachieo, 2015). This is a study that left road safety experiences in the rest of rural and urban Kisumu County unknown. There was also need to look at all road users than just *Bod bodas*. For in-depth institutional factor analysis, it was better to concentrate on traffic management than a wider in-exhaustive research about socio-cultural and economic factors. More research was required on road safety so as to provide knowledge on a diversity of road use safety indicators.

Ndung'u, C. W., Ratemo, M.B., Mwai, L. K. (2015) made an analysis of causes & response strategies of road traffic accidents in Kenya. The data for the study was gathered primarily from secondary sources including Kenya National Road Transport and Safety Authority and Traffic Police reports, Newspapers, internet, books, World Bank reports and other relevant sources. The study looked at human and physical factors as causes of road accidents. It was established that the rate of serious and fatal road accidents was still high at about or over 6000 persons in 2013, although there had been a successive decline 2009 which recorded 12000 persons involved in similar accidents. Road accidents in the country were according to the study significantly caused by several human and factors. The human factors singled out included corruption, road defects, errors of omission and commission among road transporters and other users including drivers, motorcycle riders as well as bicycle riders, passengers and pedestrians. While major physical causes cited included poor soil texture, weather and wild animals.

It was realised that the situation is so complex that it required various strategies or approaches to address such causes. Some of the strategies reported to have been devised by authorities, particularly government, included improving on the quality of roads,

positive attitude change of road traffic officials especially the police, strict enforcement of traffic rules and regulations, public sensitisation, and adoption of proper mitigation measures against physical causes (Ndung'u *et al.,* 2015). This study was not binding as it was macro, that it could not specifically distinguish the scope and geographical differences of a micro county like Kisumu. It was also broader and only qualitative that it couldn't provide a detailed quantitative analysis of road safety implication traffic management. Besides, the road accident statistics reported were obsolete for the most recent road safety changes since 2017. All the above shortcomings of the closely related previous research were impelling issues that motivated this particular study on traffic management and road safety in Kisumu County.

1.8 Scope of the study

The scope is a description of the boundaries of the study in terms of content, methodology, geographical coverage and temporal scope (Oso & Onen, 2009). In this study, the scope included the geographical scope, content scope and time scope.

1.8.1 Geographical scope

The study was carried out in Kisumu County as one of the 6 counties found in South Western Kenya, formerly known as Nyanza Province (Infotrack East Africa, 2014). The county is made up of 7 wards, namely Kisumu East, Kisumu West, Kisumu central, Seme, Nyando, Muhoroni and Nyakach wards as illustrated on the sketch map in Appendix 1 (KCG, 2013; MDP, 2013). The county was targeted for this research given its apparent road safety vulnerabilities attributed to a diversity of its busy transport activities such as water, air and road transport activities all of which had a bearing on road traffic (ASIRT, 2014; KIARA, 2014).

1.8.2 Content scope

The content scope of research was about influence of traffic management on road safety with specific focus on the influence of traffic information, effects of driver support and traffic control in the county. The scope was particularly limited to the three road traffic management variables because NTSA (2015) they were perceived to have most prominent bearing on road use dynamics and practices.

1.8.3 Time scope

The time scope of study covered the period, 2010-2018. The study analysed relevant road traffic and safety events within this period due to a more spirited role county governments were meant to play since Kenya's new constitution of 2010, yet road safety in Kisumu County was reportedly persistently very fragile. In the history of Kenya, this is when governments at all levels should have stirred the best road transport service quality and safety due to her widely revered constitutionally significant policy and institutional reforms in the road transport subsector (Ministry of Roads, 2012; Othieno, 2011).

1.9 Operationalization of variables

Traffic management - In this study, traffic management covered the road transport system. Traffic management in this context comprises activities designed to maximise and sustain the usefulness of road transport and promote road use efficiency and safety. The activities of specific concern and that formed part of road transport policy actions in Kisumu county government included traffic information, driver support systems and traffic control.

Road safety - This is defined as a function of the desired effects of road traffic management. In this study, the effects included traffic compliance, basic safety, reliability, enabling of marginal and complex road users and above all, reduced risks of serious injury and fatality of road users.

Traffic information - This refers to road use information usually provided on and off road designed to facilitate or aid effective and safe utilisation of the road for any transportation or movement needs. Such systems mainly included road signages and road use education. The signages of study included marked road lanes, parking sign posts, hump signs, zebra crossing signs, speed reduction signs, route signs, road gradient signs and children crossing signs. Road use education involves school children and community sensitisation on road use and safety, through the right and accessible forums.

Driver support – This is a function of practices and automobile fitted systems adopted to ensure driver efficiency and road use safety. The practices include driving training, road maintenance, and driver guidance on road mishaps. Automobile fitted systems include

automatic speed limit adaptor, preventive drunk driving device, anti-fatality air bag, automatic speed brake system, automatic detective and brake device against vehicle breakdown, automatic road lane deviation alerts, seat- belt locks, maximum speed governors and fatigue or sleep detective device.

Traffic control -This involves regulation and redirect road transport and movement aimed at promoting proper road use and compliance with road safety standards. Compliance needs arise in the event of road use offences committed by public transport operators and consumers, private operators, non-motorised road users and sometimes road use regulators.

CHAPTER TWO
LITERATURE REVIEW

2.0 Introduction

This chapter covers the review of literature related to this study on road traffic management and road safety. For this purpose, the chapter presents the theoretical review, the conceptual framework and review of empirical literature. Subsequently, conclusion was provided to specifically summarise the research gaps this study sought to fill.

2.1 Theoretical review

The theoretical review basically describes the theoretical framework underlying the current study. The review closes with the research model adopted to provide a bearing for research.

2.1.1 Theoretical framework

The theoretical framework of this study includes specifically relevant theories on which the study was anchored, the total safety culture theory, behavioural theory and systems theory. Much of theories mirrors an interplay of road traffic management and road safety (Brijs, Hermans and Wets, 2008), but the total safety culture theory was the most underpinning for the study. Other significant but less relevant theories to the study were itemized in the combination theory. The interplay between the two variables of research, in previous theoretical literature is often themed as traffic safety (Dulaand and Geller, 2007). Thus, the theories under review were identified as theories of road traffic safety for recognition purposes.

2.1.1.1 Total safety culture theory

The total safety culture theory underpinned the study particularly because of its perceivably guiding theoretical perspectives. The theory has reflections of the previous safety theories but it was largely developed by E. S. Geller in 1994. According to Geller (1994), the total safety culture is a responsibility for which all stakeholders of an entity should collectively be concerned about safety and show that in routine commitments. This perspective induced further analyses of the theory in which several distinct perceptions have been progressively crafted. Notably, the theory mirrors three theoretical insights, namely behavioural approach, classic approach and actively caring' model (Dulaand and Geller, 2007; Guldenmund, 2010; Rakowska, and Szubielska, 2013). Along that line, there has been a

shift from risk-tolerant to risk averse and from reactive to proactive approach in the pursuit of safety (Cole, Stevens-Adams and Wenner, 2013; Marsh, 2014). The behavioural approach was adopted to suggest that safety culture recommends reactive actions to problems and chances encountered in an organisation or institutional set up (Westrum, 2004). According to Guldenmund (2010), behavouralism presents safety culture as an epitome of actions among unit partners on safety opportunities and/or threats, based on their beliefs and attitudes, and through policy and procedures that influence the level of safety.

The classical approach perceives safety culture theory as a proposition for shared beliefs, perception and values among stakeholders in relation to the safety needs of the system in which they are involved. The classicals further posit that safety culture requires a collective programming of mind aimed at safety of a group of people in any system. They also suggest that this involves aspects of organizational or institutional or social culture which influence risk management (Berends, 1996; Guldenmund, 2000). Richter and Koch (2004) opine that classical aspects of safety culture are commonly learned and shared. According to Hale (2000), the classicals' safety culture is largely reactionary although there are significant insights of pro-action.

The actively caring model supports the use of behaviour and consists of showing concerns for such behaviour to prevent and reduce risks. It takes into account human states and barriers, explains who is likely to help, and pinpoints the conditions that eases helping (Geller, 1994, Rakowska, & Szubielska, 2013). Besides perceiving safety culture as a proactive approach actively caring model features such a culture communication based on mutual trust, perception of the importance of security, belief in the efficiency of used safety measurements (Cole et al, 2013;Guledman 2010; Marsh, 2014).

According to Marsh (2014), such logical perception variations are what transform into total safety culture. Generally, total safety culture process takes a by-the-people-for-the-people approach by teaching what people need to know and supporting them to produce positive safety outcomes in their own corner of the world. From this, the theory assumes that the more individuals are prepared, participate in a safety-improvement process and the greater

the rate of behavioural support, the greater the momentum, which will most likely be sustained and contribute to the ultimate benefit of *"total safety"* (Geller 1999: 16; Guldenmund, 2010; Marsh, 2014; Rakowska, & Szubielska, 2013). The total safety culture theory was the most underpinning because it integrates road user behaviour with behavioural support through the classical actively caring model, which embodies traffic management and safety systems. This provided a basis for exploring the efficacious use of road traffic management vis-à-vis safety promotion. Specially, the perspectives of the theory resonated well with the perceived effects of traffic information, driver support and control as significantly priority traffic management predictors of road safety in the context of Kisumu County.

2.1.1.2 Behavioural theory

The behavioural theory or behaviour-based safety (BBS) (Aubrey, 2015) was developed by Dr. Beth Sulzer-Azaroff in the 1970s (Sulzer-Azaroff, 1978; 1982). The BBS approach entails a set of tools and methods that includes defining safe and at-risk behaviours, observing and recording related behaviours, giving feedback in a supportive manner, charting progress, and using data to motivate or celebrate accomplishments and to revise behaviour-based goals (Dulaand and Geller, 2007). For clarity, the theory concisely specifies seven basic principles on which road traffic safety is hinged. They include intervention, identification of internal factors, motivation to behave in the desired manner, focus on the positive consequences of appropriate behaviour, application of the scientific method, integration of information, and planned interventions (SETC, 2011; Sulzer-Azaroff, 1978; 1982). Once again the theory was relevant for research, for it signifies road traffic management as an intervention required to control and promote road safety as a function of desired road use and wellbeing in the road transport system.

2.1.1.3 Systems theory

This is also known as 'systems' approach to safety (Salmon, and Michael, 2009). The proponents (Rasmussen, 1997; Reason, 1990) of the theory refer to it as an integrated approach that includes the road user, vehicle and road. The theory specifies that the three are interdependent elements, which through effective traffic management, can be controlled to enhance roads safety *(*Kossiakoff and Sweet, 2003; Wasson, 2006*)*. Under

this philosophy, safety is an emergent property of the overall system. In a road transport context, safety is treated as a control problem for which traffic management processes are required to be sufficient (Salmon and Michael, 2009; SETC, 2011). For safety purposes, analysts point out that the vehicle design and condition, road design and condition, road policies, and so on, should all shape road user behaviour on the road, especially the driver (Salmon and Michael, 2009).

This means that the road infrastructure has to be designed such that it meets human capacity and limitations, that the vehicle supports the performance of tasks and provides projection in the event of risks and the road user is well trained and informed, and controlled where necessary in the correct performance of the task *(*Kossiakoff and Sweet, 2003; Wasson, 2006*).* Thus, according to the theory, safety is not solely the responsibility of front line operators- drivers and other users; rather, the responsibility is shared between actors across all levels of the complex socio-technical system including policy makers, designers, manufacturers, line managers, regulators, supervisors, and front line operators (Salmon and Michael, 2009). As noted earlier the perspectives of the theory reiterate the significant of control, which in this study connoted interplay of road traffic management and safety. In practice, such road safety promotion in Kenya is equally the mandate of county governments as partners in road transport development.

2.1.1.4 Combination theory

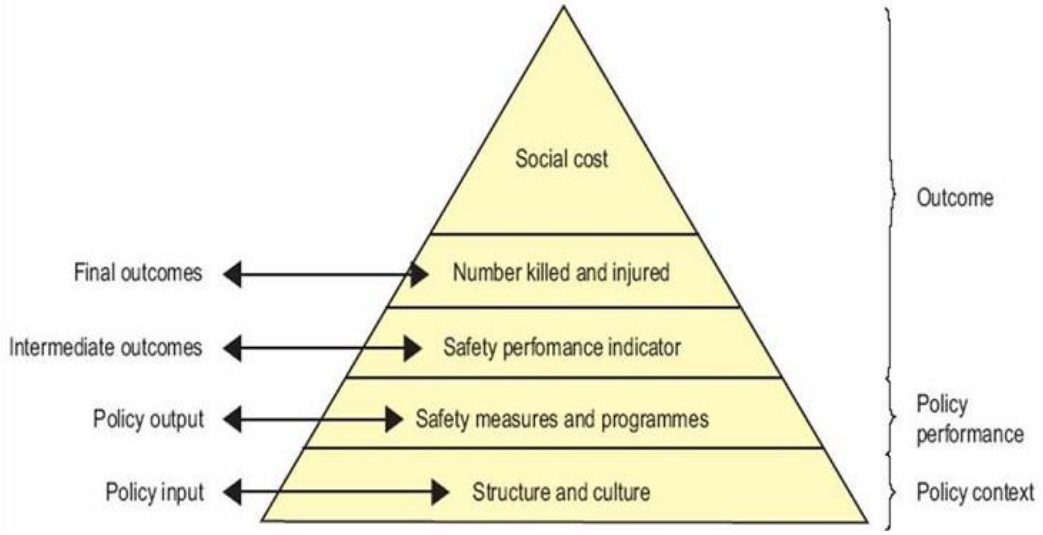
This theory integrates a number of other several theoretical perspectives that highlights potential factors underlying traffic safety and road safety in particular. The theories incorporated herein include; the domino theory, human factors theory, incident theory, epidemiological theory and the energy release theory (Gibson and Crooks, 1938). The combination theory was relevant on the basis that one model cannot be applied to all accidents.

2.1.2 Research model

A review of an existing model was made to generate and adopt a research model more aligned to the operational needs of the study. The existing model relevant to this study and preferred for review was the target hierarchy model of road safety.

2.1.2.1 Target hierarchy model of road safety

Review of the target hierarchy model was made on the basis that it is consistent with the total safety culture theory. It integrates the hypothetical insights of the theory namely behaviourism, classicism and actively caring' model through its idealisation of the road safety policy procedure, which it presents as a progression of policy input, performance and outcome (Mosink *et al.*, 2005). The theoretical beliefs and attitude of behaviouralism, classicals' shared responsibility and proactive safety support of the actively caring model regarding the safety culture can be used to define road safety policy and management. This can be in theory and practice and at any time and space not only for total but sustainable safety as well. That is why according the model, the structure of road safety performance analysis should start from the pyramidal base stating the necessary elements of the traffic management system (Luukkanen, 2003). The model adopts a Maslow's pyramidal structure only for a graphic presentation of the hierarchical importance of safety performance indicators in the road traffic management system as illustrated in Figure 2.1.



Source: Mosink *et al.* (2005)

Figure 2.1: The target hierarchy model of road safety

The figure shows that, in the target hierarchy model of road safety, three dimensions are deliberated on (Morsink et al., 2005). The vertical dimension consists of five different levels of the pyramid. In the horizontal dimension, road safety problems can be specified in a disaggregated way, per road user group, transport mode, road type or region. The third dimension is time, showing the development of factors in both the horizontal and vertical

dimensions over a given period. Each component of the vertical dimension is discussed below.

Social cost: At the top level of the pyramid, is the aggregated measure of all costs that accidents impose on the community (National Road Safety Committee, 2000). In order to determine the overall cost, several cost components need to be taken into account. Economic costs do not reflect the pain, loss of function, disfiguration, emotional stress and other suffering to the casualties and immediate families (Evans, 2004). According to Brijs *et al.* (2008), the following can be considered: property damage, lost earnings, lost household production, medical costs, emergency services, travel delay, professional rehabilitation, workplace costs, administrative costs, legal costs, and pain and lost quality of life.

Final outcomes (number killed and injured). This component represents the number of casualties and the need to reduce them as much as possible. The component can be further described in terms of road user age, transport mode, location and type of accident (Luukkanen, 2003). Road safety targets may be defined either in terms of road safety risk or as an absolute level of road safety. Targets in absolute terms are more widely understood. However, presenting outcomes as fatality or mortality rate instead of absolute numbers, and changes in mobility of the population, respectively, are taken into account. Rates per person (e.g. mortality rate), per vehicle (e.g. fatality rate) or per unit of travel (e.g. fatality risk) are often used.

Intermediate outcomes (safety performance indicator). This component represents the risk conditions of road traffic responsible for the occurrence of accidents and casualties. The indicators at this level are called safety performance indicators. The indicators provide the link between the final outcomes and the policy output. These are measured because they are generally reliable indicators of how well road traffic management interventions are working (National Road Safety Committee, 2000). A certain intervention will decrease a specific risk condition (e.g. speeding), which will eventually result in accident or injury reduction; and this should ultimately reduce the social cost. Road safety performance indicators most commonly used are those relating to behavioural characteristics, nature of vehicles and infrastructure, etc. (Luukkanen, 2003).

Policy output (safety measures and programmes). Policy output refers to the nature and context of national road safety plans, action programmes and safety related standards and legislation. Examples are the number of police patrols, the budget spent on road safety campaigns, the legal speed limit on different road types, crackdown on driving under influence of alcohol and the penalty level of seat belt violation (Morsink et al., 2005).

Policy input (structure and culture). Policy input refers to the policy context, such as public attitudes towards risk and safety, the organisation of a country and its historical and cultural background (Morsink *et al.*, 2005). This model was useful for the current study because it provided a guided direction of assessing the association of road traffic management and road safety in Kisumu County.

In perspectives, the target hierarchy model is an ideal model worthy adapting for road safety analysis in a public management context. It presents a comprehensive framework for road traffic management policy which, when effectively implemented, can help thrust road safety. It is ideally comprehensive because it integrates a logically inclusive and leading pyramid; it presents the basis of policy formulation through its pointers on structure and culture. It is also potentially guiding as regards implementation of traffic measures as a policy out and informs on consequences including the intermediate and final outcomes such as performance and social cost of road use.

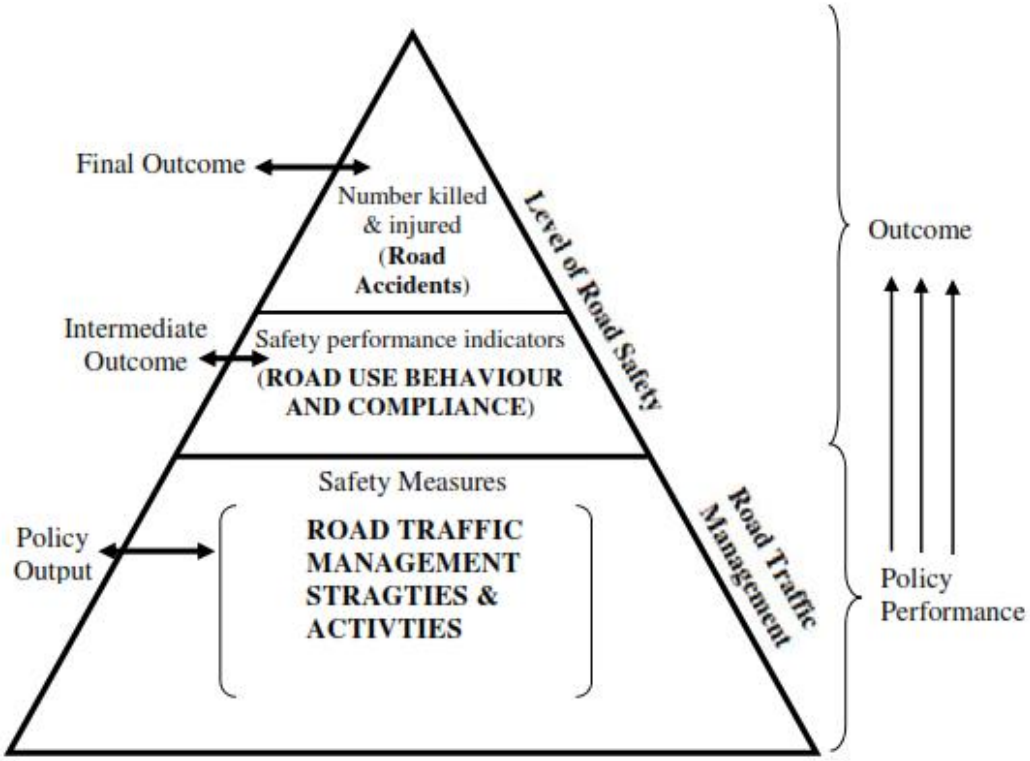
Nonetheless, the target hierarchy model is not only in theory but it is also general. So, it could not contextually represent any local analysis of road use; traffic management dynamics and road safety or consequences in a locality like Kisumu County. First, it is not particularly limited to road transport but rather can also be used for analysis of other transport systems such as railway, water and air transport. Two, Kisumu County is definitely unique from the rest of the world and the rest of Kenya. Kenya is made up of forty seven counties including Nairobi City County, the capital in the country.

Three, it is particularly too comprehensive for micro research; thus, it could not be entirely adopted for the current study that was limited to the association of traffic management, specified in its pyramidal structure as ‘measures or policy output’, and road safety, illustrated as the ‘outcome’. In that case, research based on this model could not yield a

specific, realistic and in-depth analysis. With this in mind, the following Mc'Opiyo's Road Traffic Safety Model was generated and adopted.

2.1.2.2 Adopted model: Road Traffic Safety Model

This model was the actual Research Model adopted to direct the research process. It was was derived from target hierarch model above. It was dubbed, "road traffic safety model" to resonate well the research problem, which basically centred on road safety that for long had been a contentious public administration challenge in Kisumu County. As the primary research model, the adopted model was particularly used to operationalize the research conceptual scope. It helped fashion the cause-effect correlation between traffic management and road safety as illustrated in Figure. 2.2.



Source: Researcher (2016)

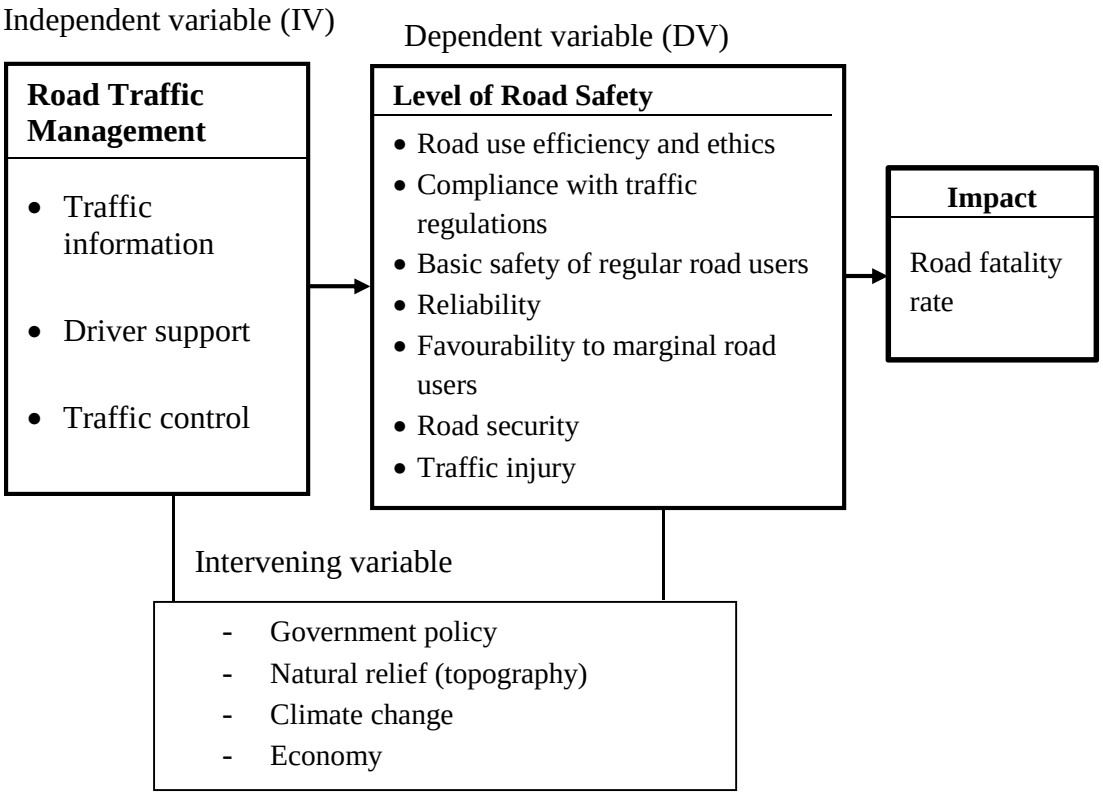
Figure 2.2. Adopted research model

The presentation in figure 2.2 breaks down the research model to which the study was preferably aligned, so as to effectively assess the influence of traffic management on road safety in Kisumu County. According to the model, the policy analysis made in this study was limited to the policy output, which centred on road traffic management strategies and

activities used to measure efficacy of road safety promotion. More importantly, the analysis also involved assessing how a change in each of the activities affected the level of road safety in the county. Road safety was measured basing on indicators categorised in the model as intermediate and final outcome. The intermediate comprise road used behaviour and compliance as safety performance indicators in both rural and urban Kisumu. Road accidents were the final outcome in the study with which the number of the people killed and injured were reviewed or investigated. The arrows in the model represent the time period in which the traffic management contributed to the outcome. The adopted model was useful as it closed the gaps detected in the existing target hierarchy model.

2.2 Conceptual framework

The conceptual framework was derived from the theoretical review to illustrate implicit variable relationships of the study.



Source: Adapted from the Total safety culture theory (Geller, 1994).

*Figure 2.3.*Conceptual framework; Influence of road traffic management on road safety

Figure 2.3 illustrates the conceptual association of traffic management and road safety in Kisumu County. Traffic management is the independent variable (predictor) while road safety is the dependent variable (criterion). The figure shows that traffic management was measured based on the parameters of traffic information, driver support and traffic control all of which as illustrated were perceived predicators of road safety in the county. The figure also breaks down road safety into specific indicators reported to be more contentious in Kisumu County. The indicators include road use efficiency and ethics, compliance with traffic regulations, basic safety of regular road users, road use reliability, favourability to marginal road users, road security as well as traffic injury. With these identified the framework singles out road fatality rate as the impact of traffic management performance.

Based on the total safety culture theory, the conceptual framework provided the basis of assessing how the constructs of traffic management predicted the level of road safety. This was reflected in the research model adapted from the target hierarchy model for road safety (Mosink *et al.*, 2005). It was also within the precincts of county government obligation on road safety needs in Kenya and Kisumu County in particular. The framework also specified the intervening variables for purpose of controlling the likely effect they could pose on the quality of research findings.

2.3 Empirical literature review

Review of empirical literature covered studies and/ or reports related to this study. The review was made under themes directly related to the research objectives. The themes include; traffic information and road safety, driver support and road safety, as well as traffic control and road safety. The review of related literature in each of the themes was based on the following considerations; focus on line literature consistent with at least specific independent variables inherent in each of the themes vis-à-vis road safety; literature with considerably scientific attention to the research variables under review, and conical analysis of literature from global, to regional, national and local perspectives.

2.3.1 Traffic information and road safety

The Global status report on road safety (WHO, 2018) highlights that the number of annual road traffic deaths had reached 1.35 million by 2018. Road traffic fatalities were reported

to be the leading killer of people aged 5-29 years. The burden was disproportionately borne by pedestrians, cyclists and motorcyclists, mainly in developing countries. This was attributed to a multiplicity of institutional factors, most prominent of which was traffic information. The report shows that while there was best practice in developed societies regarding all sorts of information required to empower and enable road users of all sorts to navigate the roads safely, in much of the developing world it was almost the opposite. Even the most basic informative traffic interventions such road traffic as signages and road safety awareness programmes were hardly sustainably facilitated for reasons typical of developing countries. Such interventions were not consistently provided for even though it could be possible (WHO, 2018). The report suggests that road safety had a significant bearing from traffic information, however there was a scope research gap because the analysis was too macro to clearly depict micro road safety experiences Kisumu County. Hence there was need for the current study that ensured more research depth and realism.

Traffic information according to a study by Arnau-Sabatés, Garcia, Muñoz & Capdevila (2013), is a critical embodiment of road user knowledge of traffic conditions and controls which in turn is fundamental for road safety promotion. In their Quantitative study about the relationship between awareness of road safety measures and accident involvement among pre-drivers in Catalonia, Arnau-Sabatés *et al.* discovered the following: It was observed that injured pre-drivers had less awareness of road safety than pre-drivers who had not been injured. That aside, was enough traffic information provided in Kisumu County? Were road users well aware of experiences and road safety measures on the roads? These were some of the big explicit questions of research since Arnau-Sabatés *et al*'s study had contextually nothing to do with Kisumu traffic management.

In their analysis of sustainable road safety practices in the Netherlands, Aarts and Wegman (2010) underscored the value of traffic information. They found out that traffic information needs of road users have no boundaries. That, such needs call for, among others, good roads with all the requisite road signages, and awareness about proper and safe road use of all sorts. They argue that such road safety practices were useful anywhere regardless of location and territory and guaranteed road safety for all. This analysis was macroscopic and about a foreign country with a different traffic context but it set a leading precedent for

the current study. It was otherwise a relevant research example which the current study sought to validate at micro level and in the context of Kisumu County.

A retrospective and prospective review was made about Road safety strategy and targets of Great Britain (McMahon, 2010). More particularly, it was realized that road safety was a human right which needed to be supported and so, the British rose to the occasion to ensure that proactive measures were adopted to empower road users control road carnage then and in the future. One of the strategies coined for that campaign was to ensure provision and use of traffic information. For this purpose, a casualty reduction target was set for Great Britain for 1987 to generate new interest and activity in road safety. This target was to reduce all road traffic casualties by a third by 2000 compared with the average for 1981–85.

The target followed an Inter-departmental Review of Road Safety set up in 1983 in the light of concern that progress on reducing casualties appeared not so significant. Between 1981 and 1985, casualties of all severities fell from 325,000 to 318,000, with an average of 322,000 over the five-year period. At the same time, deaths in road crashes fell from 5,846 to 5,165, averaging 5,598, and killed and seriously injured (KSI) together averaged 124,000. Three priority concerns were identified for redress through traffic information among other strategies: protection of vulnerable road users including school children, reconciling the demands of mobility with the need for safety, and reducing the contribution of human error to accident causation. Well, this review was motivating but could not be relied on to explain the situation in Kisumu County. It was assumed road traffic stakeholders in the county may not have similar motivation of pro-action through traffic information. The current study was thus essential.

According to a Synthesis by the UK Department of Transport (DfT, 2013), research shows that inadequate, poorly designed and maintained road signs and markings are often cited as a significant contributing factor to road traffic injuries (RTIs). Too few road signs and markings can cause driver confusion, poor traffic management and inappropriate speeding. Poorly designed and placed signs affect road safety by distracting the road user. Research also shows that over-provision of road signs and marking detract from the environment. Accordingly, too many signs and markings are thought to cause cluttering and mental

overload leading to driver distraction too. In that case, DfT recommends provision of enough road signages also as necessary and appropriate quoting the example of Great Britain as a success story.

According to DfT, Great Britain is thought to have one of the safest road networks in the world owing to the quality of its traffic signs and markings make a significant contribution. Signing and carriageway markings in the UK comply with the Traffic Signs Regulations and General Directions (TSRGD). To be effective, signs and markings were designed and implemented in a way that the messages they convey are clear, unambiguous, visible and legible. Maintenance of signs and markings is important. Whilst one of the primary objectives of road signs, signals and markings is to provide useful information to the driver so that the resulting appropriate behaviour will prevent RTIs, they also indicate legally enforceable speed regulations at specific locations. It therefore urged that clear and efficient signing and marking should be an essential part of road traffic engineering. The DfT synthesis is a good guiding analysis but was only inspirational to the current study. It was not exhaustive, for it was not only just qualitative but was also not specific about the road signages. Also it could not represent Kisumu County that presents distinct and micro traffic management dynamics and environment.

Research by Bhargavi and Kannaiya (2011) on study on the effectiveness of road traffic management in Tamil-nadu indicates that road and traffic management agencies in India started to incorporate road safety awareness in their program reforms to curtail losses of life and resources from road accidents. The study indicates a fundamental reform initiative in road traffic management but does not specify the levels of policy governance, thus leaving out a scope gap which the current study offered to address. Their study also gives some interesting scenario in citing India's national statistical trends in road accidents. It laments that it was difficult to be accurate about the number of road accidents, as many accidents, including ones where people are injured, were not reported to the Police. The study further points out that generally, only those accidents with high injury or property damage or with disputes were reported and recorded in the police stations. Comparably, traffic safety awareness gaps were only thought to be likely in Kisumu County. There was therefore need to specify and document the same.

Mirza and Seema (2013) carried out a study on knowledge, attitude and practice about road safety among peri-urban school children. The case of study was of Amal School, a private sector institution in Tulspura, Lahore. The study was cross sectional and only based on a structured questionnaire survey for collection of data from 100 children in classes four to ten. Results show that 58 percent of the respondents were males and 90% were between the age of 9 and 13 years. Major representation was from classes 4 (22 percent) and seven (21 percent). Most of the study participant, (86 percent) had ridden bicycles while motorbikes were used by only 27 percent

According to results, students of class 4, 5, 6 were not able to recognize the road signs (56 percent) but the rest of the students easily identified the road sign. The awareness regarding traffic signs was 52 percent among males and 51 percent females. The knowledge level of study participants regarding road signs was considerably high especially in case of what to do when the traffic signal lights indicate (94 percent), not to horn (79%), zebra crossing (95%) and pedestrian prohibited (75%). Students agreed that driving without a valid license is an offence (69%) and chance of accidents increase when riding bikes and motorcycles without a helmet (89%) and using mobiles while driving (92%). Of the respondent children who had ridden a bicycle and a motorcycle, only 10% wore a helmet while riding. Valid license was present with 4% students and 29% of school children had been involved in a roadside accident.

According to the study results, there was good knowledge among school children about road traffic signs in a peri-urban area of Lahore, regarding. Though results revealed that the knowledge did not correspondingly translate into prudent traffic practices, the study maintains that road sign awareness was very paramount due to traffic vulnerability on the school child especially when largely ignorant. It upheld that better wrong when knowledgeable than when not, for awareness brings hope. Indeed there is always going to be hope, and at least it was known that children in Lahore had significant traffic knowledge. In Kisumu County, such knowledge among local children was a matter of research. Besides, Mirza and Seema's study left an approach research gap for it was only qualitative and thus lacked detail.

Similarly, a study had been conducted by Swami, Puri & Bhatia (2006) about Road safety awareness and practices among school children of Chandigarh, India. It was found that 40% of 787 students involved in the study lacked correct knowledge of traffic safety rules. In particular, knowledge of correct speed limit was lacking in 67.3% of the respondents. Girls were more aware of traffic rules to be followed at traffic lights (63%) and while crossing zebra lines (41.2%), whereas boys were more versed with rules for pedestrians (49.8%). Around 60% of these children had correct knowledge of risk factors. The awareness was almost the same in both government & private schools as well as in males & female students.

The study also found out child awareness about traffic rules corresponded with vulnerability of children to traffic risks in and beyond the Union Territory (UT) of Chandigarh, including the rural territories linked to the city. According to Swami et al. (2006), Chandigarh is one of the modern cities in India with a population of 1million people. Specifically, it was reported that knowledgeable children were less vulnerable than the less or non-knowledgeable. This was because the more knowledgeable children were said to be more cautious in navigating road traffic. This study motivated the current study as it induced the desire to find out what happens in Kisumu County which also depends on Kisumu City for much of child education needs. It was also notable that the study was more than a decade old and so, there was a temporal gap for current research.

United Nations Economic Commission for Africa (UNECA, 2018) conduced a review on road safety performance in Uganda and the findings were not encouraging. The first of its kind, the review gathered that the magnitude of the road safety challenge in Uganda was serious and the country seemed highly unlikely to achieve the goals of the United Nations Decade of Action for Road Safety (UNDARS), of stabilizing and reducing the forecast level of road fatalities by 2020. According to the review, unless effective interventions were implemented, road crashes were expected to increase and even double within the next ten years. By 2016, in the previous decade alone recorded road crash fatalities rising from 2,597 to 3,503 representing a growth of 25.9%. The accident severity index was 24 people killed per 100 road crashes. Averagely, 10 people were lost daily in road traffic crashes, being the highest road fatality rate in East Africa. The total annual cost of road crashes

was estimated at approximately UGX 4.4 trillion ($1.2 billion), representing 5% of Uganda's GDP (UNECA, 2018).

According to the review, this road fatality menace was partly attributed to road traffic information which unfortunately failed to attract the sufficiently appropriate interventions. While there was a related national policy, there was no mechanism to ensure its implementation due to several challenges in institutional management with regard to coordination, research and knowledge transfer. Road crash data management was poor and far below generally accepted international standards. The road crash data collection, analysis and usage were not well aligned. The related Road Crash Data Systems (RCDS) project that cost $2 million and had reached 75% completion stalled due to cancellation of the Transport Sector Development Programme (TSDP). In addition, public road safety awareness programmes were never optimized (UNECA, 2018).

The only main event championed by the Government of Uganda was the annual National Road Safety Week and there was opportunity to strengthen both the child and youth safety awareness programmes (UNECA, 2018). Nonetheless, these were enough to counter road carnage at least in the short run. UNECA's (2018) review on Uganda's traffic information and road safety was only a learning example for road safety research for Kenya, as it could not explain similar road safety experience particularly in Kisumu County because of locational and contextual differences. There were therefore geographical and contextual research gaps for the current study to address.

A study by Harun (2015) assessed road user's awareness on strategies for controlling road traffic accidents in Kigoma- Ujiji Municipality in Tanzania. The study was based on a combination of qualitative and quantitative methods to collect and analyse data from 100 respondents involved in the field survey. The findings show that knowledge of traffic rules varies greatly among respondents by type of road user, with vehicle drivers scoring highest and pedestrians being the least knowledgeable of all. One of the reasons given for the reported gaps in traffic awareness was that, information on traffic rules and/or guidelines was supposed to be diversified and a routine which authorities could consistently do because it was more demanding. The study therefore recommends increasing and diversifying road user education, tailored to specific needs of each group as one of the key

strategies of improving road safety in Ujiji Municipality and the environs in Kigoma. What could have happened in Kigoma, Tanzania could also happen in Kisumu, Kenya vis-à-vis road traffic management and safety. However, there was need to prove that, considering the geographical and institutional differences of the two locations, thus the need for the current study.

Ezeibe et al, (2017) conducted a qualitative study to assess the impact of traffic sign deficit on road traffic accidents in Nigeria. They engaged 720 commercial vehicle drivers for field survey. Result shows that failure of government to provide and maintain traffic signs in order to guide road users through the numerous accident black spots on the highways was the major cause of road accidents in Nigeria. The study reports how this was regrettable because warning road users about black spots was not so demanding compared to the routinely required education on traffic rules and guidelines; traffic risks at black spots were occasional.

In light of the perceived discrepancies above, Ezeibe et al, (2017) notes that the government should have managed the challenge of traffic warning road signs according to best-practice which usually recommends provision and maintenance of traffic signs enough to guarantee road safety. Ezeibe et al's recommendation was admirable in relation to what transpired on Nigeria's roads. However, what happened in a micro and different context of Kisumu County was not known and thus warranting the current study

In Kenya, Manyara (2016) carried out a study about combating road traffic accidents in the country. The study identifies traffic ignorance and less compliance to traffic rules and guidelines as antecedents of Road Traffic Accidents (TRAs), which has in turn been a major cause of death and disability in the country just like around the world. It specified that over 3000 people in Kenya die through road accidents every year, most of them between the ages of 15 and 44 years. The cost to the economy from these accidents is in excess of US$ 50 million being exclusive of the actual loss of life. The study was relevant as it links road fatality to lack of enough awareness among road users, but it is macro; it

was not about Kenya as a whole and thus lacks detail of the grassroots. It also does not proportionately show how much people know about road safety needs and systems.

A study on factors that influence the incidences of road accidents in Kenya (Kasau, Mang'uriu, and Diang'a 2017) provided some encouraging insights for more research on the roads safety implications of traffic information. The study was a case study survey of black spots along Mombasa-Malaba road. A myriad of factors were identified in the study as causes behind as being the frequency of road accidents at such black spots. They included road surface conditions, vision, speeding, bad breaks or tyres, and trees along the roads. However, the most prominently observed factor was traffic information. It was reported that the existing road safety information was not based on scientific findings. It was therefore subjective and not reliable. This simply posed a content research gap for the current study to justifiably generate data on road traffic information and its influence on road safety more over in geographically distinct but contextually similar areas in Kisumu County.

2.3.2 Driver support and road safety

The WHO (2018) status report on road traffic injuries indicates that vehicle safety is increasingly critical to the prevention of crashes and has been shown to contribute to substantial reductions in a number of deaths and serious injuries on the roads world over epically societies that adopt intelligent driver support technology. According to the report, features such as electronic stability control and advance braking are good examples of vehicles safety standards that can prevent crash from occurring or reduce the severity of injuries. Eight vehicle safety standards have been prioritized for implementation by countries.

The UN recommended vehicle safety standards to include the following: frontal impact protection and side impact protection; electronic stability control; pedestrian front protection; seat belt and seatbelt anchorages; child restraints; motorcycle antilock braking system. As result of the potential benefits of such safety driver support measures, countries across the world started to adopt the vehicle safety innovations. Nonetheless, the review reveals that not all new and used vehicles are required to be fitted with these internationally recognized safety standards. As such, 40 countries representing 1 billion people,

implemented at least 7 or all of the 8 vehicle safety standards, while 124 countries were adopting 0 or 1 of the standards (WHO, 218). What happened in Kenya and more so in a remote rural and urban Kisumu county was a question of this research. The WHO review was just an eye opener for the study as it could not specify the goings-on in such localities of the world, yet the 8 safety standards were very necessarily relevant to near essential enforcement by virtue of their international recognition and recommendation. There was thus need to address content, contextual as well as approach research gaps triggered by the WHO (2018) report.

According to previous research on acceptance of driver support systems in Sweden (Adell, 2014), the last one and have decades have seen substantial development of different driver support systems aimed at improving traffic safety. The study cites a number of such systems adopted in Sweden namely, Lane Departure Warning (LDW), Automotive Collision Avoidance System (ACAS), Forward Collision Warning (FCW), Electronic Fatigue Monitoring (DFM), Road-Departure Crash Warning System (RDCW) and Intelligent Speed Adaptation (ISA). They were developed and initially tested and proved highly useful for promoting efficient and safe driving. However the study observed that these technologies would be successful in reducing fatalities and trauma, only when they were to be accepted by drivers.

Driver acceptance of the systems is vital, and it was therefore an issue of concern in Sweden. On a positive note, the study reported that the driver support systems were largely accepted in the country mainly in metropolitan areas. No wonder, road injuries in the country significantly reduced in advent of the technologies (Adell, 2014). A local Kisumu driver could not be compared to a superior Sweden counterpart, and there was suspicion that such systems could still be strange in Kenya and particularly an upcountry Kisumu County. There was therefore need for drive support technology research. Besides, the study left content research gap as it presented such driving support as a dependent as an independent variable.

In their report, Truls, Terje and Rune, (2012) identify several driver support systems used to reduce the number of fatalities in Norway; Intelligent Speed Adaptation (ISA), maximum speed governor, Alcolock, seat-belt lock, sleep/fatigue warning system,

programmable, electronic ignition lock ("Smartcard"), adaptive cruise control (ACC) and electronic stability control (ESC). According to their findings, the most effective is ISA with an estimation of 41 lives saved per year; the least effective system is a maximum speed governor with an estimate of 8 lives saved per year. Estimates of lives saved for the other seven systems vary between 15 and 38 lives saved per year. These are effective driver support systems but their application locally was not known thus the need for this study to explore the kinds of systems used in Kisumu County to reduce road safety risks.

Shunichi (2006) had indicated in his study on technological development of driving support systems, that cruise assistive systems are of growing importance in achieving both road traffic safety and convenience. He noted that such driver support was used in Japan to achieve, with the highest possible quality, nothing less than "driver-vehicle symbiosis under all conditions." Such systems were significant but could they be associated with the road safety situation in Kisumu County? Like the above mystery, this was a content question for the current study to address. At the same time, Shunichi (2006) discovered that many traffic accidents result from improper driver behaviour notwithstanding the support systems. He did not however clarify.

The mix-up above is underscored by Kazunori and Takeshi (n.d.) who in their evaluation of driver behaviour in Japan, explain that driver support systems, such as Adaptive Cruise Controls and Lane Keeping Assists, are believed to negatively change driving behaviour. These changes allow drivers to ignore the tasks performed by the driving support system, which can cause dangerous driving circumstances. They cited a few reasons that can account for the increased danger. First, decreasing driving responsibilities can make a driver lazier, while increased driving tasks require a quicker and more accurate understanding of the system. Second, an observant driver may disagree with the system's assessment of a situation. This means the current study was to be critical in assessing the consequences of driver support systems in Kisumu County.

Previous analysis was made by Tanya (2017) about travelling to developing nations with specific concern on lax vehicle safety standards. She points out that most of the latest vehicle safety features, which car buyers in developed societies like the United States must have fixed for driving support hardly exist in many developing countries. Some of the

safety features she identifies as being credited with saving lives include anti-collision systems, airbags and electronic stability control among other crash protections. According to the European Union (EU, 2006), the lack of such features, which appears most recent in most developing countries like Kenya could be attributed to the following factors: high purchase costs, costly servicing, distraction of the driver in terms of false feelings of security, fear of malfunction and unreliability of such electronic systems. Well, Tanya's analysis was just an eye opener which needed to be researched for specific proof in local societies like Kisumu County because all developing countries have same traffic management and driver support dynamics. Same applied to relations of the EU's Eurobarometer. There were contextual and specificity research gaps not addressed in such previous analyses.

Bhargavi and Kannaiya (2011) nevertheless found out that road accidents were increasing in Tamil-nadu and that road transport was associated with increased vehicle fleet and speed. They indicated that there were 1,734 deaths and more than 11,000 people injured from road accidents only in one year of 2009/10. The study quoted India's estimated annual national loss from road accidents as more than £ 9 million. This study was a good example but could not specifically epitomize the situation and thus the need for the current study that would eventually address the contextual gap.

In South Africa, a study was carried out by Luke and Heyns (2014) on reducing risky driver behaviour. It was a qualitative case study specifically about commercial fleets. It reveals that the country had one of the highest incidences of road accidents in the world partly because of unsafe driving behaviours. The study learnt that the risk of such behaviours could be corrected through the implementation of a driver risk management system part of which included driver support technologies such as speed governors, anti-fatality airbag and seat belt locks. These were widely adopted in such commercial vehicles although there were reportedly unsustainably maintained in many others.

The study also reveals a few cases of using more advanced assistive safety gadgets that were however reported to be more common in private vehicles than public transport. Otherwise it was reported there was still need for managing the riskiest driver behaviours which account for persistently more serious incidents and accidents. Generally, the results

indicate that through the implementation of an effective driver risk management system, risky incidents were significantly reduced (Luke & Heyns, 2014). What was discovered by Luke and Heyns' study with regard to such driver risk management could also happen in Kenya but the issue is that the analysis was more complex in terms of scope and contextually different compared to Kisumu County. Local research was thus necessary to address scope and context related lacunas.

The fact sheet for road safety in the WHO African region (WHO, 2013) specifies that while this region possesses only 2% of the world's vehicles, it contributes 16% to the global deaths. Nigeria and South Africa have the highest fatality rates (33.7 and 31.9 deaths per 100 000 people per year, respectively) in the region. More than one in four deaths in the African Region occurs on Nigeria's roads. Kenya is part of the seven countries in the region including Nigeria, Democratic Republic of Congo (DRC), Ethiopia, South Africa, Tanzania, and Uganda that account for 64% of all road deaths in the region. World Health Organization (2013) partly attributes this regional traffic quagmire to poor driver support including poor or lack of enough driver training as well as poor roads. The country road traffic fatality positions are undeniable but regional differentials were not sufficiently accounted for with regard to driver support. There was therefore need for the current study to fill the conceptual gaps with the possibility of discrepancies in supportive vehicle safety gadgets and the Boda boda laxity in Kisumu County.

Girma (2013) made an assessment of progresses and challenges in road safety management system in Africa on behalf of Africa Development Bank's Transport & ICT Department. Seventeen countries were surveyed for this purpose including Kenya. According to the assessment survey, road crash is a growing problem in Africa resulting into close to 1000 deaths, tens of thousands of injuries and enormous amount of economic losses every day. The specific characteristics of victims in the region signifies that road crash is the fourth leading cause of deaths of people aged 5 - 44 years; over 75% of the casualties are of productive age between 16 - 65 years; and the vulnerable road users constitute over 65% of the deaths. Compared with other regions, the losses caused in Africa are proportionate to the level of motorization and road network density. The report notes that unless appropriate comprehensive and effective actions are taken timely, the specific regional

causes of road crash indicate that the disaster will rapidly increase and have unbearable impacts.

One of the key factors exacerbating road traffic fatality is poor driver support. Among the driving support deficiency reported was neglect of automobile safety features. These among others include the old safety gadgets that have for decades been on Africa's automobile market such as the seatbelt, speed governors, anti-fatality air bag, among others. According to Girma (2013), disregard of such vehicle safety gadgets could be attributed to deliberate aversion by vehicle owners and/or operators as well as the laxity of traffic enforcement despite the existence of related legislation. Despite that, 94% of the countries have vehicle safety legislations, only half of the countries are keen on the use of such safety devices. The assessment above was revealed quite relevant automobile and road safety issues but it was too macro and more of applied research to explicitly explain the plight of Kisumu County. There was need to address the scope gap in more scholarly fashion.

In South Africa, Khan and Sinclair (2016) examined the importance of safety features to new car buyers. The related surveys involved 176 recent car purchasers and 32 car dealership salespersons in Stellenbosch and Mthatha. Results show that, while private purchasers demonstrated interest in the safety performance of vehicles, for most buyers, reliability was the most significant factor followed by vehicle cost and comfort. Safety trailed behind all these considerations. In that case, dealerships conveyed less safety information to consumers thereby prioritizing reliability, costs and other factors. Yet in South Africa, safety performance is highly regarded as one of key determinants of safety of road users. No wonder Vanderschuren, & Irvine (2002) had attributed road safety concerns in the country to vehicle safety. The two studies were about South Africa not Kenya whose territories present distinct traffic contexts and dynamics including Kisumu County.

In Kenya, Gichaga (2016) conducted a qualitative study to examine the impact of road improvements on road safety. The study underscores the significance of road maintenance on the road not only in the country, but also the surrounding great lakes region. The study discusses two case studies: one, 50-km Thika Super Highway, a high-class, high-traffic-

volume road and two, the Northern Corridor transnational road. The Northern Corridor is the transportation corridor that links the Great Lakes' Countries of the Democratic Republic of Congo, Burundi, Rwanda, and Uganda from the port of Mombasa in Kenya (Gichaga, 2016).

The study results show that road improvements to the Nairobi -Thika Highway (a trunk road) have attracted many investors along the highway corridor due to its boost of road safety. It is also reported that the rehabilitation of the Northern Corridor from Mombasa on the Kenyan coast to the border with Uganda has led to significant road safety improvement despite the road traffic woes that persist.

The monitoring and evaluation report (IATSS, 2015) on the Northern Corridor cited in Gichaga (2016) shows that drivers are the major contributors in causing accidents, with a component ratio of 49.4%; pedestrians are next at 21.7%. The report also indicates that 24% of the accidents along the Northern Corridor are fatal, which remains major concern. On account of this, the evaluation report recommends improvements in the geometric design of the road, driver training and behaviour, vehicle maintenance, and the need to enhance road safety through the utilization of road safety parks where road users can undergo training and drills on road safety aspects (IATSS, 2015). The Gichaga's study was about Kenya but on specific roads that could not even sparsely represent road driver support and road safety in Kisumu County. True, the Northern Corridor traverses the county but it is single go through segment of the transnational stretch. So, there was need to bridge the scope and geographical research gaps.

In a study by Chitere, (2014), most of Kenya's driving schools reported to be significantly commendable as regards the quality of training. The study was about the implications of training, testing and licensing of drivers of public service vehicles on compliance with traffic regulations in Kenya's City of Nairobi. Fifty two (52) drivers from 13 routes situated along four major corridors of Nairobi City were involved. According to results, respondents (drivers) generally reported that local driving schools received commendation within Nairobi and beyond as well as from outside the country. As of 2014, reports show that there were 28 commercial driving schools. The most widely known of these schools

included: Sony, Rocky, Heltz, Glory, Wings, Automobile Association of Kenya (AAK), National Youth Service, Senior, Wajimmy and Glen Edmunds. Some of these schools have had branches within and on the outskirts of Nairobi City. The study results also show, although majority (61.5%) of the respondents reported to have poorly complied with traffic regulations, those who had attended professional driving schools were sufficiently compliant. According to Automobile Association of Kenya (AAK, n.d.), quality of such driving schools was partly attributed to the standards schooling syllabi. It is for this service quality that some of the driving schools above have been benchmarked from elsewhere in Africa, especially East and Central African countries. Although this study and AAK report held a lot of clout for driver support research, they were not about Kisumu County which is not only different geographical locality but was also suspected to have distinct traffic management dynamics for local driving schools.

In research paper about Boda boda motorcycle safety in Kenya, Moraa (2016) linked knowledge and practice among operators, the riders particularly in Kisumu. A sample of 370 respondents was involved from among Boda boda riders in the descriptive research survey. Descriptive research results indicate that, majority (66.5%) had low level of motorcycle safety knowledge and low levels of rider formal training. In addition, the chi-square test indicated a highly significant relationship between formal rider training and level of motorcycle safety knowledge. Therefore, lack of enough training significantly contributed to road safety risks. The Boda boda riders engaged in unsafe riding practices and this compromised their safety and those of their pillion. The unsafe riding practices for instance, overloading, non-use of helmets and using mobile phones while riding, were attributed to inadequate motorcycle safety knowledge due to lack of formal training among riders. Moraa's research was very closely relevant but it was concentrated mainly on Kisumu City. There was therefore a territorial research gap left for the current research.

2.3.3 Traffic control and road safety

Sminkey, Garwood, and Härtl (2018), in their assessment of the WHO's highlights on world road safety, report that traffic control was regarded as almost the underlying traffic management practice as it integrates both reactive and proactive measures in road safety promotion. They point out that existing road safety efforts in some middle- and high-

income countries have mitigated the road safety situation owing to proactive traffic control strategies. Nevertheless, it was reported that this wasn't the same on most of the developing countries, which were perceived to be largely inclined on reaction or solutions than prevention.

In the settings where progress has been made, it is largely attributed to better legislation and timely enforcement around key risks such as speeding, drinking and driving, and failing to use seat-belts, motorcycle helmets and child restraints; safer infrastructure like sidewalks and dedicated lanes for cyclists and motorcyclists; improved vehicle standards such as those that mandate electronic stability control and advanced braking; and enhanced post-crash care (*Sminkey, et al.*, 2018).

It was revealed that the WHO report documents these measures contributed to reductions in road traffic deaths in 48 middle- and high-income countries. It was reported that, not a single low-income country had demonstrated a reduction in overall deaths, in large part due to their reactionary approach with similar measures, some of which were lacking such as recent and more advanced vehicle safety standards (*Sminkey, et al.*, 2018). This seemed like hearsay for parts of the world like Kisumu County due to lack of specificity; not even Kenya was mentioned but rather the assessment was only generalised. There was thus need to cover the specificity research lacuna defined by contextual differences.

In their qualitative study about urban road traffic safety management, Hu, Zhou, Zhao and Liu (2005) specify that in China, government and other stakeholders at national and local levels have given due diligence to the implementation of the road traffic safety law which was enacted in May 2004. The law provided the basis for road transport policy reform, road transport institutionalization and traffic safety in the country. They note that this was reflected in the spirit of "human being-oriented" road transport management that pays due attention to the people and personal security. They found out that road traffic safety promoters emphasize the road traffic law for safety regulation and implementation of traffic controls with the ultimate objective to reduced road accidents. This study signified effective implementation of the road traffic law and policy in China, at local government

level but it is old, was only qualitative and carried in another country, hence presenting temporal, approach and contextual research gaps for the current study to fill.

The WHO (2013) in its factual report on road safety management, observes that there can be little progress expected from lead agencies with neither working targets nor enough funding. This perhaps explains Chiduo and Minja's (2005) study findings which show that despite Tanzania's commitment to tackle the road safety problem, the frequency of accidents instead increased with the cost of road accidents shooting high at Tshs. 20 billion annually. Overloading on the major highways was estimated at 20-25% hence being one of the causes of undue damage to the road pavement. Whether this is the same within county institutions such as traffic agencies in Kisumu County, it is not clear due to lack of recent related reports (content gap) as well as contextual and location differences.

In a related study about traffic management problems in Lagos, Olaogbebikan, *et al.* (2013) found out several social and institutional causative factors of road safety risk. These include indiscriminate parking, loading and off-loading of goods and passengers on the road, and on-street trading (social) as well as over dependency on small occupancy vehicles, narrow road, inability of the traffic management agencies to evacuate crashed or breakdown vehicles on time and ineffective traffic control measures (institutional). These are factors that well account for the road safety problem but the study left out traffic information which in Kisumu County were the underlying factor to such causes specified.

According to a study by Chiduo and Minja, (2005), the government of Tanzania made a commitment to tackle the road safety problem by adopting a comprehensive road safety program. This program has however yielded results after giving emphasis on the traffic legislation, institutional set up of road safety activities, law enforcement, and road traffic management. The study shades light on similar policy and institutional efforts that have been made in Kenya but it captures a broader spectrum and was thus not exhaustive about road transport management thus leaving a depth gap.

With regard to traffic control UNECA's (2018) review of Uganda's recent road safety experiences also found out that the lack of enough commitment to enforcement of traffic regulations could have also compounded the problem of road fatalities and injuries faced

in the country. The review reports that although the country had a robust regulatory transport framework, several challenges compromised implementation of such policies and regulations. The entire country and, particularly Kampala City, was reported to be served by an unregulated public transport system, with most of the vehicles in poor mechanical condition, coupled with poor driving skills that contribute to road crashes. Most vehicles operated largely outside the transport regulatory framework. I was established that Uganda did not have an up-to-date framework for monitoring and evaluating road safety on a regular basis as required by the African Action Plan for the Decade of Action for Road Safety (AAPDARS), nor a practice of working towards a national road safety strategy.

The review also discovered that the driver licensing system; training, testing and certification in Uganda needed urgent improvement. Uganda driving standards were found to be of poor quality, with driver behaviour leading to a large number of accidents. Traffic rules were well established and provided for under the Traffic Act 17 but enforcement activities were not effective enough to yet sustainably deter unsafe traffic behaviour such as speed, drunk driving and neglecting of seat-belt use. Challenges to implementation of traffic rules were further exacerbated by the traffic police operating with just 40% of staff. In Uganda, enforcement of such rules is primarily the mandate of the traffic police force as one of the departments of the national police service. The review reports that such severe manpower shortage compromised effective enforcement of traffic rules (UNECA, 2018).

It was further found out that traffic police also faced severe logistic challenges including lack of speed guns and patrol vehicles. It was observed that given its high road-crash rate, Uganda required a robust emergency response and care system to address the high number of road injury cases. However, post-crash response and care in the country was poor, particularly on up-country roads (UNECA, 2018). This review presented startling picture of what traffic control can appear and cause to road safety if proper interventions are not made. However, all this only served a lesson for research on Kisumu County because the context and macro scope of the review were different from the county. Otherwise, there was need for the current study to fill the perceived contextual, scope and approach research gaps.

Mukabanah (2012), in his paper on Transport Reforms in Kenya, observes that the adoption of the Integrated National Transport Policy (Sessional Paper No. 2 of 2012) was a big stride but failure by government to create relevant institutions, to develop transport plans, human capacity and adopt Intelligent Transport Systems (ITS) has led to unsustainable road transport management regimes. This has also been the reason why so many studies done in the Ministry of Transport (MoT) have never been implemented. This paper provided a significant glance on the challenges to transport policy implementation in Kenya but did not specifically cover road traffic control at county level thus leaving content and contextual research gaps.

Similar to Chiduo and Minja's (2005) study, Mukabanah (2012) also found out that road transport in Kenya is characterised by many externalities such as accidents, pollution and congestion due to a poor road transport regulatory and management regime. The result has been the entrenchment of bad motoring attitude and a Matatu (Para Transit) culture cultivated by a corrupt regulatory and enforcement regiment. The study gives real facts but it was macro with no specificity, thus leaving a scope gap.

In a study on the effects of the 'new' road safety regulations on passenger service vehicle operations in Nairobi, Kenya (Kipkosgei, 2009), it was found out that the new regulations were generally good, however poor implementation and enforcement has hindered safety promotion. This is also reflected in Manyara's (2016) study about combating road traffic accidents in Kenya. Manyara notes that although a lot has been done on policy formulation, implementation and regulation on road design and use, full and meaningful participation by stakeholders still need to be stepped up in order to address the road safety menace effectively. This was ideal but the two studies do not show the mandate of counties specifically in road traffic management thus leaving a role devolution analysis gap.

A study by Olemo (2016) sought to explore the major causes of road traffic accidents in Nairobi County. The apparently prominent cause observed in the study was the laxity associated for enforcement of traffic rules. Driver and vehicle related were widely identifies as the leading causes of frequent accidents in the county. The most singled out offense s associated with driver behaviour and the vehicle were speeding and vehicle safety violation. If this could happen in the only capital city of Kenya, Nairobi how about

Kisumu? Yet Nairobi was expected to the epicentre of best traffic control! Besides, the two counties are not comparable geographically. The current research therefore sough to address this geographical research gap.

2.4 Conclusion

The literature reviewed above was significantly related to the current study as it revolved around traffic management and road safety. The most specifically relevant to study was empirical literature because it aligns with each of the traffic management activities or parameters preferably used to explain the level of road safety in Kisumu County. Empirical literature review was prominently relevant as it was the basis of spotting existing research gaps in previous related literature, which warranted empirical testing. The most significant of the research gaps was the content specificity gap. Previous literature could not specifically explain the effects traffic management activities of road traffic information, driver support and road traffic control on all individual indicators of road safety specified in the conceptual framework. These are implicit variables the current study analysed to raise information on the research problem mirrored in the theoretical framework.

The theoretical review specified the total safety culture theory as the most relevant and theoretical framework this study generated from. The theory was the most underpinning, for it integrates binding theoretical insights relative to road traffic management and safety. The theoretical review also illustrated the target hierarchy for road safety model as a useful direction for guided assessment of the research variable association. The empirical literature was reviewed under themes associated with the research objectives on the traffic management activities above and road safety. The respective theme reviews also presented other several research gaps including the scope research gap, in-depth analysis gap, temporal gap, approach gap, contextual research gap, as well as the content gap, research accuracy gaps, role devolution analysis gap, locational gaps and content clarity gap. It was bound on these gaps that the current study claims originality and was deemed essential for policy and academic significance.

CHAPTER THREE

RESEARCH METHODOLOGY

3.0 Introduction

This chapter describes the research methodology deemed useful for the empirical study and analytical phases. For this purpose, it covered the research philosophy, research design, population of study, sample size, sampling procedures, research instruments, validity and reliability of instruments, data collection procedures and techniques of data analysis. Research ethical considerations are also presented.

3.1 Research philosophy

According to Saunders, Lewis & Thornhill (2012), research philosophy refers to a belief concerning how data about a phenomenon should be gathered, analysed and used. This study adopted the Post-positivism Philosophy.

3.1.1 Post-positivism Philosophy

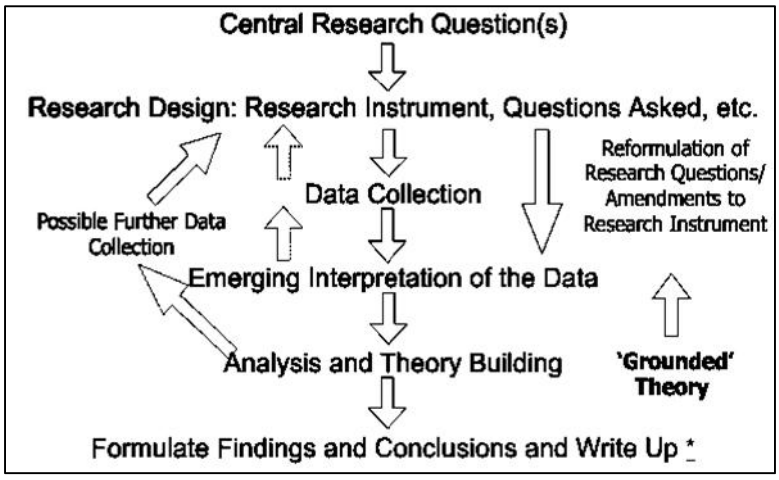
According to Taylor and Medina (2013), post-positivism is a modified paradigm distended beyond positivism for comprehensive social science research. It is a metatheoretical stance that amends positivism (Bergman, 2016). This paradigm has the same principles as positivism, but recommends more inclusive and exhaustive research procedures (Willis, 2007), considered ideal for the current study.

For a better understanding of post-positivism, it was conceptually relevant to clarify the notion of positivism. According to positivism, social science seeks to gain predictive and explanatory knowledge and to do this, research must involve theories consisting of highly general statements, expressing the regular relationships (Uddin & Hamiduzzaman, 2009). In positivist research, data collection is mainly based on field surveys or observations that usually require very little physical presence of the researcher. The observations yield quantifiable data which call for only statistical analyses (Collins, 2010). This means, positivist studies adopt a deductive approach as a general rule (Crowther and Lancaster, 2008).

While positivists emphasize independence between the researcher and the research subject or object, post-positivists postulates that only longer physical interaction from the

researcher can influence what is observed (Robson, 2002). For that reason, post-positivists pursue objectivity by recognizing the possible effects of biases (Miller, 2007; Robson, 2002; Taylor & Lindlof, 2011). Particularly, while positivists emphasize only quantitative methods, post-positivists recommend both quantitative and qualitative methods for collection and analysis of data (Taylor & Lindlof, 2011).

Due to the outward post-positivist perspective this study employed a mixed approach methodology useful for generating deductive and inductive information. This inclination was realised through the following grounded theory that structured the preferred research design, sampling strategies, data collection, analysis and interpretation techniques.



Source: Source: Raddon (2014)

*Figure 3.1.*Post- positivism derived research grounded theory

Besides, the philosophically intended theoretical framework, the essence of post-positivism also induces a research model design such as the one adopted in this study. The research model just as recommended by the post-positivism philosophy supported a mixed quantitative and qualitative approach. It was useful for generating deductive and inductive information.

3.2 Research design

This study adopted an exploratory descriptive correlational research design. The design was multi-faceted because of the contextual perspective of the research problem. Such a design structure was exhaustive as it helped to explore and describe particular phenomena

as lived experiences even in a composite research population (Groenewald, 2004; Wimpenny & Gass, 2000). In particular, the research design was used to explore and spell out the efficacy and implications or co-variance of road traffic management parameters vis-à-vis the level of road safety in Kisumu County. The traffic management parameters and the road safety indicators of interest in this study are identified in the conceptual framework in chapter two. These are implicit variables that had not received specific scholarly assessment. The exploratory facet of design was useful for research ascertaining an unfamiliar research problem (Van der Mescht, 2014), while descriptive design facet was adopted to answer questions of *who*, *what*, *where*, *when* and *how* related to the research problem (Creswell, 2007; Murphy, 2013). According to Zoëga (2008), correlational facet was used to determine co-varying linkages between variables. The study was more qualitative because of its in-depth analysis needs and integrated some quantitative procedures to enhance logic and comprehensive analysis (Harwell, 2010; Neuman, 2003).

3.3 Research approach

The research design was based on the quantitative and qualitative approach crafted for data collection and analysis. The quantitative approach involved the use of the questionnaire for data collection and statistical tools for data presentation, analysis and interpretation. The qualitative approach involved the use of the interview guide for data collection and detailed reporting tools for data analysis and interpretation. The study assumed a quantitative and qualitative methodology, because the quantitative approach is more logical while the qualitative approach is more interpretive for effective data collection and analysis. Both approaches are systematic and sensitive to the quality of data (Harwell, 2010; Neuman, 2003).

3.4 Study area

The area of study covered Kisumu County, South Western Kenya. The County land area covers 2009.5 km² (PAI, 2015), all of which was targeted for research considering the road network stretch and distribution. Kisumu County is bordered by Siaya County to the West; Vihiga County to the North; Nandi County to the North East; Kericho County to the East; Nyamira County to the South, and Homa Bay County to the South West (Figure A1, Appendix 1). The county is home to Kisumu City, the third largest urban area in

Kenya after Nairobi City and Mombasa City in that order. The city was the administrative capital of the former Nyanza Province and therefore, it forms a focal point for road traffic in South Western Kenya and beyond (KCG, 2013). This study was however not limited to Kisumu City. It covered the whole county including rural areas, which are equally connected to the region and the rest of Kenya through roads stretching to the neighbouring counties. The county has a shoreline on Lake Victoria, occupying northern, western and a part of the southern shores of the Winam Gulf (KCG, 2013). The county and its target population adequately represented South Western Kenya and the surrounding areas in this road traffic management and safety research due to the comparably immense road traffic activity (ASIRT, 2014) described in Appendix 2.

3.5 Population of study

The target population included the adult population in Kisumu County. This study was applicable to the entire population in the county, but for field survey purposes, it particularly targeted the adult population because it was deemed mature enough and helpful for providing the required information about the research problem. The county population projection for 2016 was 1,098,560 people of which 56% accounted for the adult population. This means that the adult population in the county was 615,194 (KCG, 2013; KNBS, 2013; 2016). According to Salkind (2003), such a target population is too big a number to mobilise for the sample field survey. As a result, the study narrowed to the accessible population, which according to Mugenda and Mugenda (2003), is also known as a study population. This was manageable for the eventual selection of the sample population. The accessible population entailed several population categories summarised in Table 3.1.

The most contentious but equally notable of the categories were consumer associations preferably earmarked to represent the local adult population. In Kenya's road transport subsector, passenger groups are referred to as transport consumer associations. These were used to ensure a workable and right criterion for selecting and engaging local masses in the field survey. This was based on three grounds. One, the associations were constituted by local masses believed to potentially provide unbiased perceptions based on their experiences on road safety in the county. Two, they were believed to be organised groups of road users specifically identified as consumers, and hoped to be the keenest among the

local masses about road safety dynamics in the county. Three, the associations provided a simple platform for sampling respondents that would realistically represent the whole local road transport consumer community.

Table 3.1

Summary of the study population

Subgroups	Description	Institutions	Population
County Transport Management Committee	Governor, CC, CPC, Chair PSB & Committee Members	County and Central government	6
County Executive Committee (CEC)	Deputy Governor and Committee Members	County Policy supervisor	12
Legislators	Senator, Women Rep, & MPs	Kisumu County	8
County assembly	Speaker & Members of County Assembly (MCA)	Kisumu County Government	45
County Public Service Board	Board Members & Secretary	Kisumu County	5
Lower Policy Officers	DCC (DICs), OCPD	Sub county	3
	ACC (DO), OCS	Ward Administration	6
Field Traffic Police	Station Traffic Police Officers	Ward Police Station	102
Line National Agencies	National Transport and Safety Authority (NTSA)	Central Government Agency	12
Trade Unions	LDTDU; TAWU	Kisumu	8
Operators Associations	MADCOA, MWA, MA, AKI, MOA	Sector operators	48
Business Operators	SACCOs	Transport	150
Civil society	ASIRT Kenya, NRSTSW	Kisumu Outreach	14
Grass root community leaders	Local Chiefs	County local administration	150
	Assistant Local chiefs		300
	Village elders		600
Local Masses	Members KARA, APDK, CWA	Consumer Association	450
Total			1919

Source: Records and profiles of related institutions (2016)

3.6 Sample size

To determine the sample size, this study adapted the Sloven's formula (Adanza, 2006; Altares, 2003) based on the Sample size Scale Table indicated in Appendix 3 (Krejcie and Morgan, 1970). The later was only adopted for its rule of thumb about entirely including in the sample all subjects in a category of less or 10 people (Appendix 3). Otherwise the procedure was almost entirely relied on the Solven. The sample size is a subset of the accessible population as computed in Table 3.2. For this purpose, the following Sloven's formula was used.

$$n = \frac{N}{1+N\,e^2}$$

Where:

n is the *sample size*;

N is the *study population*;

e is the 0.05 *margin of error*

The formula above applied only to population categories with over 10 subjects. According to the Krejcie and Morgan (1970), categories ranging 1-10 subjects are small for computation, so they were reserved for inclusion for the final research sample. Categories whose sample size was computable included Kisumu CEC, County Assembly, Traffic Police, Line National Agencies, Operators Associations, Transport Business Operators, Civil Society, Grass root Community Leaders and Local Masses. These categories added up to 1,883 people as the computable study population.

$$\text{Calculated Sample (n)} = \frac{N}{1+Ne^2}$$

$$= \frac{1883}{1+ (1883 \times 0.05^2)} = \frac{1883}{1+ 4.7075} = \frac{1883}{5.7075} = 329.9168 = \mathbf{330}$$

The result n = 330 was the calculated sample and not conclusive because the final sample size would be completed with additions of incalculable categories.

To calculate the size for each of the computable population categories (10 plus), only the calculated sample size of 330 was considered beside the computable study population of 1883 to generate the required sample fraction as follows.

$$\text{Sample fraction } (Sf) = \frac{n}{N} = \frac{330}{1883} = 0.175208$$

The Sample fraction (S*f*) of 0.175208 was the multiplied with the number of subjects in each of the computable categories to decide category sample sizes as shown in Table 3.2. Sizes of incalculable categories were left intact as originally identified in Table 3.1, and only cumulatively added on the size of computable categories of 330 to raise the total sample size 365.

Table 3.2

Sample size statistics

Subgroups	Description	Population	S*f*	Sample
County Transport Management Committee	Governor, CC, CPC, Chair Public Service Board, & Committee Members	6	1	6
County Executive Committee	Deputy Governor and Committee Members	12	.175208	2
Legislators	Senator, Women Rep, & Constituency MPs	8	1	8
County assembly	A Speaker & Members of County Assembly (MCA)	45	.175208	8
County Public Service Board	Board Members & Secretary	5	1	5
Lower Policy Officers	DCC (DICs), OCPD	3	1	3
	ACC (DEO), OCS	6	1	6
Field Traffic Police	Station traffic Police Officers	102	.175208	18
Line National Agencies	National Transport and Safety Authority	12	.175208	2
Trade Unions	LDTDU; TAWU	8	1	8
Operators Associations	MADCOA, MWA, MA, AKI, MOA	48	.175208	8
Transport Business Operators	SACCOs	150	.175208	26
Civil society	ASIRT Kenya, NRSTSW	14	.175208	2
Grass root community leaders	Local Chiefs	150	.175208	26
	Assistant Local Chiefs	300	.175208	53
	Village elders	600	.175208	105
Local Masses	KARA, APDK, CWA	450	.175208	79
Total		1919		365

Source: Based on Sloven's formula & Sample size scale table (Adanza, 2006; Altares, 2003; Krejcie and Morgan, 1970)

3.7 Sampling strategies

Purposive sampling and stratified random sampling strategies were employed to select the sample size of 365 above. Selection was based on subgroups in Table 3.2, used as the sampling frames. Basing on Tongco (2007), purposive sampling was adopted to select informants that were believed could provide in-depth information about the variables of study. The informants were judgementally handpicked based on two criteria; they fell in small subgroups, and/or they were hoped to be deeply informative about road traffic management and road safety in Kisumu County. The informants included; 6 County Transport Management Committee members, 8 Legislators, 5 Members of the County Public Service Board, 9 Lower Policy Officers, and 8 Trade Unionists. In addition, most experienced 18 Field Traffic Police Officers and 2 Reps from National Transport and Safety Authority were also selected purposively. Altogether, 56 respondents were purposively selected. Of these, Field Traffic Police Officers were asked to fill questionnaires. The rest 38 filled the interview guides.

Stratified random sampling as specified in Dougherty (2014), was used to achieve the desired sample representation of the larger study population. In this method, subjects were selected in a way that the population subgroups could be reproduced in the sample. For this purpose, the rest of the calculated sample size was randomly selected from individual subgroups using the lottery technique. Through this technique, Members of the CEC, County Assembly, Operator Associations, and Civil Society as well as Transport Business Operators operating in Kisumu County, in addition to Grass root Community Leaders and Members of Consumer Associations (Local Masses), were identified on pieces of papers and placed in individual boxes, respectively. The boxes acted as random groups from which calculated numbers specified in Table 3.2 for each group were randomly picked. As a result, 310 people altogether were sampled using stratified random sampling. Members from Consumer Associations representing the Local Masses were asked to participate in focus group discussion (FGD) and the rest were requested to fill the questionnaire. The sampling procedure is summarised and illustrated in Table 3.3.

Table 3.3

Summary of the sampling procedure

Sampling	Description	Population	Sample	Instrument
Purposive sampling	County Transport Management Committee	06	06	Semi structured Interview Guide (38 Copies)
	Legislators	08	08	
	County Public Service Board	05	05	
	Lower Policy Officers	09	09	
	Trade Unionists	08	08	
	National Transport and Safety Authority	12	02	
	LeadField Traffic Police Officers	102	18	Structured Questionnaire (248 Copies)
Stratified random sampling	Members of the CEC	12	02	
	Members of County Assembly	45	08	
	Members of Operator Associations	48	08	
	Members of Civil Society	14	02	
	Transport Business Operators	150	26	
	Grass root Community Leaders	1050	184	
	Local Mass (Consumer Associations)	450	79	FGD Guide
Total		1919	365	

Source: Researcher, 2016

3.8 Data collection instruments

The instruments of data collection included the questionnaire, the interview guide and focus group discussion guide.

3.8.1 Questionnaire

The study also used the questionnaire survey to collect primary quantitative data. This was done using un-standardised structured questionnaire (Appendix 7). The questionnaire comprised Section 1, covering research items (questions) on respondents' background variables. This was preceded by Sections 2, 3, 4 and 5 as the main themes directly related to the research objectives. Section 2 bears explicit variable items about road traffic information, section 3 covers items on driver support, section 4 comprises items on road traffic control while items under Section 5 were used to collect data specifically on the level of road safety. The items are closed ended questions based on a 5 Likert Scale of response options that were rightly used to generate quantitative data. The questionnaire captured more items on vehicle drivers and motorcycle riders than passengers because the two former categories, as transporters were perceived to be more influential than passengers in abusing or promoting road safety rules. Passengers were believed to have less dictates on road traffic management in the county; their stake was mainly road use.

The questionnaire survey was used because it is suitable for non-observable form of data such as perceptions and feelings of respondents. It also enables a study to easily tap such data from a large number of respondents within reasonable and limited time (Artino, La Rochelle, Kent & Hunter, 2014). Particularly, a questionnaire as an instrument allows respondents to give information free of influence from the researcher and is straightforward, less costly and less time consuming for both the researcher and the respondents (Amin 2005). The questionnaire survey was administered through the drop and pick-later method among questionnaire respondents. For this purpose, 248

questionnaires were printed and distributed to the respondents earmarked for the questionnaire survey.

3.8.2 Interview guide

Interviews were administered for collection of qualitative data. For this purpose, semi structured interview guides (Appendix 5) were used. The interview guide was used to generate detailed information about the study variables. The research items in the interview guide were systematically arranged in consistency with the implicit variables reflected in the research objectives and illustrated in the conceptual framework. The guide was composed of open and close ended items (questions). Open ended items were used to enable informants specify and substantiate their perceptions for in-depth clarification on the research variables.

The interview guide was therefore used for triangulation of qualitative data because, according to Amin (2005), it was designed to include binding questions deeply focused on the research variables to allow response detail. Interviews were used to consolidate findings as recommended in Enon (1998). For the field survey, Thirty Eight (38) semi-structured interview guides were printed and administered among respondents perceived and specified earlier as key informants in section 3.4.

3.8.3 Focus group discussion guide

Focus group discussion (FGD) is a qualitative data collection method often used to observe and listen to participants in focus groups talk about topical issues and personal experiences among themselves (Crossman, 2014; Tynan and Drayton, 2007). In this study, the FGD guide (Appendix 6) was used as the instrument to gather in-depth information from local masses or ordinary citizens as primary users. The guide was particularly significant for exploring real perceptions and experiences of the most affected road users in the county. Locals involved in the discussions included members registered with consumer organisations functional in Kisumu County, namely Association for the Physically Disabled of Kenya (APDK); Commuter Welfare Association (CWA), and Kenya Alliance of Resident Associations (KARA).

These associations were used for purposes of efficiency, due focus and objectivity in the focus group discussions. The focus group survey was conducted first, by inviting each group of locals from the respective associations to participate in group discussion at a specified venue. Two, the researcher requested and guided participants to share their experiences and opinions on issues around the research items in a prepared FGD guide. Then three, during the participant discussion, relevant points on each of the topics of focus were noted down on paper by a Research Assistant hired for discussion sessions. A recoding gadget was also used for a similar purpose to get refined details.

3.9 Validity and reliability

3.9.1 Validity of research instruments

To ascertain the validity of the interview guide, the focus group discussion guide, and the questionnaire, a pilot study was carried out as recommended in Biddix (2009). This was done by administering the three instruments in the pilot study. The Interview guide, Focus Group Discussion guide and Questionnaire were used for a pilot group in Nakuru County. This county was purposively preferred for the pilot study because, like Kisumu County, it is a rural - urban county with one of the largest cities in Kenya and an equally large expanse of the rural area. Nakuru is the Fourth largest city in the country (NCG, 2014). The group included 10% of similar respondents sampled for the main survey. Comparable pilot respondents answered the three research instruments respectively, like in the planned main study. The findings of the pilot study could not be included in the final study findings but were used to determine the face and content validity of the instruments.

Face validity refers to the face value accuracy and suitability of the research instruments relative to the field survey goal. The goal of field survey is to raise the right research data (Holden, 2010). Content validity is the extent to which the content of an instrument corresponds to the content of the data it is designed to collect (Wilson, Pan, & Schumsky, 2012). In this study, face validity was verified by previewing drafts of the instruments with the researcher's supervisor, and basing on the reactions and comments of the pilot survey respondents. Content validity was determined by discussing the pilot study results with the supervisor. In the process, ambiguous items were revised in order to improve the quality of the instruments and to elicit the required information. Further, to enhance the content

consistency of the instruments, two experts in road safety management were asked to appraise the instruments. Then, for statistical proof of the content validity, the Content Validity Index (CVI) was calculated using the following formula.

$$\text{CVI} = \frac{\text{Number of items declared valid}}{\text{Total number of items}}$$

Only the Interview guide and Questionnaire were subjected to the CVI test. The FGD guide could not because it was a direct derivative of the interview guide. So, the two were assumed to yield similar results. The CVI formula above was applied on one research item after another as systematically arranged in the instruments related to the research objectives. The calculated CVI for individual items was computed to establish total CVI and to determine the content validity level of the instruments, as indicated below:

Table 3.4

Determining the Content Validity Index of instruments

Instrument	Section	Valid Item	Invalid Item	Total
Questionnaire (Q)	1	09	00	09
	2	11	02	13
	3	10	02	12
	4	21	04	25
	5	20	03	23
	Total	71	11	82
Interview Guide (IG)	1	00	00	00
	2	09	01	10
	3	02	00	02
	4	14	01	15
	5	10	02	12
	Total	35	04	39

Source: Pilot survey (2016)

$$\text{CVI (Q)} = \frac{71}{82} = 0.866$$

$$\text{CVI (IG)} = \frac{35}{39} = 0.897$$

The Interview Guide was valid by 0.897 (89.7%), while the Questionnaire was valid by 0.866 (86.6%). According to Polit *et al.* (2007), both instruments were sufficiently valid because their CVIs were above the recommended range of 0.70. This means, the focus group discussion guide was also valid enough since it was an extract of the Interview guide.

3.9.2 Reliability of research instruments

Reliability refers to a degree to which an instrument measures the same way each time it is used for data collection in the same condition with the same subjects. A measure is considered reliable if a person's score on the same test given twice is similar (Golafshani, 2003). In this study, the reliability of the research instruments was determined by computing the Cronbach Alpha Coefficient (CAC) using the Statistical Package for Social Scientists (SPSS). The CAC is an appropriate package for determining instrument reliability necessary for better quality of research findings. The reliability test also covered computable responses to the research items of the pilot survey instruments; the interview guide and questionnaire. The test considered all the research items related to the research objectives.

According to the SPSS reliability test, CAC for the interview guide was 0.976 while that of the questionnaire was 0.986. Similarly, a research instrument is reliable if it is within the recommended range of 0.7- 1.0 (Weiner, 2007). Therefore, the two instruments were reliable. In that case, the Focus Group Discussion Guide was equally reliable as it derived from the interview guide.

3.10 Data collection procedure

In the empirical phase of this study, actual data collection was preceded by seeking an introductory letter from the Directorate of Higher Degrees and Research, Kampala International University. This followed the approval of the Research Proposal. The letter was used to secure a written research permit from the National Council for Science, Technology and Innovation (NACOSTI), Kenya. The two letters were then used for introductory purposes to the authorities in Kisumu County and the field survey respondents. A prepared Informed Consent letter (transmittal) (Appendix 4) was

particularly used to acquire the respondents' consent to administer the interview guide, FGD guide and questionnaire

Upon identifying respondents, the researcher, with the informed consent letters at hand, sought to explain to each of them the purpose of the field survey. Upon acquiring consent, the researcher hand-delivered the questionnaires and interview guides to willing respondents. This was done in a span of four weeks during which focus group discussions were concurrently held. The FGDs were held thrice, each session with 26 locals from each of the three consumer associations earmarked for field research; Association for the Physically Disabled of Kenya, (APDK), Commuter Welfare Association (CWA) & Kenya Alliance of Resident Associations (KARA). With guarantee of total confidentiality, every respondent was asked to complete an instrument or share personal experiences and opinions as honestly as possible. The researcher then constantly got in touch with respondents to collect any completed instruments at any time in a period specified for data collection. This meant, instruments were instantly collected on completion, as long as it was convenient for the respondents. After collection of all the completed instruments and FGDs, data were then set for processing and analysis.

3.11 Data analysis

Data analysis is the process of transforming raw data into information that addresses the research objectives (Chambers and Skinner, 2003). In the analytical phase of this study, quantitative and qualitative analysis were employed to transform data into the required information as per the research objectives. For both approaches, data was systematically processed, appropriately presented, analysed and interpreted.

3.11.1 Quantitative data analysis

Quantitative analysis was used for responses (data) to close ended items of the questionnaire and the interview guide. As part of the analysis procedure, data was processed using computer programmes; the Statistical Package for Social Scientists (SPSS), version 16.0 and Microsoft Office Excel (MOE), respectively. The SPSS was used to generate descriptive and inferential statistics while MOE was only employed to construct data presentation figures from SPSS descriptive statistical output. For this purpose,

responses were coded and entered into the computer using SPSS. In so doing, an electronic data-set was created and used for statistical data presentation. The presentation and eventual data analysis and interpretation were completed by running selected SPSS packages of related descriptive and inferential analysis tools.

The main descriptive analysis tools adopted included frequency distribution, arithmetic mean, the mode and standard deviation. These were applied as follows:

Frequency distribution. Also specified as *frequencies* in SPSS, this tool was used to generate frequency tables. The frequency counts were entered in Micro Office Excel to create Figures used to illustrate the response percentages for some of the research items about respondents' background, and level of road safety in Kisumu County. Frequency tables were also used and mainly adapted to compose frequency and percentage tables for items about road traffic information, driver support and road traffic control. The MOE generated figures included pie charts, simple bar graphs, clustered bar graphs and stacked comparative bar graphs.

For both figures and tables respectively, percentages were presented and used to statistically determine the response distribution of the study sample. The distributions were then explained and interpreted to describe the level of road safety, sufficiency of road traffic information and driver support, as well as the efficacy of road traffic control in rural and urban areas of Kisumu County. Analysis of road safety was centred on indicators that demonstrate effects of traffic management. For concise identification, Rural Kisumu was used to denote rural areas while Urban Kisumu represented urban areas in the county

Arithmetic mean and the mode. These were used for analysis of the same responses to closed ended research items. However, the analysis tools were only adopted for items consistent with research objectives. Descriptive tables were generated from the SPSS data set and used to present the related mean and modal statistical values. The arithmetic mean ($\bar{x}$) measures centrality or central location of a data set (Salkind, 2007; Watier, Lamontagne & Chartier, 2011)**.** It was therefore specifically used to determine the response averages for items about the road safety, road traffic information, driver support and traffic control.

Particularly, the averages were useful for more accurate description of the efficacy of these traffic management activities and level of road safety in rural and urban Kisumu County.

For the purpose of mean statistical interpretation, the mean range scale below was used.

Table 3.5

Arithmetic mean range scale

5-Likert Scale	Range	Interpretation	
		Levels	Efficiency
SA	4.01 - 4.75	Very high	Very Efficient
A	3.26 - 4.00	High	Efficient
N	2.51 - 3.25	Moderate	Fairly efficient
D	1.76 - 2.50	Low	Less efficient
SD	1.00 - 1.75	Very low	Least efficient or Inefficient

Source: Adapted from Kostoulas (2013)

The mode (*Mo*) was used to describe the incidence of each of the functions of road traffic management, and indicators of road safety. Particularly, the mode was adopted to measure the most to the least dominant, traffic management practices (parameters), and road safety indicators (prospects). The Modal measurement scale ranged from *Mo* = 1 to *Mo* = 5 as adapted from (Muiner, 2014), where 1 stands for *very rare*, 2 = *Less common* or *rare*, 3 = *fairly common*, 4 = *Common* and 5= *Very Common*.

Standard Deviation. Cyphered as *SD* or 'S', the Standard Deviation measures spread from the mean of a data set (Guven, Senocak, & Vehid, 2017). As such, it was used to describe the extent of response variation from the sample mean perception about road safety, road traffic information, driver support and road traffic control. It was particularly adopted to measure and describe the extent of respondents' agreement with perceived levels of road safety and efficacy of road traffic management practices in Kisumu County. Interpretation of the SD was at the 95% confidence level anchored on the following rule of thumb; a large standard deviation (≥ 1.5) indicates that a data score of the sample is more spread from the

mean while with a smaller standard deviation (≤ 1 or <1.5) the scores are clustered closely around the mean (*Bland & Altman, 1996)*.

The **inferential analysis** tools employed included Pearson's Correlation Coefficient (PCC) and Multiple Regression Analysis (MRA). These were used as follows:

Pearson's Correlation Coefficient Analysis. This was used to generate a 2- tail Bivariate Pearson's Correlations Tables from the SPSS data set. The correlation statistics therein were used to determine statistical significance of the covariance between the road management practices and level of road safety. The statistics included correlation coefficients (*r*) and probability values (*p*- values) or significance indices. For analysis and interpretation of both positive and inverse (Negative) covariance, Correlation coefficients (in absolute value) ≤ 0.35 = low or weak correlations; 0.36- 0.67 = modest or moderate correlations, 0.68- 0.89 = strong or high correlations and ≥ 0.9 = very high correlations (Asuero, Sayago, & Gonz´alez, 2006; *Taylor, 1990*). Correlations were significant at p ≤ 0.01(SPSS).

Multiple linear regression analysis. Using this multivariate analysis tool, Regression Tables (Modal summary, ANOVA[b] and Coefficients[a]) were generated from the SPSS data set. The statistics in tables were then used to determine the predictive influence of traffic management practices on road safety rural and urban Kisumu County. In doing so, the analysis particularly specified the significance and contribution of each of the practices as independent variables to the road safety, being the dependent variable. This was based on the following linear equation.

$$Y= \beta o+ \beta_1 X_1+ \beta_2 X_2+ \beta_3 X_3+ \varepsilon$$

Where:

Y = Road safety (RS)

β_0 = Constant or intercept which is the value of the dependent variable at zero factors.

$\beta_1, \beta_2, \beta_3, \beta_4$ = Parameters or Regression coefficients of independent variables.

X_1= Road traffic information (RTI);

X_2= Driver support (DS);

X_3 = Road Traffic Control (RTC)

ε = Stochastic or disturbance term or error term.

Interpretation of the levels of significance of the multiple independent- dependent predictions was based on the 5% scale and at 95% level of confidence.

3.11.2 Qualitative data analysis

Qualitative analysis was used for the interview and focus group discussion data. The data specifically included responses to the open-ended questions in the interview and focus group discussion guides. The analysis was done using the content and interpretive analysis methods. This was used to give comprehensive descriptions and implications of perspectives about variables inherent in the research items. This only applied to items related to the study objectives and specifically road safety, road traffic information, driver support and road traffic control in rural and urban Kisumu County. For that purpose, the following analysis procedure was undertaken. Initially, the relevant themes and items were written in the margins of the interview guides for subsequent data analysis and interpretation.

Data was transcribed before coding it into categories. This involved breaking down the data into manageable pieces, sorting and sifting it while searching for its legibility, sequences, consistency, accuracy, comprehensiveness and patterns. During this process, irrelevant data was edited out. Then, the relevant data was organised according to the related themes and items reflecting the relevant study objectives. The purpose of this process, as specified in O'Dwyer (2004), was to assemble or reconstruct data in a meaningful or comprehensible fashion. Generalization of the analysed data was subsequently made.

3.11.3 Conclusion

Table 3.6 summarises the data analysis procedure objective by objective. This particularly captures the analysis structure for the main findings which in this study are data consistent with the respective research objectives.

Table 3.6

Summary of data analysis procedure

Research Objectives	Independent variable		Dependent Variable	Data analysis techniques
	Implicit	Explicit		
1. To examine the influence of traffic information on road safety	*Traffic information*	- Road Signages - School children sensitization - Information on regulations - Traffic warnings	*Road safety* - Efficiency - Respect - Observing Rules - Basic safety - Favourability to marginal road users - Security - Fatality rate	- Frequency distribution - Arithmetic Mean - Mode - Standard Deviation - PCC - Multiple linear regression - Content and interpretive analysis
2. To ascertain the effect of driver support on road safety	*Driver support*	- Quality of driving schools - Vehicles installed with safe driving gadgets - Roads maintenance - Driver guidance against danger on the road - Motorcyclists trained on road use safety	*Road safety*	- Frequency distribution - Arithmetic Mean - Mode - Standard Deviation - PCC - Multiple linear regression - Content and interpretive analysis
3. To assess the efficacy of traffic control in road safety promotion	*Traffic control*	-Dangerous mechanical conditions vehicles arrested -Designated road sideways for fragile road users -Vehicle safety requirements enforced -Basic motorbike safety requirements enforced -Traffic control based on detective technology -Consistent control of road traffic offences	*Road safety*	- Frequency distribution - Arithmetic Mean - Mode - Standard Deviation - PCC - Multiple linear regression - Content and interpretive analysis

Source: Researcher (2018)

3.12 Ethical Considerations

1. **Authorization**. This involved getting clearance from the National and County government authorities for permission to collect data in the spheres under their control.
2. **Informed consent**. The researcher sought prior consent from potential respondents for them to willingly accept to participate in the study. The researcher ensured free-will consent from participants.

3. **Anonymity and Confidentiality**. The names or identifications of the respondents were not necessary. They were informed that their responses as well as information collected from them would be treated with utmost confidentiality.
4. **Ascriptions of authorship**. The researcher accurately attributed the sources of information to respective authors in an effort to celebrate the works of past scholars or researchers. This ensured that no plagiarism occurred.

CHAPTER FOUR

PRESENTATION, ANALAYSIS AND INTERPRETATION OF FINDINGS

4.0 Introduction

This chapter covers presentation, analysis, and interpretation of findings of the study. The findings specifically include data on the background of respondents, road safety as the dependent variable and the three independent variables of road traffic information, driver support, and road traffic control. Structurally, the chapter begins with description of respondents' background and then presents sections consistent with the research objectives. These sections include description of the dependent variable, and verification of hypotheses. The latter captures themes about effect of road traffic information, driver support and road traffic control on road safety. This spells out the influence of road traffic management on road safety in Kisumu County.

The response rate was calculated to determine the generalizability of the actual study findings. The study sample size was 365 respondents intended for interviews, questionnaire survey and focus group discussions. In order to cater for the response gap, the sample field survey covered 268 questionnaires instead of the planned 248, and 43 interviews instead of 38. For the focus group discussions (FGD), 85 participants were invited instead of 79. The calculated response rate of the surveys is summarised in Table 4.1.

Table 4.1

Response rate distribution by instruments

Research instrument	Sample	Gender	Frequency		Response Rate (%) by gender	Total Response Rate (%)
			Actual Response	No Response		
Interview guide	38	Male	19	4	82.6	84.6
		Female	13	2	86.7	
Focus group discussion guide	79	Male	42	5	89.4	90.0
		Female	29	3	90.6	
Questionnaire	248	Male	135	9	93.8	94.0
		Female	98	6	94.2	

Source: Field survey (2018)

Details in Table 4.1 show that the interview response rate for both male and female respondents was 84.6%, while the questionnaire response rate was 94% males and females altogether. Of the focus group discussion sample, male and female, the response rate was 90.0. Generally, the average response rate of the three research instruments was 89.5%. At this rate, the study findings were very sufficient to address the research objectives. Research science recommends that a response rate of over 70% is adequate and appropriate in social science research (Babbie, 1990; Fincham, 2008). The calculated response rate was therefore adequate for generalizability of the study sample findings.

4.1 Background information

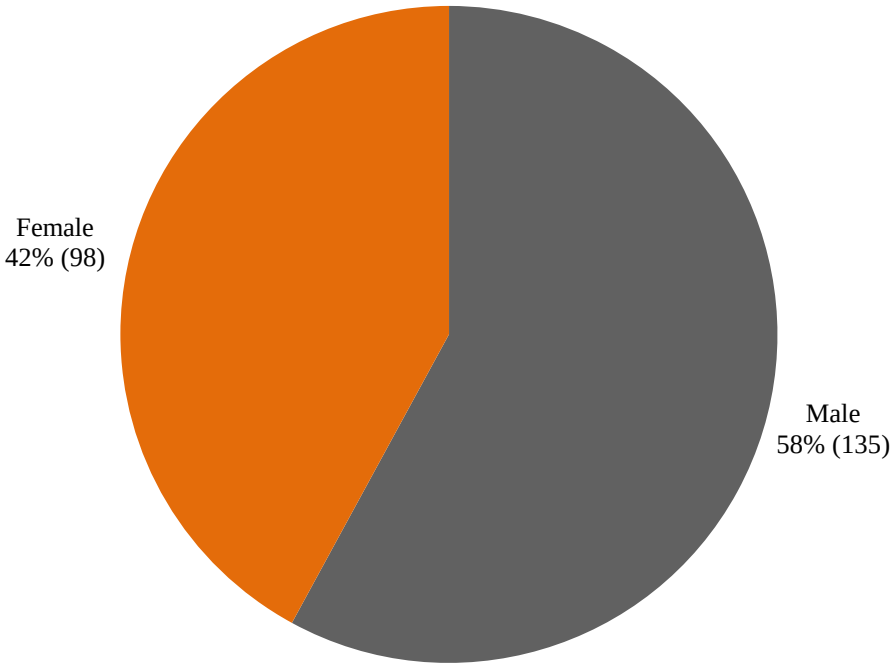
Kaya (2013) posits that research covers background characteristics of respondents basically to verify their potential to provide responses consistent with the research problem. For this purpose, this section covers findings on demographic characteristics of respondents, their period of stay in Kisumu County, type of road use and experience with road accidents in the county. The section also covers findings on the nature of accidents suffered by respondents or their kin. According to Wyse (2012), such background variables were researched to prove the response authenticity of 'common respondents'. As such, the study background check was limited to questionnaire informants, considered in this study as general respondents.

The interview respondents and FGD participants were not subject to background analysis because they were presumed to be more reliably informed about the research problem. The target interview informants are reputable institutional and community leaders with mandate to ensure best practice in road traffic management and enhance road safety. The FGD informants were the lead local masses with presumably primary exposure to the road safety dynamics and were thus more useful for assessing the research problem.

4.1.1 Demographic characteristics of respondents

This section entails findings on demographic characteristics respondents including gender, age and level of education. Once more, each of these features, like other background variables, was investigated for purpose of justifying respondent inclusion in field research. Regarding gender, the study sought to demonstrate the balanced gender delineation of the

study. The related finding shows that they were male and female respectively as illustrated in Figure 4.1.

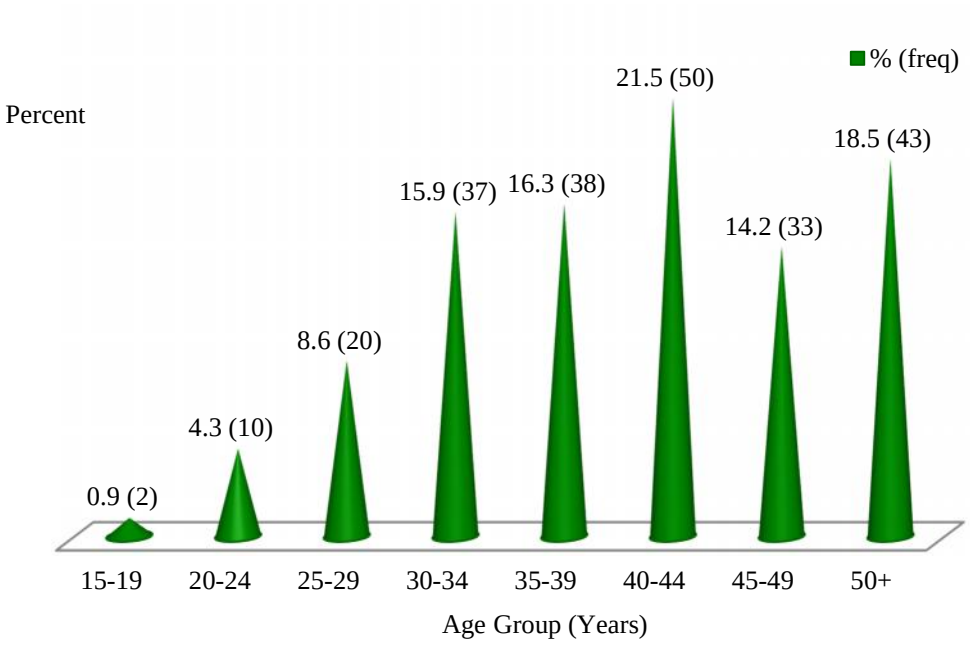


Source: Field research (2018)

Figure 4.1. Distribution of respondents by gender

Figure 4.1 shows that 58% of the respondents (n = 233) that filled the field questionnaire were male and the rest 42% were female. The majority of the respondents were male but the size of females was also significant enough. This means the study was able to capture gender balanced experiences in relation to the road safety unpredictability of Kisumu County. European Union (2016) reports that the county is one of the counties in Kenya, with apparent road safety vulnerabilities attributed to diverse and busy economic activities. Such proneness is not limited to a specific gender, but rather affects both male and female population in the county.

About age, Axinn, Link and Groves (2009) note that it is usually captured in most social science research particularly to certify their research response maturity. The age distribution of respondents participated in the study is summarized in Figure 4.2.



Source: Field research (2018)

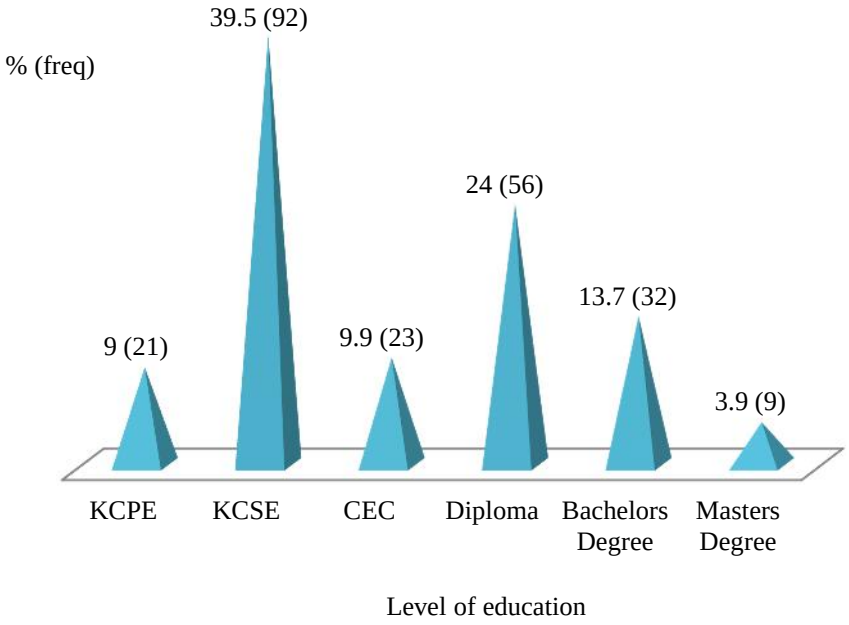
Figure 4.2. Distribution of respondents by age in years

Figure 4.2 shows that of the respondents, only 0.9% were aged between 15-19 years, 4.3% were aged 20-24, and 8.6% were 25-29 years old. Others as many as 15.9% were 30-34 years, 16.3% were 35-39 years, 21.5% were 40-44, and 14.2% were 45-49 years old. The rest 18.3% were aged 50+ years. The majority 67.2% of the respondents were middle aged. Stern (2016) specifies that a middle aged person falls between 35 and ends at 58 years. The rest 28.8% of the respondents were youths and only 0.9% were below.

The youth policy in Kenya defines the youths as persons between the age of 18 and 35 years (Awiti and Scott, 2016). Nevertheless, like the middle aged, the youthful respondents were old youths and mature enough to responsibly inform on such a contentious subject of the road safety dynamics in Kisumu County. Miller (2004) posits that maturity determines the potential of respondents to handle complex and sensitive questions about the research problem.

Information on education of respondents is equally critical because according to Meyer, Shanahan and Laugksch (2005), the level of education of a research participant corresponds with the individual capacity to articulate facts related to the research problem in question.

So in this study, education levels of the respondents were ascertained to prove their response articulacy. The related data was presented in Figure 4.3.



Source: Field research (2018)

Figure 4.3. Distribution of respondents by levels of education

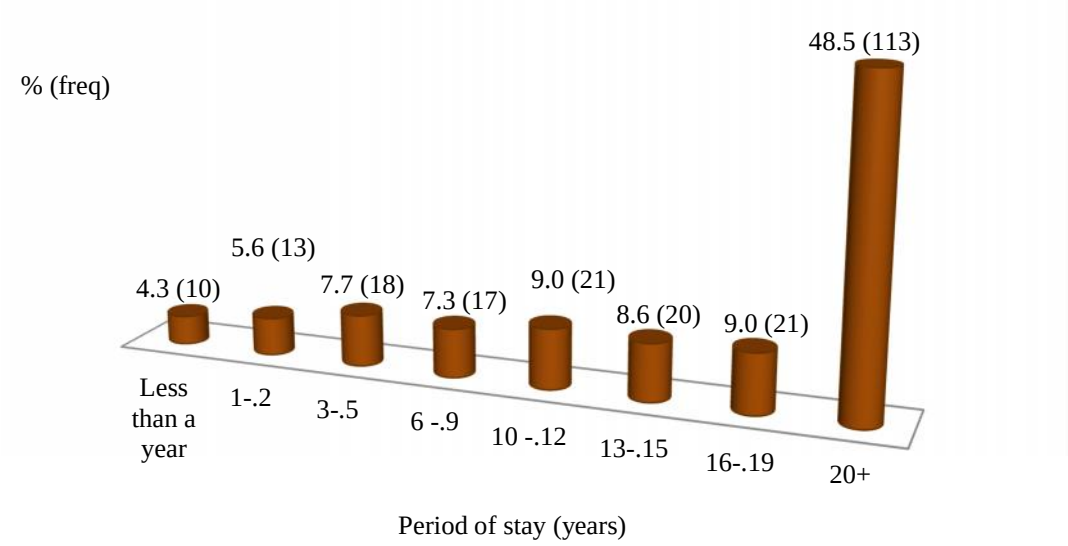
The findings in Figure 4.3 indicate that of the respondents, 9.0% of them had Kenya Certificate of primary education (KCPE), 39.5% were holders of Kenya Certificate of Secondary Education (KCSE), while only 9.9% had College Education Certificate (CEC). In addition, 24% of the respondents had Diplomas, the rest 13.7% were holders of bachelors' degrees, and 3.9% were had masters' degrees. A part from the very few who were CPE holders, most of the respondents (99.1%) were educated enough to dependably handle questions on the subject of research. KCSE holders are equally literate enough by Kenya's standards (Nicolai, Prizzon and Hine, 2014) to articulate issues of social importance.

With guidance, even respondents with a CPE responded to relevant research items sufficiently though. Otherwise most of the education qualifications (i.e. from KCSE) were enabling enough for respondents to give consistent responses. In fact, Bowling (2005) posits that literate respondents usually have the ability to interpret research instruments and

provide reliable responses. Their responses are usually real and factually consistent with the context of the research problem.

4.1.2 Period of stay of respondents in Kisumu County

Louw, Pearse & Dhaya (2016) opine that the period of respondents' stay in the study area usually defines the level of their contextual experience in the study subject. With enough of such experience, they are well acquainted and can sufficiently inform research incident per incident with limited exaggeration, omissions or falsehoods. For this reason, the span of respondents' stay in Kisumu County was also covered. The related findings are summarised in Figure 4.4.



Source: Field survey (2018)

*Figure 4.4.*Distribution of respondents by the period of their stay in Kisumu County

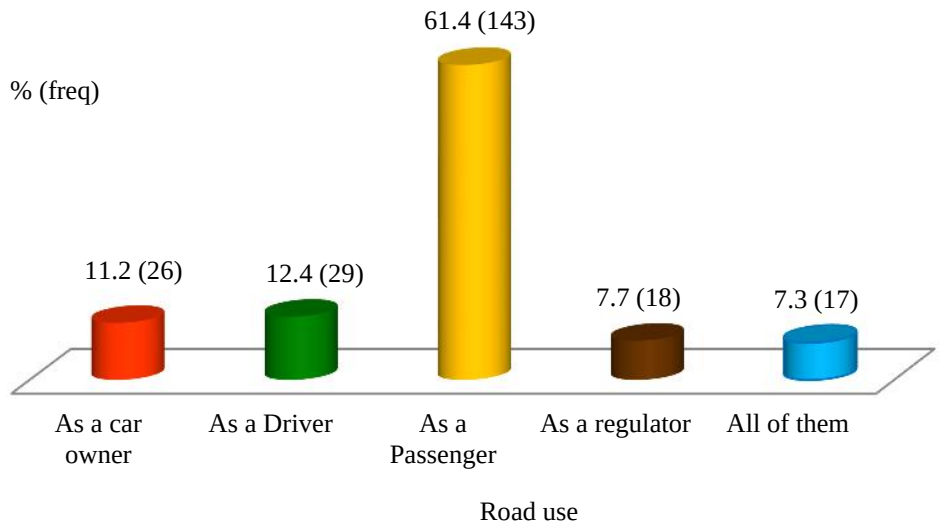
The statistics in the figure above indicate that 4.3% of the respondents have stayed in the county less than 1 year, 5.6% had stayed there 1-2 years 7.7% had lived in the county for 3-5 years, while 7.3% had stayed there for 6-9 years. In relation, 9.0% of the respondents had stayed in the county for 10-12 years, 8.6% had lived in the area for 13-15 while 9.0% had stayed there for 16-19 years. The majority 48.5% of the respondents had lived in Kisumu County for over 20 years. Most (75.1%) of these respondents had lived in the county over 10 years, long enough to have witnessed Kisumu's road traffic developments pre and post Kenya's new constitution of 2010. This legal transformation introduced

devolution, which alongside other constitutional dynamics, has shaped road traffic management in the county (SIDA, 2015).

Besides, considering the high stakes associated with road transport almost on a daily basis (Balasko, Kuzmin and Bickel, n.d), even respondents with at least half a year's experience in Kisumu were conversant enough about road safety developments in the County. Thus, those with less than 8 years' experience were quite reliable to inform on road safety dynamics in the county.

4.1.3 Type of road use among respondents

The findings in this section include revelations of the types of road use by the respondents. Road use was investigated to specify respondents' exposure to road safety risks and substantiate their reliability to answer questions on road transport variables of research. The findings are presented in Figure 4.5



Source: Field survey (2018)

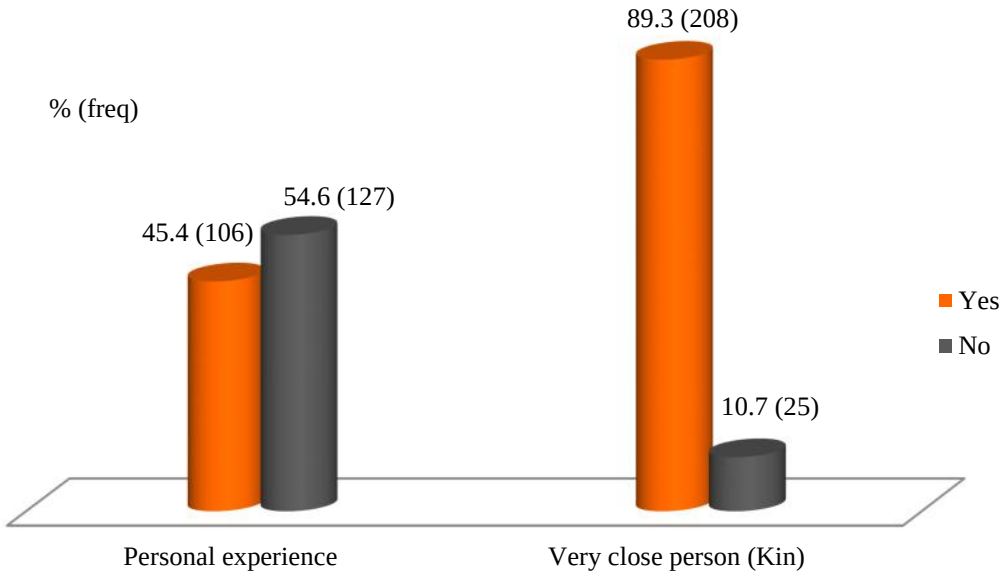
Figure 4.5. Distribution of respondents by types of road use

According to Figure 4.5, 61.4% of the respondents mostly used road transport in Kisumu County as passengers, 12.4% others used the roads in the county mostly as drivers while 11.2% were most involved in road use as car owners. In relation, 7.7% of the respondents were regulators of road use in the county. The rest 7.3% indicated that there had equally used all these forms of road used foresaid. These revelations certify that all respondents of

research were primary road users with the exposure enough to provide first-hand information on road traffic information and control, driver support as well as level road safety.

4.1.4 Respondents' experience of road accidents in Kisumu County

The study also sought to assess respondent close encounter with road accidents in Kisumu County. In so doing, respondents were asked whether they or their kin have ever been involved in any road accident in the county. Their responses are summarised in Figure 4.6.



Source: Field survey (2018)

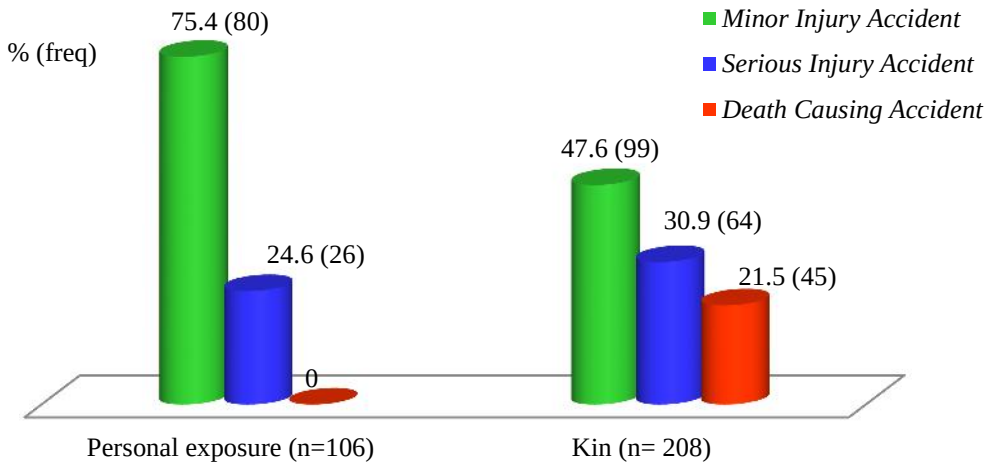
*Figure 4.6.*Distribution of respondents by experience of road accidents in Kisumu County

The findings in Figure 4.6 show that 45.4% of the respondents had been personally involved in any road accidents while 54.6% others had not in Kisumu County. In relation, majority 89.3% of these respondents revealed that at least their kin (or a very close person to them), respectively had suffered a road accident. Only 10.7% did not know of any very close victims of such accidents in the county. Personally, majority of the respondents had never been involved in a road accident but almost all of them had ever witnessed a kin or very close person becoming victim to a road accident in Kisumu County. By and large, all the respondents were in one way or the other victims to road accidents in the county. So,

they were largely keen on road safety. Thus, they could be relied on for responses on road safety developments i.e. risks and measures in the county.

4.1.5 Severity of road traffic accidents suffered by respondents

The study also ascertained the severity of road accidents suffered by respondents or their kin to specifically validate their first-hand experience road safety risks or fatality in the county. The findings are illustrated in Figure 4.7.



Source: Field research (2018)

Figure 4.7. Distribution of respondents by the severity of road traffic accident

The findings in Figure 4.7 show that 75.4% of the respondents ever personally involved in roach accidents (n= 106), suffered minor injuries while 24.6% others suffered serious injury road accident. In addition, 47.6% of the respondents (n= 208) had ever witnessed their kin involved in minor injury accidents, 30.9% others had kin said to have suffered serious injury accidents, and the rest 21.5% had ever had such very close persons perish in death causing accidents. These revelations indicate that much of severe or fatal accidents witnessed by respondents in Kisumu County were suffered by their kin or persons very closely known to them. However, this did not make any difference because all respondents were directly or indirectly affected by an accident irrespective of the severity. Thus, all respondents were all equally victims to rely on for road safety assessment in the county.

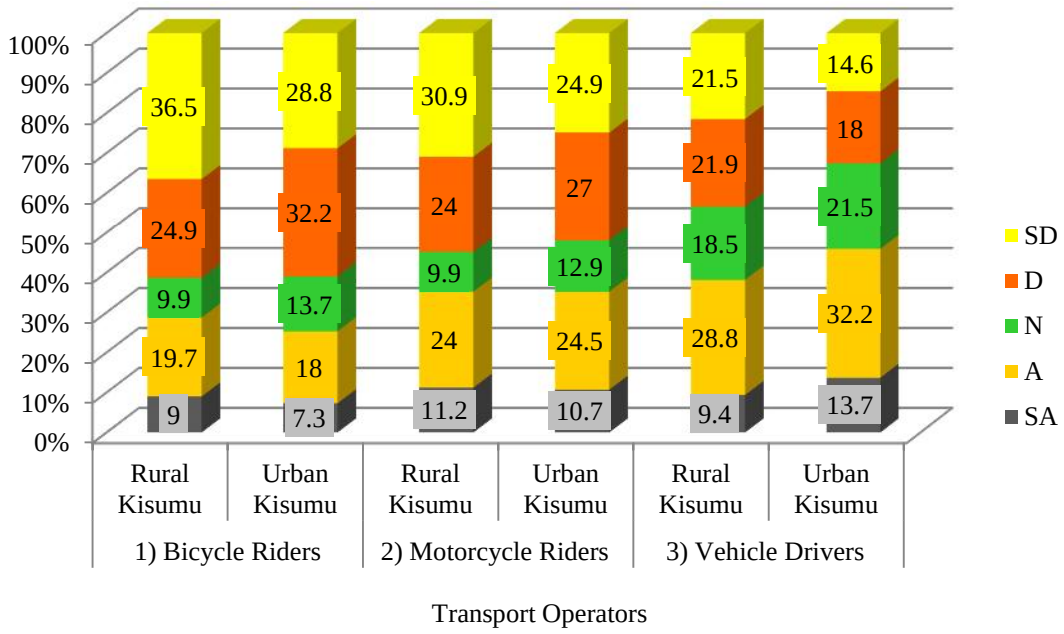
4.2 Description of the dependent variable: Level of Road safety

The dependent variable in this study is the level of road safety. Basing on Gudoi (2015), road safety was conceptualized as a function of desired effects of road traffic management and road use in Kisumu County. The effects of study were captured in the research instruments as indicators or implicit research items used to ascertain the level of road safety in rural and urban areas of Kisumu County. The instruments included the questionnaire, interview and focus group discussion guides. Road safety was separately analysed for Rural Kisumu and Urban Kisumu because the two locations present distinct contexts with different experiences of road use (Pateman, 2011), respectively. In addition, road safety is behaviourally induced (Rudin-Brown and Jamson, 2013) and largely defined by road use dynamics, which basically differ between rural and urban environments (Xuedong, Wang, Meiwu and Zhang, 2012). For concision purposes, Rural Kisumu represents rural areas while Urban Kisumu represents urban areas of Kisumu County.

Each of the research items or questions was scaled using 5-Likert response points where; 5 = Strongly Agree, 4 = Agree, 3 = Neutral, 2 = Disagree, and1 = Strongly Disagree. For the purpose of statistical interpretation, this scale led to the use of related measurement ranges respectively adapted (Bland & Altman, 1996*;* Kostoulas, 2013; Muiner, 2014) and specified in chapter three, section 3.9.1. In this theme, the items were structured into separate sections of findings describing road safety for both Rural and Urban Kisumu. The sections include efficiency of transport operators on the roads, respect among transport operators on the road, observance of traffic rules and regulations by road users, safety of regular road users, road favourability to high-risk or marginal road users, and fatality rate of road use. Findings presented in these sections are both quantitative and qualitative.

4.2.1 Efficiency of transport operators on the road

Findings in this section include respondents' perceptions on road efficiency of bicycle riders, motorcycle riders, and vehicle drivers as transport operators in Kisumu County. Findings from the questionnaire survey are presented in Figure 4.8.



Source: Field Research (2018)

*Figure 4.8.*Distribution of respondents by perceptions on the efficiency of transport operators on the road in Kisumu County

Figure 4.8 illustrates distribution of the sample (n = 233) on each of the study transport operators in rural and urban areas of Kisumu County. Transport operators were categorised into codes 1-3 for identification and simplicity purposes in explaining the frequency percentage distribution. The distribution about transport operators category 1in Rural Kisumu shows that 9% of the respondents strongly agreed and 19.7% others agreed that bicycle riders were efficient on the road. In relation, 9.9% of the respondents were neutral, whereas 24.9% disagreed and the rest 36.5% strongly disagreed about this. For Urban Kisumu, the distribution shows that 7.3% of the respondents strongly agreed, 18% agreed, while 13.7% others were neutral with the prospect that urban bicyclists were efficient. On the contrary, 32.2% of the respondents disagreed and the rest 28.2% strongly disagreed with the prospect. Only a few of the respondents for both Rural Kisumu (28.7%) and Urban Kisumu (25.3 %) felt that bicyclist transporters were efficient enough on road, respectively.

About category 2, the figure indicates that 11.2% of the respondents strongly agreed and 24% others agreed that Rural Kisumu Motorcycle riders were efficient on the road. The rest 9.9% were neutral, 24% disagreed and 30.9% strongly disagreed with this perception.

With regard to Urban Kisumu, 10.7% of the respondents strongly agreed and 24.5% agreed that motorcycle riders were efficient of the road. On this prospect, 12.9% of the respondents were neutral, 27% other disagreed and the rest 24.9% strongly disagreed. Just 35.2% of the respondents believed that motorcyclist transporters in Rural and Urban Kisumu were efficient enough on road.

Regarding category 3, the figure indicates that for Rural Kisumu, 9.4% of the respondents strongly agreed and 28.8% agreed that vehicle drivers were efficient on the road. On this perception, 18.5% of the respondents were neutral while 21.9% others disagreed and the rest 21.5% strongly disagreed. About Urban Kisumu, 13.7% of the respondents strongly agreed, 32.2% agreed and 21.5% were neutral about the prospect of vehicle drivers being efficient of road. On the other hand, 18% of the respondents disagreed and 14.6% strongly disagreed with that prospect. A total of 38.2% of the respondents were contented with road efficiency of vehicle drivers in Rural Kisumu but a difference of 7.7% respondents indicated that Urban Kisumu vehicle drivers were more efficient than their rural counterparts.

Beside the above frequency distribution, arithmetic mean and standard deviation were adopted. The mean measures centrality and standard deviation measures spread from the mean of a data set (Guven *et al*., 2017; Salkind, 2007; Watier *et al*., 2011). The two were thus used to accurately determine how respondents respectively rated road efficiency of specified transport operators in Rural and Urban Kisumu as presented in Table 4.2.

Table 4.2

Descriptive statistics about efficiency of transport operators on the road in Kisumu County

Transport operator	Territory	n	Mean($\bar{x}$)	Std. Deviation(s)
1) Bicycle riders efficient on road	Rural Kisumu	233	2.42	1.39
	Urban Kisumu	233	2.43	1.28
2) Motorcycle riders efficient on road	Rural Kisumu	233	2.62	1.42
	Urban Kisumu	233	2.69	1.36
3) Vehicle drivers efficient on road	Rural Kisumu	233	2.85	1.31
	Urban Kisumu	233	3.12	1.28

Source: Field research (2018)

Per the rating scales adapted (see data analysis in chapter three), Table 4.2 shows that perception scores on road efficiency of Bicycle riders generated low arithmetic means for rural Kisumu ($\bar{x}$ = 2.42) and urban Kisumu ($\bar{x}$ = 2.43), respectively. This connotes less efficiency on the road. The scores also generated narrow standard deviations for either county territories (S = 1.39 and 1.28), signifying that respondents were not much spread from the perception mean. By implication, most of rural and urban bicyclist transporters known to the respondents (n = 233) in Kisumu County were less efficient on the road.

With regard to efficiency of motorcycle riders, moderate perception means were generated for both rural Kisumu ($\bar{x}$ = 2.62) and urban Kisumu ($\bar{x}$ = 2.69). Though less spread from the mean, standard deviation of the perceptions on rural Kisumu (S = 1.42) was a bit higher than one about urban Kisumu (S = 1.36). In that case, respondents believed that urban motorcyclists were largely fairly efficient than rural counterparts on the road.

The statistics about vehicle drivers show that the perception mean on their road efficiency was highly moderate ($\bar{x}$ = 3.12) in urban Kisumu and less moderate ($\bar{x}$ = 2.85) in rural Kisumu. The related standard deviation for each of the territories was narrow [S = 1.28 (UK) & S= 1.31(RK)] and thus less spread from the average perception. This means most of the vehicle drivers were fairly efficient in urban Kisumu than rural Kisumu.

Similar findings were recorded from interviews and focus group discussions. According to the interview findings, four (04) of the thirty-two (32) informants strongly Agreed and six (06) agreed that transport operators in Kisumu County were efficient on the road. Eight (08) informants remained neutral about this perception while eleven (11) disagreed and three (03) others strongly disagreed with that. When asked to clarify their perceptions, only three (03) interview informants noted that most of the operators were efficient on the road and seven (07) others stated that many transport operators particularly motorists were efficient. However, one of them said: “operators are efficient in less peak hours and less efficient during high peak times”. In relation, seven (07) others indicated that most of the operators were relatively efficient.

Besides, seventeen (17) of the informants noted that most transport operators were less efficient on the road. Six (06) of them revealed that transport operators persistently

committed traffic offenses. One of these informants singled out motor- and tri-cyclists as common offenders stating that, “transport operators that commit traffic felonies the most are the *Boda-boda*, and *Tuk-tuk*”. In Kisumu County, just like the rest of Kenya, Boda boda is a term used for a type of motorcycle with a space for a one pillion passenger or carrying limited goods, often used as a taxi. The term is also used to refer to riders of such motorcycles (Butiko, 2017; Mwangi, 2017). As for Tuk-tuk, it is a three-wheeled motorized vehicle used as a taxi with space for three passengers and back carrier for their goods (Makena, 2018).

In addition to the above, an informant noted that, “transport operators are efficient for their own purposes but very careless and dangerous in breaking traffic rules”. Three (03) informants specified that most operators are not trained and licensed, are not polite on the road, very disorganized and rowdy. Furthermore, two (02) informants indicated that in Kisumu City, operators caused traffic jam during peak hours. One (01) of them explained that, “…most of such transport operators are usually less concerned about road efficiency due to bribery”. Another informant added that, “…. they gift authorities, especially the traffic police to buy their way to deliberate traffic offenses”.

In the case of focus group discussions, most of the participants revealed that private vehicle drivers were the most efficient, followed by government and/or public vehicles and then commercial vehicle operators. They further noted that Tuk-tuk and Boda bodas trailed, in that order, among road transport operators in the county. Particularly, a lead participant from Commuter Welfare Association (CWA), Kisumu Chapter reported that efficiency of transport operators depended on locality of the road. He specified that, “Kisumu City has the most efficient transport operators, followed by some operators in other towns and then rural transport operators in the County”. This was supported by majority of the participants, all of whom concurred that drivers were more careless on rural roads than urban roads.

In relation to the above, one of the participants noted that, “it is common in Kisumu County for a driver to take great caution on urban roads but behaves very carelessly on rural roads”. To support this, another discussion participant from Kenya Alliance of Resident Association (KARA), Kisumu said:

> Shuttle drivers plying routes from Kisumu City to the rest of the county, have a very common tendency of overloading on the way in the rural areas and revert to the acceptable number of passengers when they are about to reach urban destinations such as Ahero Town, Muhoroni Town, Maseno Town, Chemilil Town, name them.

Furthermore, a participant explained that, "…instead of 14 passengers, most Shuttles load 17 as they traverse on rural roads. They only become restless when they are approaching a town centre".

In the same disposition, almost all participants recounted that even the rest of the operators including Boda-bodas were more efficient on the roads in urban than rural Kisumu. One of the participants noted that, "Like Boda bodas, Tuk-tuks are unruly in rural villages they access around Kisumu City and some towns they operate from in Kisumu County". Another participant from the Association for the Physically Disabled of Kenya (APDK) also added that,

> ….in the county, Tuk-tuks are however mainly concentrated in Kisumu City and operate only to the nearby rural destinations for example villages between Kisumu City and Nyakach, the city and Nyando etc. Unfortunately, they try to be disciplined on the road in the City, and not the rural precincts".

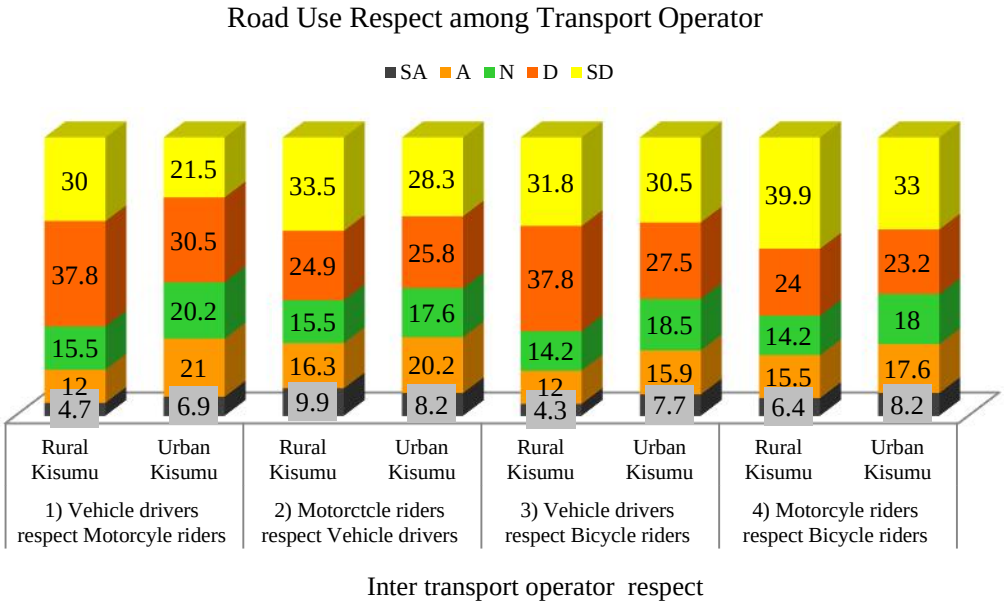
Most of the participants pointed an accusing finger to the Boda bodas as the most inefficient on road irrespective of the areas of operation in the county. A participant (CWA) lamented that, "Boda bodas are chaotic whether in Kisumu City or rural villages! In the city, they pretend to be orderly only in the presence of Traffic Police officers. They are partly the reason safe driving is sometimes a challenge". According to participants, bicycle riders are less efficient both as perpetrators and victims.

As perpetrators, a participant (APDK) noted that, "many bicyclists ride carelessly in towns and rural areas. That is why bicycle accidents are common". Another participant reported that, "Bicyclists are an inconvenience to the flow of traffic especially in Kisumu City. As a result, they are victims of other traffic operators especially Matatus, Tuk-tuks and Boda bodas". Matatus in Kenya and Kisumu County in particular are minibuses used to ply intra or inter town and zonal routes for commercial public service transport (Parkinson, Philips, & Gourlay, 2006). Indicate

The field survey reports analysed above indicate that transport operators had different levels of efficiency and neither of them was highly efficient. Field survey reports formed findings generated from questionnaire survey, interview and focus group discussion. The reports also show that, in both rural and urban Kisumu, vehicle drivers were the most efficient, followed by motorcylists and lastly bicycle riders, respectively.

4.2.2 Respect among transport operators on the road

This section covers findings on respect among transport operators on the road in Kisumu County. The perceptions from the questionnaire survey are summarised in Figure 4.9.



Source: Field research (2018)

Figure 4.9. Distribution of respondents by perceptions on road use respect among transport operators in Kisumu County

Similarly, Road users covered in Figure 4.9 were numbered for no logical implications but simplicity purposes in the description of the sample distributions. The statistical scores on inter transport operators respect (ITOR) were distributed among respondents (n =233) as follows: Concerning 'ITOR 1'in rural Kisumu, 4.7% of the respondents strongly agreed, 12% agreed and 15.5% others were neutral with the question of whether Vehicle drivers respected motorcycle riders. In contrast, 37.8% of the respondents disagreed and 30% others strongly disagreed with the question. About urban Kisumu, 6.9% of the respondents

strongly agreed and 21% others agreed that vehicle drivers there respected motorcycles on the road. On the same prospect 20.2% of the respondents were neutral and 30.5% others disagreed. The rest 21.5% strongly agreed with that. Majority (57.8%) of the respondents felt that rural vehicle drivers were not respectful enough to motorcycle riders on the road, while just over half (52%) of the respondents felt the same for Urban drivers in Kisumu County.

Regarding ITOR 2, statistical distribution on rural Kisumu shows that 9.9% of the respondents strongly agreed and 16.3% others agreed that motorcycle riders respected vehicle drivers. In relation 15.5% of the respondents were neutral while, 24.9% disagreed and the rest 33.5% strongly disagreed with that perception. For urban Kisumu, 8.2% of the respondents strongly agreed and 20.2% others agreed that there motorcyclists respected vehicle drivers on the road. About the same perception 17.6% of the respondents were neutral, whereas 25.8% others disagreed and the rest 28.3% strongly disagreed. Just over a quarter (26.2%) of the respondents believed motorcyclists in rural Kisumu respected drivers on the road. Much less than a third (28.4%) of them felt the same for urban motorcyclists in the county.

As regards ITOR 3, statistics about rural Kisumu show 4.3% of the respondents strongly agreed and 12% others agreed that vehicle drivers respected bicycle riders on the road. Against this perception, 14.2% of the respondents could not agree or disagree while 37.8% disagreed and the rest 31.8% strongly disagreed. In the case of urban Kisumu 7.7% of the respondents strongly agreed, 15.9% agreed while 18.5% were neutral about the inter transport operator respect. On the contrary, 27.5% of the respondents disagreed and 30.5% strongly disagreed with the prospect. Very few (16.3%) of the respondents felt vehicle drivers in rural Kisumu were respectful of bicyclists and only less than a quarter (23.6%) of them indicated the same over urban vehicle drivers in Kisumu County.

Relating to ITOR 4, the statistics about rural Kisumu indicate that 6.4% of the respondents strongly agreed and 15.5% agreed that motorcycle riders respected bicycle riders on the road. In relation, 14.2% of the respondents were neutral while 24% disagreed and the rest 39.9% strongly disagreed with that perception. On urban Kisumu, 8.2% of the respondents

strongly agreed, 17.6% agreed while 18% others could not agree or disagree that motorcyclists showed that respect. Against this, 23.2% of the respondents disagreed and the rest 33% strongly disagreed. Only less than a quarter (21.9%) of the respondents agreed that rural motorcyclists respected bicycle riders and just over a quarter (25.8%) felt that urban motorcyclists did the same in Kisumu County.

To accurately determine the extent of respondents' approval of inter-transport operator respect specified above, their perceptions were also subjected to the mean and standard deviation assessments. The results are presented in Table 4.3.

Table 4.3

Descriptive statistics about respect among transport operators on the road in Kisumu County

Inter transport operator respect (ITOR)	Territory	N	Mean	Std. Deviation
1) Vehicle drivers respect Motorcycle riders on the road	Rural Kisumu	233	2.27	1.17
	Urban Kisumu	233	2.61	1.23
2) Motorcycle riders respect Vehicle drivers on the road	Rural Kisumu	233	2.46	1.36
	Urban Kisumu	233	2.54	1.31
3) Vehicle drivers respect Bicycle riders on the road	Rural Kisumu	233	2.21	1.15
	Urban Kisumu	233	2.43	1.28
4) Motorcycle riders respect Bicycle riders on the road	Rural Kisumu	233	2.26	1.31
	Urban Kisumu	233	2.45	1.33

Source: Field Research (2018)

According to Table 4.3, perceptions about ITOR 1 in rural Kisumu generated a low mean score ($\bar{x}$ = 2.27) and a narrow standard deviation (S = 1.17). This means only a few rural vehicle drivers known to respondents (n = 233) were respectful of motorcycle riders on the road. On the same respect category, perceptions on Urban Kisumu bred a moderate mean score ($\bar{x}$ = 2.61) and small standard deviation (S = 1.23). This suggests, just half of urban vehicle drivers known to respondents exhibited that respect. For both territories in Kisumu County, all was not enough but urban vehicle drivers were more respectful of motorcyclists than rural drivers.

Statistics on ITOR 2 in rural Kisumu also included a lower arithmetic mean ($\bar{x}$ = 2.46) and less wide standard deviation (S = 1.36) indicating that almost half of rural motorcyclists known to respondents had respect for vehicle drivers. In the case of urban Kisumu, similar statistics included a less moderate mean score ($\bar{x}$ = 2.54) and a less spread stand deviation

(S = 1.15) meaning that only half of the urban motorcyclists respected vehicle drivers. In Kisumu County both Urban and rural motorcyclists were not respectful of vehicles but the former were slightly better.

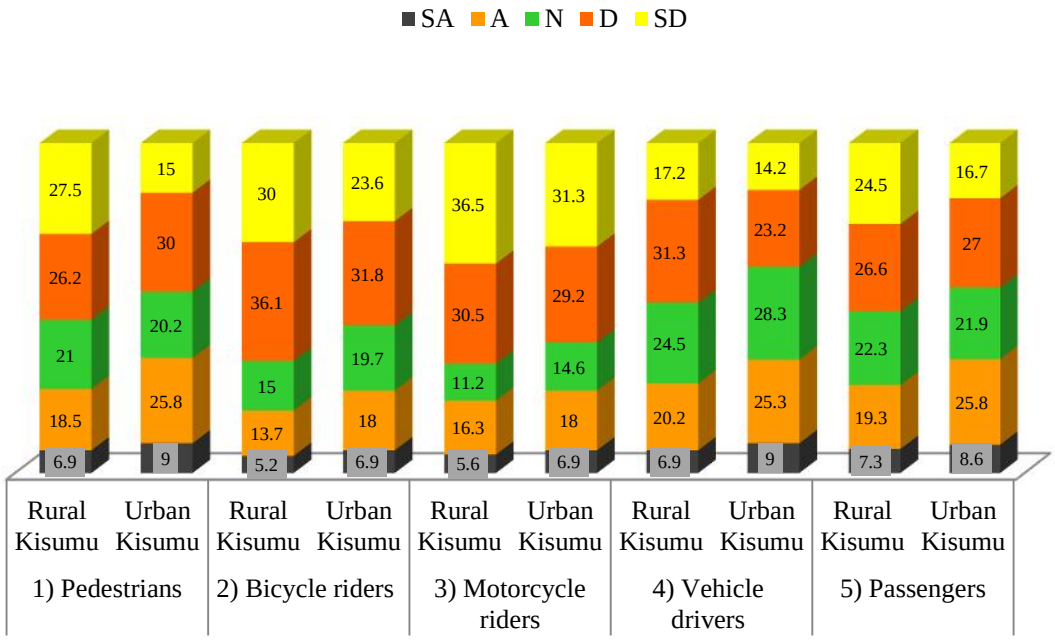
Perceptions about ITOR 3 in rural Kisumu led to a lower mean score ($\bar{x}$ = 2.21) and a narrow standard deviation (S = 1.31). This implies merely a few of the rural vehicle drivers respected bicycle riders on the road. About Urban Kisumu similar perceptions also registered a low arithmetic mean ($\bar{x}$ = 2.43) and small standard deviation (S = 1.28) implying that also a few urban vehicle drivers familiar to respondents exhibited such respect. In either territory in the county, both rural and urban vehicle drivers had less respect for bicyclists on the road.

Statistics about ITOR 4 in rural Kisumu the related perceptions also yielded a lower mean score ($\bar{x}$) of 2.26 and small stand deviation (s) of 1.31 suggesting that there was low respect of bicyclists among rural motorcyclists known to respondents. Similar perceptions about urban Kisumu also formed a low arithmetic mean ($\bar{x}$) of 2.45 and small standard deviation of 1.33 indicating that a few of the urban motorcyclists known to respondents respected bicycle riders on the road. In both rural and urban Kisumu County there were motorcyclists who had less respect for bicyclists.

The analysis above reveals that inter transport operator respect varied among operating road users of research. Despite such respect not being enough, motorcycle riders were more respectful than vehicle drivers in rural Kisumu, while in urban Kisumu, it was vehicle drivers who were more respectful on the road.

4.2.3 Compliance with traffic rules and regulations

This section presents findings on the compliance of road users with traffic rules in Kisumu County. Findings of the questionnaire survey are presented in Figure 4.10.



Source: Field research (2018)

Figure 4.10. Distribution of respondents by perceptions on the compliance of road users with traffic rules in Kisumu County

According to Figure 4.10, distribution of the sample (n = 233) on road users 1 in rural Kisumu shows that 6.9% of the respondents strongly agreed, 18.5% agreed and 21% were neutral with the prospect that pedestrians complied with road traffic rules. On the contrary, 26.2% others disagreed and the rest 27.5% strongly disagreed with that prospect. On the same road users in urban Kisumu, the distribution indicates that 9% strongly agreed, 25.8% agreed while 20.2% could not agree or disagree that pedestrians were consistent of the road rules. In that case, only a quarter (25.4%) of the respondents felt that rural pedestrians were road traffic rules abiding while just over a third (34.8%) of them believed the same with urban pedestrians. For both territories, majority of the respondents differed.

On road user 2 in rural Kisumu, the sample distribution shows that 5.2% of the respondents strongly agreed, and 13.7% others agreed that bicycle riders observed road traffic rules. In relation, 15% of the respondents were neutral, while 36.1% others disagreed and the rest

30% strongly disagreed with that perception. About urban Kisumu, the distribution indicates that 6.9% of the respondents strongly agreed, 18% agreed while 19.7% remained neutral that bicycle riders complied with road traffic rules. Contrastingly, 31.8% of the respondents disagreed and 23.6% strongly disagreed with that perception. Just less than a fifth (18.9%) of the respondents believed that rural bicyclists were compliant with road traffic rules and slightly less than a quarter (24.9%) of the respondents felt the same for urban bicyclists in Kisumu County.

About the road user 3 in rural Kisumu, Figure 4.10 shows that 5.6% of the respondents strongly agreed, 16.3% agreed and 11.2% others were neutral about the motorcycle riders complying road traffic rules. On the contrary, 30.5% respondents disagreed and the rest 36.5% strongly disagreed with that prospect. For urban Kisumu, the sample distribution shows that 6.9% strongly agreed and 18% agreed that motorcycle riders complied with the traffic rules. On that perception, 14.6% of the respondents were neutral while 29.2% others disagreed and the rest 31.3% strongly disagreed. Just above a fifth (21.9%) of the respondents felt rural motorcyclists complied with road traffic rules. Also just a little less than a quarter (24.9%) of the respondents indicated the same for urban motorcyclists in Kisumu County.

Regarding road user 4, the sample distribution on rural Kisumu indicates that 6.9% strongly agreed and 20.2% agreed that vehicle drivers complied with road traffic rule. In relation to same perception, 24.55 % of the respondents were neutral awhile 31.3% disagreed and the rest 17.2% strongly disagreed. About urban Kisumu, the distribution shows that 9% strongly agreed and 25.3% agreed that similar drivers were consistent with the traffic rules. Against that perception, 28.3% of the respondents were neutral, 23.2% others disagreed and the rest 14.2% strongly disagreed. Only over quarter (27.1%) of the respondents believed rural vehicle drivers observed road traffic rules. Just above a third (34.3%) of the respondents felt the same for urban motorists in Kisumu County.

Concerning road user 5, distribution of the sample about rural Kisumu indicates that 7.3% of the respondents strongly agreed, 19.3% agreed and 22.3% could not agree or disagree that passengers obeyed road traffic rules. On the contrary, 26.6% of the respondents

disagreed and 24.5% others strongly disagreed. On urban Kisumu, the distribution shows that 8.6% strongly agreed and 25.8% agreed that passengers there followed the traffic rules. In relation, 21.9% of the respondents were neutral, 27% others disagreed and the rest 16.7% strongly disagreed with that perception. Just over quarter (26.6%) of the respondents felt that passengers in rural areas observed road traffic rules. Only slightly over a third (34.4%) of the respondents indicated the same for passengers in urban areas of Kisumu County.

The same scores above were also analysed using the arithmetic mean and standard deviation to accurately determine how traffic rules compliance among road users was rated by respondents. The related descriptive statistics are presented in Table 4.4.

Table 4.4

Descriptive statistics about compliance of road users with traffic rules in Kisumu County

Road User	Territory	N	Mean	Std. Deviation
1) Pedestrians	Rural Kisumu	233	2.55	1.27
	Urban Kisumu	233	2.82	1.22
2) Bicycle riders	Rural Kisumu	233	2.31	1.20
	Urban Kisumu	233	2.53	1.23
3) Motorcycle riders	Rural Kisumu	233	2.27	1.28
	Urban Kisumu	233	2.40	1.29
4) Vehicle drivers	Rural Kisumu	233	2.73	1.19
	Urban Kisumu	233	2.91	1.19
5) Passengers	Rural Kisumu	233	2.64	1.27
	Urban Kisumu	233	2.82	1.24

Source: Field Research (2018)

Statistics about road user 1 in rural Kisumu show that a less moderate arithmetic mean ($\bar{x}$ = 2.55) and a small standard deviation (S =1.27) were computed from the related perception scores. This means pedestrians known to most respondents were less relatively compliant with traffic rules on the road in rural areas of Kisumu County. In the case of urban Kisumu, more moderate arithmetic mean ($\bar{x}$ = 2.82) and smaller standard deviation (S = 1.22) were generated. In that case, according to most of the respondents, pedestrians in urban areas of the county were more relatively submissive to the traffic rules. For most of the respondents, pedestrians in rural and urban Kisumu County relatively complied with traffic rules. The urban based were bit better given the mean perception difference ($\bar{x}$ = 0.27) recorded.

With regard to road user 2, statistics about rural Kisumu show that a low mean score ($\bar{x}$=2.31) and narrow standard deviation (S = 1.20) were generated suggesting that rural bicycle riders known to most of the respondents were less compliant with the traffic rules. According to statistics on urban Kisumu, a less moderate arithmetic mean ($\bar{x}$ = 2.53) and a small standard deviation (S = 1.23) were computed. This implies urban bicyclists known to most respondents were less relatively biddable with traffic rules while on the road. In Kisumu County, bicyclists familiar to respondents a little relatively observed traffic rules than rural counterparts perceive less consistent.

About to road user 3 in rural Kisumu, the statistics show that a lower mean score ($\bar{x}$ = 2.27) and small standard deviation (S = 1.28) were computed. This indicates that rural motorcycle riders known to most of the respondents were less respectful of the traffic rules. Statistics on urban Kisumu, show that also low arithmetic mean ($\bar{x}$ = 2.40) and a small standard deviation (S = 1.29) were generated. This suggests that urban motorcyclists known to most of the respondents were less compliant with traffic rules in their road use. According to most of the respondents, motorcyclists were less compliant with traffic regulations in both rural and urban Kisumu County.

Concerning road user 4, stats on rural Kisumu show that a moderate mean perception ($\bar{x}$ = 2.73) and smaller standard deviation (S = 1.19) were registered. This means rural motorists known to most respondents fairly observed traffic rules. Related to urban Kisumu, moderate arithmetic mean ($\bar{x}$ = 2.91) and equally small standard deviation (S=1.19) were yielded. In that case, urban motorists known to most of the respondents much fairly complied with road traffic rules. That implies most vehicle drivers both rural and urban Kisumu County fairly observed traffic regulations in both rural and urban. Drivers in urban areas were more consistent than rural counterparts though given the mean perception ($\bar{x}$ = 0.22) lead.

The statistics on road user 5 and rural Kisumu show that a moderate mean perception ($\bar{x}$= 2.64) and small standard deviation (S = 1.27) were computed from the related perceptions. This suggests that in rural areas, passengers known to most respondents fairly adhered to traffic rules. In relation to urban Kisumu, similarly a moderate arithmetic mean ($\bar{x}$ = 2.82)

and a small standard deviation (S = 1.24) were generated from the line perceptions. This means passengers known to most of the respondents in urban areas were more fairly consistent with road traffic rules. Most of the passengers in rural and urban Kisumu County relatively complied with road traffic guidelines, though they were more consistent in urban areas than in rural areas considering the mean perception difference 0.18.

Interviews and focus group discussions bred similar and more findings. From the interviews, only one (01) of the informants strongly Agreed and four (04) others agreed that road users in Kisumu County consistently observed traffic guidelines. Seven (07) of the informants were neutral about this while seventeen (17) disagreed and the rest three (03) strongly disagreed with that. To shed more light, three (03) informants reported that there were only few cases of Public Service Vehicles (PSVs) and motorcycles in Kisumu City who do not observe traffic rules. Relative to this, seven (07) informants indicated that some road users observed traffic rules while some others do not.

For more clarification, one of these informants pointed out that, "…usually private motorists observe traffic rules, except the PSV & Boda-boda operators. These are chaotic". In addition, another informant noted that "in most cases transport operators observe rules except when under influence of drinks, drugs or stress". Further, an informant disclosed that, "…they only observe traffic rules and regulations when traffic enforcement officers are on the roads either from NTSA or traffic police". According to seventeen (17) informants however, most of road users are careless and reckless on the road. Seven (07) of the informants singled out Boda boda riders as the most negligent of the traffic rules.

In relation, an informant indicated that, "…many public service transport operators work as if there are no rules guiding road use, for example, Matatu, bodaboda and Tuk-tuk operators". Another informant added that, "…dangerous overtaking is very rampant among vehicles, Boda bodas and Tuk-tuk. There is also a violation by Matatus which stop anywhere to pick passengers". Also two (02) informants revealed that road users in most cases break traffic rules with a lot of impunity as a result of compromising corrupt traffic enforcers with bribery.

Furthermore, three (03) cited pedestrians as being irresponsible road users beside transport operators. One of them said: “you find pedestrians crossing the road at any point including highways, though they are among the most vulnerable road users traffic regulations are sought to protect!” Generally, two (02) informants reported that road users in urban and mainly in rural areas flout traffic rules all the time.

Focus group discussions led to divergent revelations as well, concerning compliance with road use rules. None of the participants indicated that all was well as regards this road traffic requirement in Kisumu County. Some of the participants reported that users who complied with the guidelines most were drivers of government vehicles and other non-governmental public institutions or organisations. According to participants, these road users were followed by drivers of PSVs, heavy commercial vehicles and private vehicles, bicycles, tri-cycles and motorcycles. Most of the participants faulted passengers, pedestrians and other non-transport operator community as among the most abusers of traffic rules.

One of the participants from CWA reported that, “it is true PSVs in Kisumu County significantly flout rules, but they are not the most culprits. Among vehicles, the most offenders are private vehicles”. These were followed by heavy commercial vehicles, according to another participant (KARA). She said: “there is a perception that PSVs are the major traffic offenders of road traffic rules, which is contrary to actual experience! Private and heavy commercial vehicles are more perpetrators in that order compared to PSVs”. Many discussion participants also accused the Tuk-tuks as more traffic law breakers among tricycles, only second to Boda bodas in the County.

A participant noted that Tuk-tuk offenses are gross especially in Kisumu City where they are most dominant. One of the serious traffic offenses committed by Tuk-tuk in Kisumu, according to participants, is causing traffic congestion. A participant from KARA lamented that, “increase in the number of Tuk-tuks has led to congestion at the main bus terminus in Kisumu City. This obviously causes them to commit traffic offenses like dangerous parking, blocking of traffic and sometimes leading to accidents”.

Majority of the participants reported that Boda boda business in Kisumu County is laissez-faire. A participant from APDK noted that, "……one only needs to know how to ride a Boda boda formally or informally and they are in business. This alone is not consistent with best practice supposed to be enforced as recommended in traffic laws". The participants identified several traffic offenses committed by Boda bodas in particular. Most of the participants revealed that Boda bodas flouted traffic rules depending on their interests at a given time and places of operations. One participant (KARA) observed that, "in towns and rural areas of Kisumu County, wherever they operate, Boda bodas will not shy away from committing an offense on the road. However, the most notable offenses are committed in towns especially Kisumu City".

According to a participant (CWA), the offences committed by Boda bodas in the City are gross given its intensity of road use. Further, the participant lamented:

> …..Boda bodas do not stop at zebra crossings even when other motorists have clearly stopped to allow pedestrians to cross safely, they ride on the wrong side(s) of the road and when traffic jams hit, they turn to pavements and sidewalks.

This was supported by another participant who specified that:

> At the Kondele roundabout, for instance, while other motorists respect the stop signs even during pick hour(s) traffic jam, Boda boda riders usually weave their motorcycles in and out of the immobile vehicles, and get on the curb through. This is committed all in the presence of traffic officers as the Boda bodas take advantage of officers' commitment to directing vehicle traffic.

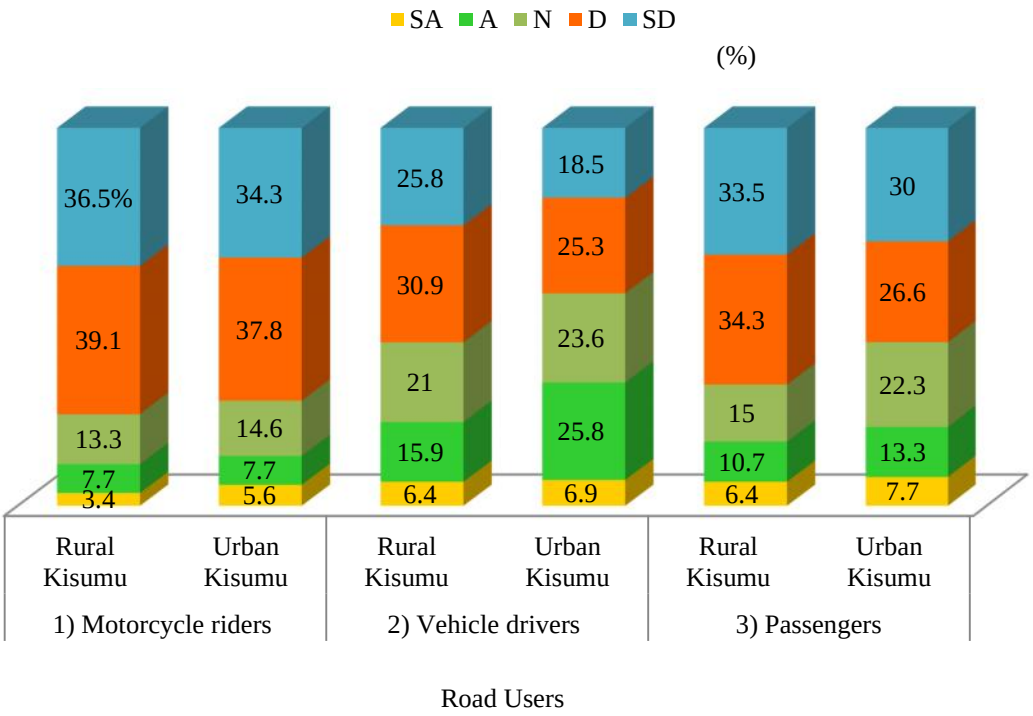
Bicycle riders were also cited by many participants as being notorious on the road. A participant noted that, "bicycle road notoriety is common among commercialised peddle cycling mainly in smaller towns where cyclists are still dominant for example in Chemelil, Ahero, Muhoroni, and Sondu". The Coordinator, Consumer Associations Kisumu Chapter summed it up noting that, "Kisumu County is lagging behind in the Nyanza region in terms of road traffic compliance. On this note, the NTSA has devised means to ensure compliance is increased".

Notwithstanding territorial variations significant compliancy gaps, the above findings indicate that in both rural and urban Kisumu, Vehicle drivers were the most compliant of

all road users of study, followed by passengers and pedestrians, then motorcycle riders and lastly bicycle riders.

4.2.4 Safety of regular road users from accidents

Safety of regular road users was another indicator investigated to assess the level of road safety in Kisumu County. The related findings from the questionnaire survey area presented in Figure 4.11.



Source: Field Research (2018)

Figure 4.11. Distribution of respondents by perceptions on safety of road users from accidents in Kisumu County

Figure 4.11 specifies the sample distribution (n = 233) for each of the regular road users in both rural and urban Kisumu. The distribution about road user1in rural Kisumu indicates that 3.4% of the respondents strongly agreed and 7.7% agreed that motorcycle riders were safe from accidents. However, 13.3% of the respondents could not agree or disagree, 39.1% disagreed and 36.5% strongly disagreed with that. In the case of urban Kisumu, 5.6% of the respondents strongly agreed and 7.7% agreed that motorcyclists were safe. On the other hand, 14.6% of the respondents were neutral while 37.8% disagreed and the rest 34.3%

strongly disagreed with that perception. Very few of the respondents felt motorcyclists were safe from accidents in both rural (11.1%) and urban (13.3%) areas of Kisumu County.

About road user 2, the distribution shows that for rural Kisumu, 6.4% of the respondents strongly agreed and 15.9% agreed that vehicle drivers were safe from accidents. In relation to this, 21% of the respondents remained neutral whereas 30.9% disagreed and 25.8% strongly disagreed. On urban Kisumu, the distribution indicates that 6.9% of the respondents strongly agreed and 25.8% agreed that urban vehicle drivers were safe in that respect. However, 23.6% of the respondents were neutral while 25.3% disagreed and the rest 18.5% strongly disagreed with that prospect. Just over a fifth (22.3%) of the respondents believed that rural motorists in Kisumu County were safe from accidents. Just about a third (32.7%) of the respondents indicated that urban motorists in the county were safe from such fatality.

The distribution about road user 3 and rural Kisumu 6.4% of the respondents strongly agreed and 10.7% others agreed that passengers were safe from accidents. Besides, 15% of the respondents could not agree or disagree whereas 34.3% disagreed and 33.5% strongly disagreed with that prospect. For urban Kisumu, the distribution shows that 7.7% of the respondents strongly agreed and 13.3% agreed that passengers were safe from such fatality threat. In relation, 22.3% of the respondents were neutral about that. Conversely 26.6% disagreed and the rest 30% strongly disagreed with that perception. Less than a fifth (17.1%) of the respondents indicated that passengers in rural Kisumu County were safe from accidents. Only slightly above a fifth (21%) of the respondents felt that passengers in urban areas of the county were safe from a threat.

The arithmetic mean and standard deviations were computed from the same perception scores above to determine with more accuracy how respondents rated regular road users' safety from accidents. The resultant descriptive stats are present in Table 4.5.

Table 4.5

Descriptive statistics about safety of regular road users from accidents in Kisumu County

Road user safety	Territory	N	Mean	Std. Deviation
1) Motorcycle riders safe from accidents	Rural Kisumu	233	2.07	1.09
	Urban Kisumu	233	2.21	1.13
2) Vehicle drivers safe from accidents	Rural Kisumu	233	2.51	1.23
	Urban Kisumu	233	2.76	1.22
3) Passengers safe from accidents	Rural Kisumu	233	2.26	1.23
	Urban Kisumu	233	2.40	1.25

Source: Field Research (2018)

Table 4.5 shows that according statistics on to road user 1 in rural Kisumu, a low arithmetic mean ($\overline{x}$ = 2.07) and smaller standard deviation (S = 1.09) were computed suggesting that rural motorcycle riders known to most of the respondents were less safe from road accidents. Similarly, perceptions on urban Kisumu generated a low mean ($\overline{x}$) of 2.21and small standard deviation (S) of 1.13. In this case, urban motor cyclists also known to most of the respondents were less safe from such road fatality. Accordingly, in Kisumu County most rural and urban motorcyclists were less safe from accidents.

Statistics on road user 2 in rural Kisumu indicate that a less moderate arithmetic mean ($\overline{x}$ = 2.51) and small standard deviation (S = 1.23) were generated signifying that rural vehicle drivers known to most of the respondents were less relatively safe from road accidents. About urban Kisumu statistics show that a moderate mean ($\overline{x}$ = 2.76) and small standard deviation (S = 1.22) were computed. This suggests urban vehicle drivers according to most of the respondents, were fairly safe from such fatality. In Kisumu County most rural and urban motorists were relatively safe from accidents though the urban had an edge over rural counterparts by a mean perception difference of 0.21.

Statistics on road user 3 in rural Kisumu show that a lower mean score ($\overline{x}$ = 2.26) and small standard deviation (S = 1.23) were produced indicating that rural passengers, according to most of the respondents, were less safe from road accidents. About urban Kisumu stats show that a low mean ($\overline{x}$ = 2.40) and small standard deviation (S = 1.25) were recorded. This indicates urban bound passengers were according to most of the respondents, also less

safe from the road menace. In the county therefore most rural and urban passengers were less safe from road accidents though the urban abound were a bit better than the rural given a mean perception difference of 0.17.

From the interviews, results on a similar question about safety of regular road users show that four (04) informants **s**trongly agreed and five (05) others agreed that there were no safety mishaps. Seven (07) informants were neutral about that while the majority thirteen (13) respondents disagreed and the rest three (03) strongly disagreed, suggesting that not all and sundry were safe from road calamity. To expound on their perceptions, four (04) contented informants indicated that road users mainly in urban Kisumu were safe enough on road. One of them stated: "road user safety in Kisumu City is demonstrated by the number of accidents which is not all that high". Another informant added that, "there are limited or no accidents on road spots with the requisite road signages including the rural areas".

However, the explanation above was not sufficient as one (01) informant reported that, "all regular road users are 50% safe whether among motorists, motorcyclists or passengers. In fact, all road users are potentially vulnerable to accidents especially on roads outside Kisumu City". On a more negative note, the majority twenty-two (22) informants indicated that such regular road users were less safe because accidents are very common especially in the rest of the county, save Kisumu City. In particular, three (03) informants specified that accidents were common on narrow roads, congested roads and roads along which pedestrians cross anywhere.

In addition, two (02) informants noted that accidents occurred on road spots with no side reserve paths and/or road user signages. Two (02) other informants indicated that such accidents were common where roads were poorly maintained. One of these informants specified that, "…such road use susceptibility is especially more common with feeder roads in rural areas". Another informant revealed that accidents were common with motorists and motorcyclists driving neck to neck speed. Relative to this, an informant disclosed that, "regular road users are also not safe because accidents are usually associated with careless overtaking among motorists and motorcyclists". According to an informant, such road

users were not safe enough due to poor road designation for high risk users. Generally, two (02) reported that motorcyclists, motorists, or even passengers were not safe enough on road also because of the recklessness of some wayward drivers.

According to most of the focus group discussants revealed that there was nothing like road users are safe on the road. Twelve (12) of these participants noted that passengers were unsafe in urban Kisumu as much as they were in rural areas. One of the participants from APDK reported that, "recently, the Kisumu County Traffic Commandant warned that road users were increasingly at risk following rise of accidents caused mainly by cattle crossing major highways in the county". This was overwhelmingly supported by participants, some of whom added that cattle wandered even within the Central Business District (CBD) of Kisumu City posing threat to road users irrespective of category. A female participant from CWA noted that, "some cattle spend the night in the middle of roads while others are led by owners to cross roads in undesignated areas, thus causing disorder".

He observed that market places are jammed leading to the disruption of parking order in the city. The commissioner said the operators have invaded the CBD and should be regulated. In relation, another participant pointed out that, "…cattle related road traffic threats are most common on Kisumu-Nairobi highway at Nyamasaria. Recently, an accident occurred in the same area between a Tuk-tuk and a lorry due to the cattle menace". In addition, a participant from KARA lamented that, "all road users are under threat in all parts of Kisumu County. The difference is with the degree of the threats". Majority of the participants were categorically convinced that motorcyclists especially Boda boda and Tuk-tuk were the most threatened, followed by passengers, private vehicles, heavy commercial vehicles, PSVs and then public institutional vehicles including government and non-government social vehicles.

A participant (APDK) cited concerns of key stakeholders in the transport sector in Kisumu County as proof of the vulnerability of Boda boda and Tuk-tuk operators. She said:

> Roadwise Network and Kisumu Traffic Police Department took initiative to offer training to all riders on account of their road use incompetence. The Roadwise CEO had said most of the motor (vehicles) and tri-cyclists lacked basic road safety skills and were thus the most exposed to accidents. Indeed,

> it is still common knowledge most riders in Kisumu County significantly lack such skills.

Another participant (KARA) interjected pointing out that riders' unskillfulness was itself a threat to the rest of regular road users by virtue of a very large number of Boda boda and Tuk-tuk. He quoted the statistics from authorities: "Kisumu Traffic Police reports show that there are over 120 groups of riders in Kisumu City that translate to 24,000 registered by the central body of the Boda boda operators". Another participant also from KARA further quoted related reports on riders' awareness of their road safety. He revealed that, "similar Traffic Police reports indicate that 66.5% of motorcyclists in Kisumu County have low level of knowledge about motorcycle safety associated with personal physical protection, motorcycle good conditions and rider's behaviour or riding practices".

Another participant from KARA singled out private vehicles as the least safe on the road of all vehicles in Kisumu County. She cited the NTSA report (2015) indicating that "private car drivers are the most contributors to road accidents in Kisumu compared to other vehicles. They are the most vulnerable". Relative to that several participants reported that many private cars in the county play public service roles, which is illegal and otherwise risky to road safety. Two of the participants referred to the tendency of Probox Cars of piling and carrying passengers, way beyond their capacity especially on inter town routes, apart from Kisumu County. One of the participants revealed that, " the NTSA had warned in 2014 private cars including Probox and mainly the 7-seater cars against acting as PSVs". Most of the participants observed that such cars were at great risk and risked other road users because they obligated to adopt essential safety kits required for PSVs.

If anything, the lack of such safety requirements made PVSs themselves in Kisumu County less safe and un-roadworthy. One (APDK) of the participants reported that, "……the NTSA recently impounded a total of 50 Public Service Vehicles (PSVs) in a single clampdown in Kisumu County. Most impounded vehicles had no Transport Licensing Board Licenses, Stickers among other requirements to operate on the road". In addition, another participant (CWA) noted that, "PSVs are the widely known road carnage causers in Kisumu although the NTSA ranks them second to private cars. PSVs have a tendency of overloading making them vulnerable to accidents". A related participant cited a PSV that could have suffered a road accident largely due to overloading. She said, "the

overloaded Matatu crashed uncontrollably along Kisumu- Kendu Bay road on January 5, 2017. The ill-fated vehicle was travelling from Sirare in Migori County to Kisumu".

Most of the participants observed that PSVs were prone to induced accidents due to drop off and pick up habit of passengers anyhow on the roadside even where there is no parking space. One of the participants (CWA) clarified: "…PSVs in general stop anywhere on the road upon passengers' request, causing traffic jam in towns, particularly Kisumu City and road accidents on the highways". About heavy commercial vehicles, most of the participants revealed that drivers were very vulnerable due to overwork. One of the participants, a leader from KARA noted with concern:

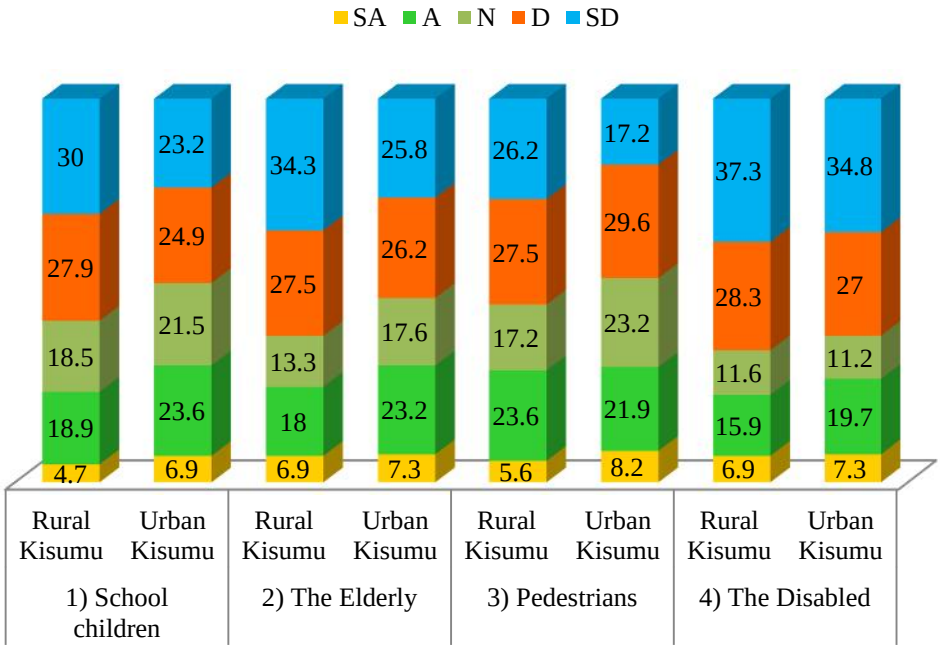
> ….most drivers of heavy duty vehicles especially the commercial ones are overworked by employers as lone drivers because they need the job and have no option. In the end, they are prone to driver fatigue and vehicle accidents. This is common everywhere in Kisumu County!

Four (04) participants also cited the same reason as the safety challenge of long distance heavy trucks that have had road carnage within the precincts of Kisumu County. Some participants also cited the challenge of undeveloped road reverses due to which there were common cases of stationary trucks on the roads in rural and urban Kisumu. One of them (CWA) explained that, "….in different parts of Kisumu, trucks tend to remain on the road in case of mechanical complications and rescue response takes days. As a result, this has caused safety risks to road users including the affected trucks".

The findings above suggest that regular road users were safer in urban than rural areas of Kisumu County although none was sufficiently safe on the road. This difference notwithstanding, both rural and urban road users had one thing in common; in either territory, vehicle drivers were the safest from accidents, followed by passengers and lastly motorcyclists.

4.2.5 Favourability of roads to marginal road users

The study also investigated the extent to which roads in Kisumu County are favourable to high risk road users such as School Children, Pedestrians, the Elderly, and Disabled. The findings from questionnaire enquiry are presented in Figure 4.12.



Source: Field Research (2018)

Figure 4.12. Distribution of respondents by perceptions on whether roads in Kisumu County are conducive for high risk road users

Figure 4.12 summaries the distribution of the sample (n = 233) about road safety of high risk users in both rural and urban Kisumu county. The distribution on road user1in rural Kisumu indicates that 4.7% of the respondents strongly agreed and 18.9% others agreed that roads were favourable for school children. However, 18.5% of the respondents could not agree or disagree while 27.9 % disagreed and 30% strongly disagreed with that perception. About urban Kisumu, the distribution shows that 6.9% of the respondents strongly agreed and 23.6% others agreed that urban roads were favourable for school child use. Besides, 21.5% of the respondents were neutral, while 24.9% disagreed and the rest 23.2% strongly disagreed with that prospect. Just less than a quarter (23.6%) of the respondents felt that rural roads were favourable for school children while only less than a third of same respondents indicated the same for urban bound school kids.

Findings about road user 2 and rural Kisumu show that 6.9% of the respondents strongly agreed, 18% agreed and 13.3% others could not agree or disagree that roads were favourable for the Elderly. On the contrary, 27.5% of the respondents disagreed and the

rest 34.3 % strongly disagreed with that admission. The findings on urban Kisumu indicate that 7.3% of the respondents strongly agreed and 23.2% others agreed that urban roads were favourable for use by the Elderly. In relation, 17.6% of the respondents were neutral, whereas 26.2% disagreed and the rest 25.8% strongly disagreed with that perception. Over three fifth (61.8%) of the respondents felt that rural roads were not conducive for the Elderly. Over half (52%) of same respondents could not endorse urban roads for the Elderly.

Results about road user 3 in rural Kisumu show that 5.6% of the respondents strongly agreed, and 23.6% others agreed that roads were favourable for pedestrians. In relation, 17.2% of the respondents could not agree or disagree with that. On the other hand, 27.5% disagreed and 26.2 % strongly disagreed with the prospect. Findings on urban Kisumu include 8.2% of the respondents strongly agreed and 21.9% others agreed that urban roads were favourable for pedestrians. Comparably 23.2% of the respondents were neutral, 29.6% disagreed and the rest 17.2% strongly disagreed with that perception. Over half (53.7%) of the respondents believed rural roads were not favourable enough for pedestrian use while less than (46.8%) of same respondents shared a similar feeling over urban roads.

The sample distribution on road user 4 in rural Kisumu show that 6.9% of the respondents strongly agreed, and 15.9% others agreed that roads were favourable for the disabled. Relatively, 11.6% of the respondents remained neutral about that. In contrast, 28.3% disagreed and 37.3 % strongly disagreed with that. Results about urban Kisumu indicate 7.3% of the respondents strongly agreed and 19.7% others agreed that urban roads were suitable for the disabled. In relation to this 11.2% of the respondents remain neutral, 27% disagreed and 34.8% strongly disagreed. For both rural and urban Kisumu, majority (65.6% and 61.8%) of the respondents felt rural and urban roads in Kisumu were not favourable enough for the disabled.

The arithmetic mean and standard deviation were used on the same score reflected in Figure 4.12 to truthfully define how respondent rated the favourability of roads in Kisumu County to high risk road users. The results are summarised in Table 4.6

Table 4.6

Descriptive statistics about the favourability of roads to high risk road users in Kisumu County

Prompt	Territory	N	Mean	Std. Deviation
1) Roads conducive for School children	Rural Kisumu	233	2.44	1.25
	Urban Kisumu	233	2.68	1.26
2) Roads conducive for the Elderly	Rural Kisumu	233	2.42	1.33
	Urban Kisumu	233	2.62	1.30
3) Roads conducive for Pedestrians	Rural Kisumu	233	2.58	1.27
	Urban Kisumu	233	2.76	1.23
4) Roads conducive for the Disabled	Rural Kisumu	233	2.30	1.32
	Urban Kisumu	233	2.41	1.35

Source: Field research (2018)

Statistics on road user 1 in rural Kisumu indicate that a low mean score ($\bar{x}$ = 2.44) and small standard deviation (s = 1.25) were generated. This suggests rural roads known to most of the respondents were less favourable for school children. In respect of urban Kisumu, the statistics show that a moderate arithmetic mean ($\bar{x}$ = 2.68) and similarly small standard deviation (S = 1.26) were computed. This implies urban roads known to most of the respondents were relatively conducive for school children. In that case, in Kisumu County most of the rural roads were less favourable and most of the urban roads were relatively suitable for school children.

The statistics on road user 2 in rural Kisumu show that likewise a low mean score ($\bar{x}$ = 2.42) and less wide standard deviation (S = 1.33) were generated. This means, rural roads known to majority of the respondents were less favourable to the Elderly. About urban Kisumu, the statistics indicate that a moderate arithmetic mean ($\bar{x}$ = 2.62) and less eclectic standard deviation (S= 1.30) were recorded. In that, case urban roads known to most of the respondents were fairly conducive for the Elderly. Similarly, most of the rural roads in Kisumu County were less favourable for the Elderly while most of those in urban areas were fairly favourable for such elderly road users.

About road user 3 in rural Kisumu, the statistics show that a less moderate arithmetic mean ($\bar{x}$ = 2.58) and small standard deviation (S = 1.27) were computed. This suggests, rural roads known to most of the respondents were less fairly conducive for pedestrians.

Regarding urban Kisumu, the statistics specify that a moderate mean perception ($\bar{x}$ = 2.76) and small standard deviation (S = 1.23) were recorded. This implies urban roads known to most of the respondents were relatively favourable for pedestrians. In Kisumu County therefore, most of the rural roads were less favourable for pedestrians whereas most of those in urban areas were partially favourable for such elderly road users.

The statistical results about road user 4 in rural Kisumu show that a low arithmetic mean ($\bar{x}$ = 2.30) and less-wide standard deviation (S = 1.32) were produced. This symbolises the fact that rural roads known to most of the respondents were less favourable for the disabled. As regards urban Kisumu, the results indicate that a low mean perception ($\bar{x}$ = 2.41) and less-stretched standard deviation (S= 1.35) were recorded. This suggests that urban roads known to many respondents were also less favourable for the disabled. In the county, most of the rural roads were less conducive for the disabled and many roads in urban areas were also less favourable for similar road users.

Beside the above revelations, findings from interview and focus group discussions provide more detail for in-depth explanation of the extent to which roads were favourable to the specified high-risk road users. First and foremost, according to interviews, only four (04) of the interview informants strongly agree and four (04) others agreed that roads in Kisumu County were conducive high-risk road users. Five (05) informants were neutral about this whereas fourteen (14) informants disagreed and rest four (04) informants interviewed strongly disagreed with the notion. In support of their views, four (04) informants specified that many parts of Kisumu City have roads conducive for school children, pedestrians and the disabled. Another four (04) informants indicated that other towns in addition to Kisumu City have roads conducive for such users.

However, the majority eleven (11) of the interview informants disputed the suggestion above noting that roads were less user friendly to specified marginal road users in most of the towns in Kisumu County. Similar revelation was in part reflected in accounts of seven (07) informants also interviewed who indicated though some roads were favourable, in many parts of the County, many roads were less conducive for such high risk use most particularly in rural areas. This was further specified by an informant stating that, “roads

in other towns other than Kisumu City have not reached the standard of being conducive for high risk road users, especially the disabled and the elderly". On the other hand, two informants indicated that even in Kisumu City most roads lacked designated sections for this class of road users.

In addition, another informant added that, "most roads are impassable during rain seasons especially in the rural areas and in a similar season a few in towns are somehow conducive". This was corroborated by revelations of two informants who explained that most rural roads were in bad state because they are not properly maintained, and others are under construction. Three (03) other informants also indicated that roads were narrow in rural areas and most of the towns as well as in many parts of Kisumu City.

According to an informant, not all roads in Kisumu City were conducive; he specifically stated that, "…some roads are full of potholes and only a few such as Nairobi roads are okay". Another informant added that, "some roads in Kisumu City have poor drainages just like in most of the towns and rural roads and thus less conducive most especially during rainy seasons". In relation, an informant also expressed concern specifying that in most of the towns and much of the rural areas in Kisumu County there was no much provision for pedestrians, for example there were very minimal or no zebra crossing signs. Specifically to note, ten (10) informants ideated that roads in most of Kisumu County and particularly rural areas were not conducive at all for the elderly.

According to focus group discussions, majority of the participants observed that some marginal road users were safer on the roads than others although all of them were significantly potentially susceptible. Some participants specified that the disabled and elderly were more at risk compared to school children and pedestrians on the roads of Kisumu County. It was also revealed that pedestrians were commonly involved in road mishaps than school children even though the latter are widely perceived to be more fragile. According to some of the participants, vehicle threatened pedestrians were prone to safety risks especially on highways between Kisumu City and the surrounding counties. One of the participants (APDK) explained that:

> Pedestrian accidents among vehicles are common along highway routes away from Kisumu City. This is usually and partly associated with over

> speeding vehicles and poor or no road walkways. Good examples include Kakamega route, Kisii route, Busia Route and sometimes Kericho route.

Participants also noted that the most unsafe pedestrians were endangered by mainly motorcycle and then bicycle Bodabodas. These were followed by the tricycle (Tuk-tuk) threat. Most of the participants blamed Bodabodas in Kisumu City, then similar motorcycles and bicycles in other towns and rural areas in the county in that order. The participants attributed this variation of pedestrian risk to differences in the levels of traffic congestion. In addition, a participant (CWA) particularly disclosed that, "the Tuk-tuk risk to pedestrians cannot be ignored especially in Kisumu City where they are the most dominant in the county. The reckless driving of Tuk-tuk operators put pedestrians at high risk though it does not match Bodabodas".

Pertaining to school children, majority of focus group discussion participants observed that children were more threatened in rural Kisumu than in urban Kisumu despite being significant at risk in most of the towns in the county including Kisumu City. Some participants revealed that they were mainly unsafe on the road even towns as long as they walked alone. "…they are significantly at risk in Kisumu City, other township and on rural roads in the County as long as there is reckless road traffic among vehicles, Boda bodas and Tuk-tuk", said a participant for KARA. Another participant reported that, "cases of school children accidents are rampant in areas of irresponsible road use irrespective of geo-economic territory; rural or urban but most especially in rural areas in the county".

More concern among discussants was about safety of the disabled (People Living with disability) in the county. Most of them showed sympathy with how the disabled manoeuvre to use the roads everywhere in the county. Participants from the APDK, Nyanza Region unanimously reported that it was safer to stay home than travelling even when it was necessary to. Most of the participants including the non-disabled faulted Matatu Touts at long route terminals (names withheld on request) in Kisumu City, saying most of them show very little remorse to the disabled passengers. Some participants appreciated that flyovers have been built on some roads in Kisumu City, but they were not everywhere. This means, the flyovers were distant apart and thus less useful for the disabled. A lead participant (APDK) lamented: "…such safety installations can only be found in Kisumu

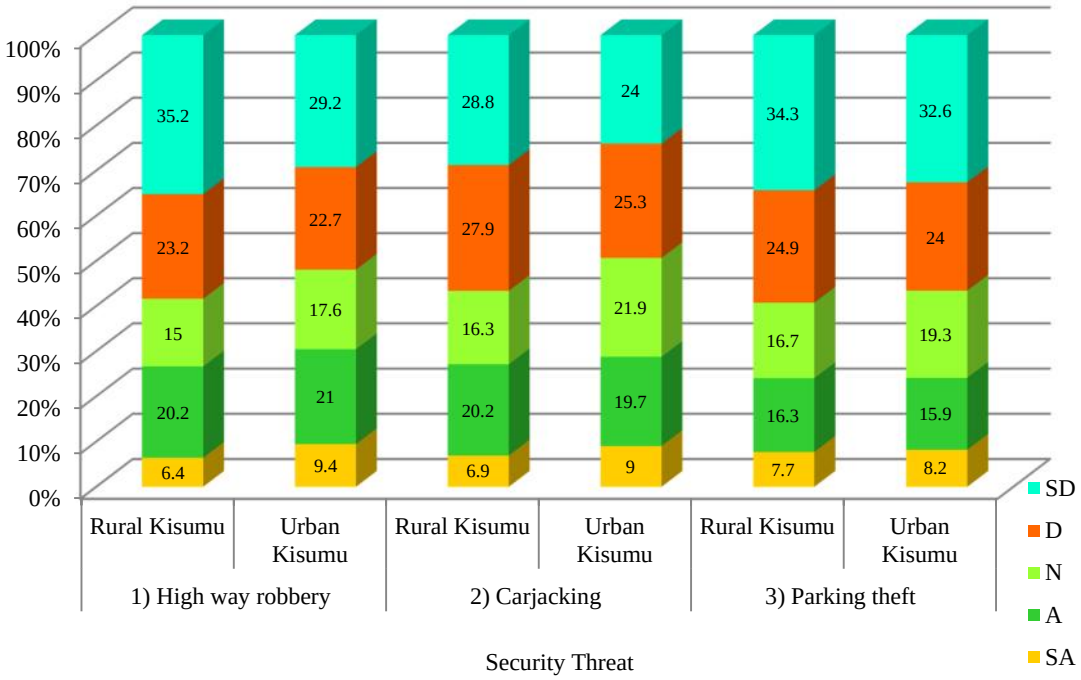
City and not the rest of the County. Yet, the disabled are everywhere including rural areas and equally have the need and right to travel!"

Another very senior participant from the regional APDK expressed sympathy mainly with the blind, "…. some of the most vulnerable among persons living with disabilities (PWDs) on the roads anywhere in Kisumu County are the blind. They lack even basic safety gadgets such as a walking white cane for road use". The participants particularly reported that zebra crossings had been provided on the roads to help pedestrian road users including the blind in most of Kisumu County, but there were reservations! Some of the participants bemoaned that this was more common in urban centres and very rare in rural Kisumu. These participants also noted that the zebra crossings were only well indicated and more regularly repaired only in Kisumu City than elsewhere. Even then, a few participants regretted that such crossings in the city itself were very distant apart making life hard for such disabled people just like the elderly, who too would have specially benefited from the signage.

Basing on the foregoing analysis, urban roads, though not sufficiently suitable, were more favourable to high risk road users than rural roads in most of Kisumu County. Beside this difference, roads in both rural and urban Kisumu constrained the disabled most, then the elderly, followed by school children and lastly pedestrians, in that order.

4.2.6 Road use poses no security threats

Also investigated in the study was the security of roads in Kisumu County. Respondents were asked about whether road use in the county poses security threats like high way robbery, Carjacking, and Parking Theft. The questionnaire findings are summarised in Figure 4.13.



Source: Field Research (2018)

Figure 4.13. Distribution of respondents by perceptions on whether road use in Kisumu County poses security threats

Figure 4.13 illustrates the distribution of the sample (n = 233) for each of the study road related security threats in rural and urban areas of Kisumu County, respectively. To begin with, sample distribution on security threat 1 in rural Kisumu shows that 6.4% of the respondents strongly agreed and 20.2% agreed that rural roads did not pose high way robbery threats. In relation, 15% of the respondents could not agree or disagree, 23.2% disagreed and 35.2% strongly disagreed with that perception. About urban Kisumu, the distribution shows that 9.4% of the respondents strongly agreed and 21% others agreed that urban roads did not pose such a security threat. Besides, 17.6% of the respondents were neutral, while 22.7% disagreed and the rest 29.2% strongly disagreed with that prospect. About three fifth (58.4%) of the respondents felt that rural roads posed high way robbery threat to road users. Over half (51.9%) of the same respondents indicated that urban roads posed a similar threat.

In relation to security threat 2, sample distribution on rural Kisumu shows that 6.9% of the respondents strongly agreed and 20.2% agreed that roads did not pose carjacking threats. Against this prospect, 16.3% of the respondents were neutral while 27.9% disagreed and

28.8% strongly disagreed. On urban Kisumu, the distribution shows that 9% of the respondents strongly agreed and 19.7% others agreed that urban roads did not pose this security threat. However, 17.6% of the respondents were neutral, whereas 25.3% disagreed and the rest 24% strongly disagreed with that perception. Also about three fifth (56.7%) of the respondents believed that rural roads posed carjacking threats to road users and about half (49.3%) of the same respondents felt that urban roads posed a similar threat.

On security threat 3, the distribution about rural Kisumu shows that 7.7% of the respondents strongly agreed and 16.3% agreed that roads did not pose parking theft threats. Beside this perception, 16.7% of the respondents were neutral whereas 24.9% disagreed and 34.3% strongly disagreed. About urban Kisumu, the distribution shows that 8.2% of the respondents strongly agreed and 15.9% others agreed that urban roads did not pose such security threats. On the other hand, 19.3% of the respondents were neutral, whereas 24% disagreed and the rest 32.6% strongly disagreed with that perception. Similarly slightly about three fifth (59.2%) of the respondents indicated that rural roads posed parking theft threats to road users and over half (56.6%) of the same respondents believed that was the same with urban roads.

For accurate description of how respondents rated the security safety of roads in rural and urban areas of Kisumu County, their perceptions were also analysed using arithmetic mean and standard deviation statistics. The results are presented in Table 4.7.

Table 4.7

Descriptive statistics about the road use not a security threat in Kisumu County

Threat	Territory	N	Mean	Std. Deviation
1) Road use poses no robbery threat	rural Kisumu	233	2.45	1.35
	urban Kisumu	233	2.63	1.37
2) Road use poses no Carjacking threat	rural Kisumu	233	2.54	1.30
	urban Kisumu	233	2.68	1.30
3) Road use poses no Parking theft threat	rural Kisumu	233	2.42	1.33
	urban Kisumu	233	2.47	1.33

Source: Field research (2018)

The statistics on security threat 1 in rural Kisumu show that a low arithmetic mean ($\bar{x}$ = 2.45) and less spread-out standard deviation (1.35) were computed. This suggests that rural

road use according to many of respondents was less safe from highway robbery. In respect of urban Kisumu, the statistics show that a moderate arithmetic mean ($\bar{x}$ = 2.63) and similarly less spread-out standard deviation (s = 1.37) were generated. This implies that urban road use according to many of the respondents was relatively safe from highway robbery. In Kisumu County therefore, lots of rural roads were less safe from high way robbery while many urban roads were relatively safe from such a security threat.

About security threat 2 in rural Kisumu the statistics show that a less moderate arithmetic mean ($\bar{x}$ = 2.54) and less spread standard deviation (s =1.30) were generated. This indicates that rural roads known to many of respondents were less fairly safe from carjacking. For urban Kisumu, the statistics show that a moderate arithmetic mean ($\bar{x}$= 2.68) and standard deviation (s) of 1.30 were computed. This suggests that urban roads also known to many of the respondents were fairly safe from carjacking. This infers that in Kisumu County quite a lot of rural roads are less relatively safe while several urban roads were fairly safe from carjacking.

According to statistics on security threat 3 in rural Kisumu, a low arithmetic mean ($\bar{x}$ = 2.42) and less spread-out standard deviation (s = 1.33) were registered indicating that roads in many rural areas were less safe from parking theft. On urban Kisumu, the statistics also indicate that a low mean perception ($\bar{x}$ = 2.47) and standard deviation (s) of 1.33 were computed. This means urban roads also known to many of the respondents were less safe from parking theft. This surmises that Kisumu County many rural and urban roads were less safe from parking theft threats.

Besides the above statistical results, similar and detailed findings on road use security threats in the county were generated from interviews and focus group discussions. The interview findings show that two (02) of the informants interviewed strongly agreed and eight (08) others agreed that road use in Kisumu County posed serious security threats. Besides, nine (09) were neutral about the question, whilst eight (08) informants disagreed and the rest four (04) strongly disagreed over the possibility of road related security threats. To shed light on their perceptions, seven (07) informants indicated that carjacking and parking thefts were well controlled. One of the informants noted: “such threats are prevented or countered by car security devices such as car tracking and vehicle security

alarm systems". In addition, four (04) respondents pointed out that the county government had ensured proper street lights for road related security purposes. In relation, an informant specified that,

> Apart from rural access roads, most of the highways and urban roads in Kisumu County are cleared of the nearby bush either ways. Road side trenches are also regularly drained. All this is done to ensure secure vision and road use.

The contentment above was a bit differed by four (04) informants according to whom there were few serious road security threats in Kisumu County. On a completely contrasting end, majority thirteen (13) informants indicated that such threats actually existed on most of the roads in rural areas and many in urban centres. For further clarification, two (02) of these informants revealed that the insecurity was impelled by ignorance of grave insecurity spots. In addition, three (03) informants disclosed that Boda-bodas were commonly used in the commission of social crime against road users.

Relative to the above, one of the informants alleged that, "some transport operators connive with criminals to rob from passengers on high ways and some remote parts of Kisumu County". Another informant said, "roads pose security threats because in the event of chase of criminals either by vehicle or motorcycle, chances of escape are high". According to two (02) informants security threats were common on accident scenes especially where vehicles or motorcycles were abandoned by the drivers or riders respectively. Lastly, an informant noted that, "insecurity also prevails on some roads under construction or maintenance because any of these road development activities presents exploitable spots for road robbers"

In the focus group discussions, many of the participants disclosed that road insecurity was not as much a risk as traffic violation related or caused risks. In fact, many participants reported that there was less road insecurity, but indicated it was more grave in rural Kisumu than urban areas due to variations in socially and government supported security apparatus. However, there were reservations among some participants on the same who pointed out that in many towns in the county including the county's capital Kisumu City, parking thefts and carjacking were common. One (KARA) of the participants revealed that, "personally I have on several occasions witnessed parking thefts in Ahero, Chemelil and Muhoroni

Towns." I have also seen some and heard about many in Kisumu City". Another participant (CWA) reported that, "though there are no clear statistics, in towns, parking thefts are common though not as dominantly grave as carjacking and any other road robberies, be it in Kisumu town or elsewhere".

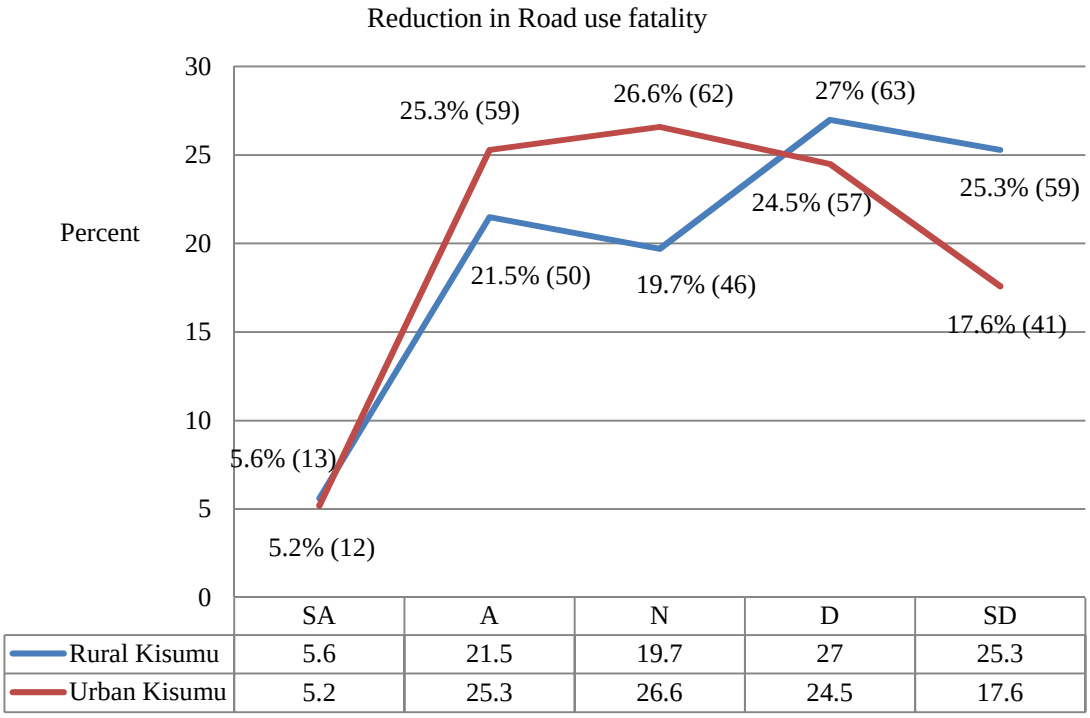
Several participants pointed out the following other towns where they had seen parking thefts: Muthoni, Nyalenda, Amimos, Sondu, Esabalu and Mutet. About carjacking, some participants specified that it was commonly reported in Kisumu City through the media especially on radio and TV. One participant (KARA) stated: "carjacking has been reported not only in Kisumu City but also from other towns! There have also been similar reports on the same on highways and rural motorable roads but to a rare extent". Many participants agreed that carjacking was common on highways though not as much as highway robbery against passengers. Some of them nonetheless reiterated that carjacking was dominant in towns compared to rural highways.

Such highways, according to three participants, were reported to be mostly associated with cargo and passenger robberies. The highways widely known for robbery in Kisumu County include Kisumu- Busia highway, Kisumu- Kakamega high way, Kisumu- Kericho highway, Kisumu Siaya-highway, Kisumu- Homabay road. Two of the participants explained how two leading traffic security crimes were orchestrated. One of them cited Boda-bodas, and another singled out privately owned vehicles as the modes usually used for carjacking and highway robbery, respectively in several cases reported in Kisumu County.

The findings above show that rural road use posed higher security threat than urban road use. In both rural and urban Kisumu, carjacking was the most road security threat, followed by highway robbery, and parking theft in the county as a whole.

4.2.7 Fatality of road use

Findings in this section include perceptions on the fatality rate of road use in Kisumu County. Findings from questionnaire survey are presented in Figure 4.14.



Source: Field Research (2018)

Figure 4.14. Distribution of respondents by perceptions on reduction in road use fatality in Kisumu County

According to Figure 4.14, distribution of the sample (n = 233) on road use fatality in rural Kisumu shows that 5.6% of the respondents strongly agreed and 21.5% agreed that there was reduction in road use fatality. In relation to this perception, 19.7% of the respondents could not agree or disagree, 27% disagreed and 25.3% strongly disagreed. About urban Kisumu, the distribution shows that 5.2% of the respondents strongly agreed and 25.3% others agreed that road use fatality had reduced. Against this prospect, 26.6% of the respondents were neutral, whereas 24.5% disagreed and the rest 17.6% strongly disagreed. Only over a quarter (27.1%) of the respondents felt there was reduction in fatality rates on rural roads and just two thirds (30.5%) of the same respondents shared a similar perception for urban roads in Kisumu County.

More detailed findings about reduction in road fatality were recorded from interviews and focus group discussions conducted along the questionnaire survey. According to interviews, six (06) informants strongly agreed and twelve (12) others agreed that there were reduced road use fatality in Kisumu County. Seven (07) informants were neutral

while the respect seven (07) informants disagreed about that. To expound on their perceptions, eleven (11) informants noted that road accidents significantly reduced in Kisumu City and some other urban centres in the county.

One (01) of such informants indicated that accidents have reduced on some recently constructed or maintained roads. In addition, three (03) of the informants pointed out that road fatality has reduced in parts of the county with intensive patrols by traffic police and NTSA. Another informant said: “there is much fatality reduction in parts of Kisumu County where road safety awareness campaigns have been conducted. In relation, five (05) informants indicated that reduction in road accidents had been relative in most towns of Kisumu County. One of these informants specified that, “road accidents reduced more in urban areas particularly in Kisumu City than in rural areas”. Another informant added that not many cases of traffic accidents are reported from urban compared to rural Kisumu.

Six (06) informants however reported that there was very little reduction in road accidents in Kisumu County as a whole. One of them revealed that most rural roads are prone to accidents due to non-compliance with traffic regulations. Another informant said: “the road fatalities at the main entry points of Kisumu City have instead increased despite some calmness in the city central business district (CBD)”. In addition, two of the informants reported that there was an upsurge in road accidents involving boda-boda and Tuk-tuk riders even in Kisumu City.

In Focus group discussions, the lead participant (KARA) revealed that, “as regards road fatalities, reports show that Kisumu County was in 2015 only fourth and behind only to Nairobi County, Nakuru County and Kiambu County out of the 47 counties of Kenya. In 2016, it was only behind Nairobi County”. Another participant (KARA) disclosed that NTSA had reported 95 to 150 deaths annually as road fatalities between 2014- 2016. Some participants specified that cases of accidents were recorded daily in urban Kisumu mainly in Kisumu City and a few other towns like Ahero through motorcycle accidents mainly and other moving engines. One of the participants (CWA) reported: “heavy commercial vehicles, particularly big trucks overloaded with sugarcane pass continuously in Ahero and greatly contribute to incidences of road accidents and fatalities”.

According to participants, private car drivers contributed most to road fatalities within Kisumu County. One of them reiterated that, "…true, private motorists have since the recent past been the major causes of road carnages in most of the county". In relation, some participants also noted that Public Service Vehicles (PSV) were the second most contributors of road accidents followed by drivers of state owned vehicles. Participants unanimously agreed that accidents were booze induced and that most of the worst tragedies occur on Saturdays and Sundays. One of the participants (APDK) reported that: "… authorities that revealed that with 36% of the deaths on roads in Kisumu County were recorded on the two days". Another participant observed: "…of the fatalities recorded, pedestrians constituted the biggest number of the victims followed by passengers".

Participants also indicated that young and economically viable people between the ages of 20 and 44 years were the majority of the victims who perished on the roads of Kisumu County. A participant suggested that, "…judging from reports of different sources especially the media, drivers have increasingly died in road accidents in recent times". Most of the participants reported that motorcyclists particularly Boda bodas were leading among transport operators in the county that had perished in the accidents as of 2016. From the presentations above, it would suffice to say that reduction in road fatality was very low in rural areas and less moderate in urban areas of Kisumu County.

4.2.8 Average indices about the level of road safety in Kisumu County

Average indices were computed to get an accurately binding picture of how respondents generally rated each of the constructs broken down in Tables 4.2- 4.7. The construct average indices are presented in Table 4.8 and are specifically about road efficiency of transport operators ('Reftops'), inter transport operator respect ("Itporspct"), road traffic rules compliance ('Rdfrscomp'), safety of regular road users ('Saftrrusacds'), road favourability to high-risk users ('Frhrrusrs'), road use security threats ('Rusthr'), and reduction in the road fatality ('Rdcrfatl') in rural and urban in Kisumu County.

For the purpose of correlating road safety in each of rural and urban Kisumu with the independent variables, the average indices of individual constructs above were aggregated, also shown in Table 4.8, to generate grand average indices. The overall indices were useful

for accurate expression of the Level of Road Safety ('lvlrosfty') in the two territories in Kisumu County.

Table 4.8

Average indices on the level of road safety in Kisumu County

Construct	Territory	N	Mean ($\bar{x}$)	Mode	Std. Deviation (S)
1) Efficiency of transport operators (Reftops)	Rural Kisumu	233	2.63	3.00	1.17
	Urban Kisumu	233	2.73	3.00	1.12
2) Inter transport operator respect (Itporspct)	Rural Kisumu	233	2.30	2.00	1.02
	Urban Kisumu	233	2.51	3.00	1.02
3) Compliance with traffic rules ('Rdfrscomp')	Rural Kisumu	233	2.50	2.00	1.01
	Urban Kisumu	233	2.70	3.00	1.00
4) Safety of regular road users (Saftrrusacds)	Rural Kisumu	233	2.28	2.00	1.02
	Urban Kisumu	233	2.46	2.00	1.10
5) Roads Favorability to marginal users (Frhrrusrs)	Rural Kisumu	233	2.44	2.00	1.13
	Urban Kisumu	233	2.62	3.00	1.09
6) No road use poses no security threats ('Rusthr')	Rural Kisumu	233	2.47	2.00	1.16
	Urban Kisumu	233	2.59	3.00	1.17
7) Reduction in road use fatality ('Rdcrfatl')	Rural Kisumu	231	2.57	3.00	1.23
	Urban Kisumu	231	2.78	3.00	1.18
Grand Indices	Rural Kisumu	233	2.46	2.00	0.87
	Urban Kisumu	233	2.63	3.00	0.80

Source: Descriptive statistics (2018)

According to Table 4.8, the average index for Construct 1 ('Reftops') and about rural Kisumu registered a moderate arithmetic mean ($\bar{x}$ = 2.63) and narrow standard deviation (S = 1.17). This in principle means, in such a territory most of the transport operators known to respondents were fairly efficient, only a few were efficient, and many were inefficient on the road. For urban Kisumu, the average index also recorded a moderate mean average ($\bar{x}$ = 2.73) but with a difference of $\bar{x}$ = 0.10 and a smaller standard deviation less 0.05 compared to rural Kisumu. Similarly, of the transport operators known to respondents in urban Kisumu, majority was fairly efficient on the road, only a few were inefficient, and many were efficient to that effect. The study generally suggests that transport operators in Kisumu County were largely fairly efficient on the road as users.

The statistics about Construct 2 ('Itporspct') in rural Kisumu yielded a low arithmetic mean ($\bar{x}$ = 2.30) and smaller standard (S = 1.02). This means most of the respondents were closely in agreement about the apparently road use respect among rural transport operators. In relation to urban Kisumu, related statistics registered a moderate arithmetic mean ($\bar{x}$) of 2.51 and an equally smaller standard deviation (S = 1.02). In this case, most respondents were also closely in consensus that there was relative respect among urban transport operators. The study results therefore suggest that inter transport operator respect on the road was little in much of rural areas and mostly moderate in towns of Kisumu County.

Reading from the average index for construct 3 ('Rdfrscomp'), rural Kisumu, a low arithmetic mean ($\bar{x}$ = 2.50) and a smaller overall standard deviation (S = 1.01) were computed. This means rural road users known to most of the respondents were generally less compliant with traffic rules. In the case of Urban Kisumu, the average mean index computed was moderate and equally a smaller standard deviation was generated. In that case, urban road users in Kisumu County known to most of the respondents were fairly compliant with the rules. The results show that, in Kisumu County, most of the road users in rural areas had little respect for the traffic regulations while their counterparts in urban areas were largely complaint with similar rules.

The indices about Construct 4 ('Saftrrusacds') for rural Kisumu include a low grand arithmetic mean ($\bar{x}$) of 2.28 and smaller standard deviation (S) of 1.02. This suggests that according to most the respondents, rural regular road users were less safe from accidents. The statistics for urban Kisumu indicate that also a low grand mean ($\bar{x}$ = 2.46) and smaller standard deviation (S) of 1.10 were generated. Similarly, urban regular road users were according to majority of the respondents less safe in that respect. The preceding analysis implies that in Kisumu County most of rural and urban regular road users were less safe from accidents. However, according to average indices, the urban bound regular road users were a bit safer than rural counterparts by a mean perception edge of 0.18.

According to Table 4.8, the transformation of the statistics on Construct 5 ('Frhrrusrs') and about rural Kisumu led a low grand arithmetic mean ($\bar{x}$) of 2.44 and a small standard deviation (S) of 1.13. This means that rural roads known to most of the respondents were

less favourable to the high-risk road users in general. Transformation of similar statistics for urban Kisumu generated a moderate grand mean ($\bar{x}$) of 2.62 and smaller standard deviation of 1.09. This indicates that urban roads known to most of the respondents were fairly favourable to such high-risk road users. According to the above analysis, most of the rural roads in Kisumu County were less conducive while majority of urban roads were relatively favourable for high risk road users.

The indices generated from Construct 6 ('Rusthr') and relating to rural Kisumu include a low arithmetic mean ($\bar{x}$) of 2.47 and small standard deviation (S) of 1.16. These meant that most rural roads in Kisumu County were less safe from security threats. In the case of urban Kisumu, the statistics transformed into a moderate grand mean ($\bar{x}$) perception of 2.59 and small standard deviation (S) of 1.17. This means most urban roads in the county were fairly safe from security threats. The indices connote two situations: one, roads in most rural areas of Kisumu County were largely faced with security threats and two, those in most urban areas of the county were relatively safe from such threats.

According to the table, the average indices about Construct 7 ('Rdcrfatl') in rural Kisumu shows that a less moderate arithmetic mean ($\bar{x}$ = 2.57) and small standard deviation (S = 1.23) were computed. This suggests that road fatality had less relatively reduced on rural roads known to most of the respondents. Concerning urban Kisumu, the statistics indicate that a moderate mean perception ($\bar{x}$ = 2.78) and smaller standard deviation (S = 1.18) were generated. This means there was relative reduction in fatality on urban roads also known to most respondents of research. In view of that, road fatality had less fairly reduced on most of rural and more relatively decreased on most of urban roads in Kisumu County.

Grand indices in the same table above show that the mean perception ($\bar{x}$) on road safety in rural Kisumu was 2.46 with standard deviation (S) of 0.87. For urban Kisumu, the mean perception on road safety was 2.63 and the stand deviation was 0.80 respectively. Basing on the rating scales adapted, these results suggest that the level of Road Safety in rural Kisumu was low ($\bar{x}$ = 2.46) while in urban Kisumu, road safety was relatively high ($\bar{x}$ = 2.63). Roads were more fatal in rural Kisumu than urban areas.

However, in both county territories, the grand average road safety indices were normally distributed (0.22 and 0.35, respectively). This implied that the indices could be confidently subjected to bivariate and multivariate analyses particularly the linear regression analyses (Sweet and Grace-Martin, 2003). Relating grand average road safety indices with the respective independent variables was done as presented in the following themes.

4.3 Verification of the hypotheses

This section includes themes that were respectively used to present findings related to the three research hypotheses and directly consistent with the corresponding research specific objectives, all of which are specified in Chapter One, sections 1.4 and 1.5. Hypothesis one was about traffic information and road safety, hypothesis two was on driver support and road safety, while hypothesis three was about traffic control and road safety. For the purpose of explicit verification, the implicit independent variable of each of the hypotheses was described quantitatively and qualitatively prior to bivariate and multivariate statistical analyses.

The implicit variables (i.e. traffic management factors) include road traffic information, driver support and road traffic control (NTPRC, 2016). The section also captures results of the grand multivariate analysis adopted to accurately and generally determine the contribution of road traffic management on road safety in Kisumu County.

In this section, much of the findings were likewise separately presented for rural Kisumu (RK) and urban Kisumu (UK) not only because the two environments are usually distinct but also due to reasons unique to each of the implicit variables (or factors) of road traffic management. Road traffic information as a component of traffic management is not routine and thus less subjective to behavioural dynamics of regular stakeholders (Peden, 2001), but it is sometimes more sufficient in urban than rural areas. This is due to unfair concentration of social amenities particularly in the developing world (Booth, Hanmer and Lovell, 2000). Driver support is also comparably more afforded in urban than rural areas mainly because of unequal economic opportunities and institutional treatment or laxity (Indrawati, 2014).

Road traffic control is the most routine and as a result, the most subjective activity of all traffic management. In the developing world, Komba (2016) observes that road traffic control in most cases is more subjective to the behavioural dynamics of stake holders in rural areas than in urban areas. The above observations on urban- rural inequality were relevant but could not explain the road traffic condition in Kisumu County due to its contextual differences from the rest of Kenya or the world. Also, never before had there been a known similar study on Kisumu County. Besides, the perceived situational imbalances between rural and urban Kisumu were reflected in the findings of the study. Therefore, findings were separately presented not for comparative purposes but to demonstrate the real experiences in the two distinct environments in the county.

4.3.1 Hypothesis One: Traffic information and road safety

Hypothesis one was framed to examine whether traffic information significantly influenced the level of road safety in Kisumu County. For this purpose, this theme describes the quality of road traffic information and presents bivariate and multivariate analyses of the influence of such information on the level of road safety in the county.

4.3.1.1 Description of the sufficiency of traffic information

The findings in this section describe the sufficiency of road traffic information in Kisumu County. For this motive, constructs related to road traffic information were used as research items in the respective research instruments to gather the required findings. The constructs include:- 1) availability of road signages, 2) sensitization of school children on road use, 3) provision of information road use regulations, and 4) issuance of warnings ahead of dangerous road scenes and/or spots. In this section, the same constructs form sections of joint statistical and qualitative data presentation, analysis and interpretation.

Construct 1: Availability of Road Signages

The findings about this construct include respondents' perceptions on the availability of Road Signages in Kisumu County. The signages of research include well-marked road lanes, parking signposts, hump signs, zebra crossings, speed reduction signs, route signs, road gradient signs and children crossing signs. The related findings specifically generated from the questionnaire survey are presented in Table 4.9.

Table 4.9: *Descriptive statistics about availability of road signages in Kisumu County*

Road Signage	Response Category	Frequency (per cent); n = 233		Mean		Standard Deviation	
		RK	UK	RK	UK	RK	UK
1) Well-marked road lanes	SA	17 (7.3)	50 (21.5)				
	A	36 (15.5)	85 (36.5)				
	N	20 (8.6)	46 (19.7)	2.23	3.48	1.31	1.22
	D	70 (30.0)	31 (13.3)				
	SD	90 (38.6)	21 (9.0)				
2) Parking sign posts	SA	13 (5.6)	27 (11.6)				
	A	27 (11.6)	99 (42.5)				
	N	21 (9.0)	31 (13.3)	2.04	3.17	1.23	1.29
	D	67 (28.8)	39 (16.7)				
	SD	105 (45.1)	37 (15.9)				
3) Hump signs	SA	20 (8.6)	42 (18.0)				
	A	24 (10.3)	70 (30.0)				
	N	39 (16.7)	44 (18.9)	2.32	3.18	1.25	1.33
	D	77 (33.0)	42 (18.0)				
	SD	73 (31.3)	35 (15.0)				
4) Zebra Crossings	SA	19 (8.2)	34 (14.6)				
	A	14 (6.0)	85 (36.5)				
	N	16 (6.9)	31 (13.3)	1.97	3.1	1.38	1.38
	D	66 (28.3)	37 (15.9)				
	SD	118 (50.6)	46 (19.7)				
5) Speed reduction signs	SA	17 (7.3)	29 (12.4)				
	A	36 (15.5)	61 (26.2)				
	N	27 (11.6)	36 (15.5)	2.28	2.82	1.29	1.38
	D	70 (30.0)	51 (21.9)				
	SD	83 (35.6)	56 (24.0)				
6) Route signs	SA	17 (7.3)	38 (16.3)				
	A	31 (13.3)	74 (31.8)				
	N	23 (9.9)	43 (18.5)	2.15	3.15	1.30	1.33
	D	62 (26.6)	41 (17.6)				
	SD	100 (42.9)	37 (15.9)				
7) Road gradient/ slope signs	SA	16 (6.9)	21 (9.0)				
	A	24 (10.3)	46 (19.7)				
	N	33 (14.2)	33 (14.2)	2.21	2.53	1.22	1.33
	D	80 (34.3)	67 (28.8)				
	SD	80 (34.3)	66 (28.3)				
8) Children crossing signs	SA	14 (6.0)	34 (14.6)				
	A	30 (12.9)	65 (27.9)				
	N	19 (8.2)	40 (17.2)	2.02	2.9	1.28	1.44
	D	53 (22.7)	32 (13.7)				
	SD	117 (50.2)	62 (26.6)				

Source: Field Research (2018)

The findings in Table 4.9 include distribution of the sample (n = 233) as well as the related arithmetic mean and standard deviation indices on each of the road signages coded 1- 8 in rural and urban Kisumu. The distribution on road signage 1 in rural Kisumu indicates that 7.3% of the respondents strongly agreed, and 15.5% agreed whereas 8.6% could not agree or disagree that road lanes were well-marked. On the other hand, 30% of the respondents disagreed and 38.6% strongly disagreed with that. About urban Kisumu, the distribution shows that 21.5% of the respondents strongly agreed and 36.5% others agreed that urban roads had well-marked lanes. Against this perception, 19.7% of the respondents were neutral, 13.3% disagreed and the rest 32.6% strongly disagreed. Only less than a quarter (22.3%) of the respondents indicated that rural roads were well lane marked. Majority (58%) expressed the similar approval for urban roads.

For more accurate description of how respondents rated the availability of well-marked road lanes, arithmetic mean and standard deviation measures were adopted. In doing so a low mean perception ($\bar{x}$ = 2.23) and less spread-out standard deviation (S = 1.31) were computed about rural Kisumu. For urban Kisumu the mean ($\bar{x}$ = 3.48) generated was high and the standard deviation (S = 1.22) was small. This suggests that many roads in rural areas of Kisumu County had less marked lanes while in urban areas most roads were largely well lane marked.

The distribution about signage 2 in rural Kisumu shows that 5.6% of the respondents strongly agreed and 11.6% agreed that parking sign posts were provided on rural roads. In relation, 9% of the respondents were neutral, 28.8% disagreed and 45.1% strongly disagreed with the perception. Regarding urban Kisumu, 11.6% of the respondents strongly agreed, 42.5% others agreed and 13.3% could not agree or disagree that urban roads bore parking signposts. In contrast, 16.7% of the respondents disagreed and the rest 15.9% strongly disagreed with that prospect. Nearly three quarters (73.9%) of the respondents indicated that there wasn’t parking signposts on rural roads whereas less a third (32.6%) expressed the same condition for urban roads.

On the same road signage in rural Kisumu, a low arithmetic mean ($\bar{x}$ = 2.04) and small standard deviation (s = 1.23) were computed. About urban Kisumu, the computed mean ($\bar{x}$

= 3.17) was moderate and the related standard deviation (s = 1.29) was less spread. This implies most rural roads in Kisumu County had few parking signposts, far from the required standards whereas many urban roads in the county were fairly flecked with such signages.

In relation to signage 3 in rural Kisumu, the distribution shows that 8.6% of the respondents strongly agreed, 10.3% agreed and 16.7% were neutral to the question about whether hump signs were provided on rural roads. Contrary to this 33.3% disagreed and 31.3% strongly disagreed. On urban Kisumu, 18.0% of the respondents strongly agreed, 30.0% others agreed and 18.9% could not agree or disagree that urban roads were marked with similar hump signs. On the contrary, 18.0% of the respondents disagreed and the rest 15.0% strongly disagreed with that perception. Over two thirds (66.9%) of the respondents revealed that there were no hump signs on rural roads while only a third (33%) had a similar perception about urban roads in Kisumu County.

About the same signage in rural Kisumu, a low arithmetic mean ($\overline{x}$ = 2.32) and small standard deviation were generated. In respect of urban Kisumu, a moderate mean score ($\overline{x}$ = 3.18) and less spread-out standard deviation were computed. The statistics imply that most of the rural roads in Kisumu County had less hump signs while many of the urban roads in the county were fairly provided with such signs necessary for guiding road use.

Pertaining to signage 4 in rural Kisumu, Table 4.16 shows that 8.2% of the respondents strongly agreed, 6.0% agreed and 6.9% were neutral to the availability of zebra crossings on rural roads in Kisumu County. However, 28.3% disagreed and 50.6% strongly disagreed with that. The distribution about urban Kisumu shows that14.6% of the respondents strongly agreed, 36.5% others agreed while 13.3% neither agreed nor disagreed that urban roads had zebra crossings. Conversely, 15.9% of the respondents disagreed and 15.0% others strongly disagreed with that reflection. More than three quarters (78.9%) of the respondents revealed that zebra crossings weren’t provided on rural roads whereas only less than two fifth (30.9%) shared a comparable perception about urban roads in Kisumu County.

About the same signage, a far low mean perception ($\bar{x}$ = 1.97) and less spread-out standard deviation (S = 1.38) about rural Kisumu were computed. Regarding urban Kisumu, a moderate arithmetic mean ($\bar{x}$ = 3.1) and similarly less spread-out standard deviation were produced. The statistics suggest that many roads in rural Kisumu County had much less zebra crossings while many others in urban areas of the county were fairly marked with such road signages.

The distribution about signages in rural Kisumu indicates that that 7.3% of the respondents strongly agreed, and 15.5% others agreed that there were speed reduction signs on rural roads in Kisumu County. Another 11.6% of the respondents were neutral about this perception while 30% disagreed and 35.6% strongly disagreed with that. About urban Kisumu, the distribution shows that 12.4% of the respondents strongly agreed, 26.2% others agreed while 15.5% remained neutral on whether such signages were provided along urban roads in the county. In opposition, 21.9% of the respondents disagreed and 24.0% others strongly disagreed with that. Almost two thirds (65.6%) of the respondents disclosed that speed reduction signs were not provided on rural roads and less than half (45.9%) had a similar perception about urban roads in Kisumu County.

Further analysis on the same road signage in rural Kisumu show that a low arithmetic mean ($\bar{x}$ = 2.28) and small standard deviation (S = 1.28) were generated. In the case of urban Kisumu, a less moderate perception mean ($\bar{x}$ = 2.28) less sparsed standard deviation (S = 1.38). In that case, most of the rural roads in Kisumu County had less speed reduction signs and many of the urban roads in the county were fairly provided with such signages.

Findings on signage 6 in rural Kisumu show that 7.3% of the respondents strongly agreed, and 13.3% others agreed that there were route signs on rural roads in Kisumu County. In addition 9.9% of the respondents were neutral about this perception but 26.6% disagreed and the rest 42.9% strongly disagreed with that. On urban Kisumu, the distribution shows that 16.3% of the respondents strongly agreed, 31.8% others agreed while 18.5% remained neither agreed nor disagreed on whether such signages were provided along urban roads in the county. On the other hand, 17.6% of the respondents disagreed and 15.9% others strongly disagreed with that. Over two thirds (69.5%) of the respondents revealed that

routes were not signposted along rural roads and just over a third (33.5%) had a point to a similar condition about urban roads in Kisumu County.

More accurate descriptive statistics on the same signage in rural Kisumu specify that a low mean perception ($\bar{x}$ = 2.15) and less strewn standard deviation (S = 1.30) were registered. As regards urban Kisumu, the statistics show that a moderate arithmetic mean ($\bar{x}$ = 3.15) and less sparsed stand deviation (S = 1.30) were computed. In Kisumu County, many rural roads had less route signs while among the urban roads many were fairly marked with such signages.

Scores on signage 7 and rural Kisumu, show that 6.9% of the respondents strongly agreed, 10.3% agreed and 14.2% were neutral about the availability of road gradient signs on rural roads in Kisumu County. However, 34.3% disagreed and 34.3% strongly disagreed with that. The scores about urban Kisumu show that 9% of the respondents strongly agreed, 19.7% others agreed while 14.2% neither agreed nor disagreed that urban roads had marked gradient signs. However, 28.8% of the respondent disagreed and 28.3% others strongly disagreed with that perception. More than two thirds (68.6%) of the respondents disclosed that gradient sign were not indicated on rural roads and almost three fifth (57.1) had a similar perception over urban roads in Kisumu County.

Related descriptive statistics on the road gradient signs in rural Kisumu show that a low arithmetic mean ($\bar{x}$ = 2.21) and small standard deviation (S = 1.22) were computed. About urban Kisumu, the statistics indicate that a less moderate mean ($\bar{x}$ = 2.53) and less spread standard deviation (S = 1.33) were generated. The results imply that most rural roads in Kisumu County had less marked gradient signs and urban areas such road signs largely less fairly marked on the roads.

Statistics on signage 8 in rural Kisumu show that 6% of the respondents strongly agreed and 12.9% agreed that children crossing signs were provided on rural roads. In relation, 8.2% of the respondents were neutral, 22.7% disagreed and 50.2% strongly disagreed with the perception. Regarding urban Kisumu, 14.6% of the respondents strongly agreed, 27.9% others agreed and 17.2% could not agree or disagree that urban roads had such child related signs. Contrastingly, 13.7% of the respondents disagreed and the rest 26.6% strongly

disagreed with that prospect. Almost three quarters (72.7%) of the respondents revealed that there wasn't children crossing signs on rural roads and more than two fifth (40.3%) had the same perception of urban roads in the county.

From the same scores on children crossing signs in rural Kisumu, a lower arithmetic mean ($\bar{x}$ = 2.02) and small standard deviation (S = 1.28) were generated. About urban Kisumu, a moderate mean perception ($\bar{x}$ = 2.9) and less sparred standard deviation (S = 1.44) were yielded. These statistics suggest that most of the rural roads in Kusimu County had fewer children crossing signs and in urban areas in the county many of the roads were only fairly marked with such road signages.

Related and more explanatory findings about road signages in rural and urban Kisumu were gathered from interviews and focus group discussions. Six (06) of the informants interviewed indicated that road signages were to a great extent provided in Kisumu County. Ten (10) informants noted that such signages were to relative extent available on the roads. However, sixteen (16) informants indicated that the signages were less sufficient. To justify their perceptions, the six (06) informants that seemed comfortable indicated that at least all roads where signs are needed were provided even including road bumps. The neutral informants however reported that some roads had signages while others did not have. One of the informants said: "…..only newly constructed roads had most of the signages including children crossing signs, zebra crossings, road lanes, parking notices, hump signs, route signs, road gradient signs and speed reduction signs".

On the other hand, fourteen (14) informants revealed that most roads in rural Kisumu have very few road signs. Ten (10) of them reported this was the same in some towns in the county and five (05) others noted that some roads in Kisumu City were short of the requisite signages. Furthermore an informant noted that, "….in Kisumu City, some roads lack signages due to road constructions which are on-going". Another informant alleged that, "the signages on some roads in Kisumu City are sometimes not relevant to the current traffic requirements, for example the no entry sign near Imperial Hotel". In addition, two (02) informants reported that road signs were very few on many roads in the county, some that were damaged could be not replaced.

In relation to the above, other two (02) informants revealed that there was always a possibility of erected road signs being removed and/or stolen by members of public because they wrongly attach no importance to them or for selfish reasons. More alarming four (04) informants showed concern that interior roads were never given attention regarding signages. Two (02) of them revealed the only indications were temporary or semi-permanent humps or bumps. One of the informants disclosed: "…..some roads even in Kisumu City are confusing due lack of signs at all, especially in Milimani where roads are not indicated if they are main or not". An informant wondered: "there is no budgetary allocation for signages in the fiscal strategy paper, how can they be sufficiently provided?"

According to Focus group discussions, majority of the 71 participants that attended expressed reservations over the availability of road signages in Kisumu County. Only very few were generally contented on the question of signage availability in the county. The discontent stemmed from a number of concerns. Some participants argued that while some road signs like parking signs, road lane signs, and speed reduction signs were sufficiently provided, many others were not, for example road hump signs, zebra crossings, road gradient signs, children crossing signs, and route signs. A lead participant (CWA) noted that:

> Apart from common road signs, most of Kisumu County lacks many very necessary road signages. Only Kisumu City has enough of the road signages. Almost all other towns in the county do not have enough and clear zebra crossings, route signs and children crossing signs.

In addition, six (06) participants revealed that road signages were not sufficiently provided mainly on rural roads. One of them (KARA) reiterated that, "….zebra crossings, route signs and children crossing signs are not enough on most of the roads in rural areas." Four of the participants moreover cited the lack of enough hump signs, speed reductions signs, road gradient signs in much of rural Kisumu. Two respondents lamented that many rural roads especially branching off the main roads lacked signages widely known to be common; road lane signs, parking signposts and hump signs. One of the participants (APDK) asserted that, "…..and this is very common for all roads off the highways from Kisumu City!"

A lead informant of KARA observed that, "the main problem is lack of follow-up by authorities to repair old and damaged road signages. In Kisumu County, especially in rural

areas, the tendency is that signages are never well maintained wherever and long after they are initially provided." A section of participants indicated that it was common knowledge that accidents were common in most of Kisumu County including some parts of the city due to inconsistencies in road signages. A participant (APDK) reported:

> ……even certain quarters of government, particularly the presidency, are faulting the road transport authorities for negligence in the provision and maintenance of certain road signs otherwise incredibly useful. It is widely acknowledged that this laxity was partly to blame for the prevalence of preventable road accidents and/or fatality.

Majority of the participants lauded the presidency for coming out on the lack of certain road signs singling out unmarked and sudden road humps as a common cause of avoidable road accidents. The participants therefore urged road transport authorities especially in charge of road constructions and development as well as the NTSA not to sleep on the job. They seemed to demand such authorities to address the shortage of road signages especially rural Kisumu so as to guide the users and help save the county from avoidable road accidents.

From the foregoing statistical results as well as interview and focus group discussion reports, road signages in rural and urban areas of Kisumu County were not equally available. In rural Kisumu, zebra crossings were the least noticed of the signages of study, followed by children crossing signs, then parking signs, route signs, road gradient signs, road lane markings, speed reduction signs and hump signs. In the case of urban Kisumu, the most noticed was road lane marks, then hump signs, followed by parking signs, route signs, zebra crossings, children crossing signs, speed reduction signs, and road gradient signs.

Construct 2: School children sensitisation on road use

The findings allied to this construct include respondents' perceptions on the strategies used for school children road use sensitisation. The strategies of study included school based child education, electronic media child sensitisation and print media child sensitisation. In this context, the electronic media included either broad cast (Radio) or telecast (TV) or both, and the print media of interest was newspapers. The related findings are presented in Table 4.10 respectively.

Table 4.10

Descriptive statistics about school children road use sensitisation in Kisumu County

Strategy	Response Category	Frequency (per cent); n= 233		Mean		Standard Deviation	
		RK	UK	RK	UK	RK	UK
1) School based road use education	SA	35 (15.0)	49 (21.0)	2.76	3.3	1.47	1.32
	A	52 (22.3)	73 (31.3)				
	N	39 (16.7)	39 (16.7)				
	D	36 (15.5)	43 (18.5)				
	SD	71 (30.5)	29 (12.4)				
2) Electronic media child road use sensitisation	SA	19 (8.2)	24 (10.3)	2.07	2.57	1.29	1.41
	A	19 (8.2)	54 (23.2)				
	N	30 (12.9)	35 (15.0)				
	D	55 (23.6)	41 (17.6)				
	SD	110 (47.2)	79 (33.9)				
3) Print media child road sensitisation	SA	12 (5.2)	14 (6.0)	2.02	2.52	1.23	1.33
	A	23 (9.9)	55 (23.6)				
	N	36 (15.5)	49 (21.0)				
	D	47 (20.2)	35 (15.0)				
	SD	115 (49.4)	80 (34.3)				

Source: Field research (2018)

The school child sensitisation strategies were coded in Table 4.10 and identified in the following description as strategy 1-3. To start with, the distribution of the sample (n = 233) on strategy 1 in rural Kisumu indicates that 15.0% of the respondents strongly agreed, and 22.3% agreed whereas 16.7% neither agreed or disagreed that school based education was used to sensitise children on road use. On the contrary, 15.5% of the respondents disagreed and 30.5% strongly disagreed with that. On urban Kisumu, the distribution shows that 21.0% of the respondents strongly agreed and 31.3% others agreed that such strategy was used for child road use education. In relation 16.7% of the respondents were neutral about this while 18.5% disagreed and the rest 12.4% strongly disagreed with that. Only less than two fifth (37.3%) of the respondents indicated that school based child road use sensitisation was adopted in rural Kisumu. Just over half (52.3%) had a similar strategy for child sensitisation in urban Kisumu.

Similarly, the arithmetic mean and standard deviation were used to accurately determine how respondents rated school based child sensitisation on road use. The statistics about rural Kisumu in Table 4.17 show that a less moderate arithmetic mean ($\bar{x}$ = 2.76) and less dispersed standard deviation (S = 1.47) were computed. In relation to urban Kisumu, the statistics indicate that a more moderate arithmetic mean ($\bar{x}$ = 3.3) and less spread standard deviation (S = 1.32) were generated. This means school based sensitisation as a strategy of child road traffic education was less fairly adopted in most rural areas and more fairly adopted in urban areas of Kisumu County.

The frequency scores on strategy 2 and rural Kisumu show that 8.2% of the respondents strongly agreed, 8.2% agreed and 12.9% were neutral about the use of electronic media for child sensitisation on road use in Kisumu County. In contrast, 23.6% disagreed and 47.2 % strongly disagreed with that. The scores about urban Kisumu show that 10.3% of the respondents strongly agreed, 23.2% others agreed while 15.0%were neutral about such strategy of child sensitisation. On the other hand, 17.6% of the respondents disagreed and 33.9% others strongly disagreed with that. Almost three quarters (70.8%) of the respondents were not aware perhaps of any electronic media used for child traffic sensitisation in rural Kisumu. Just more than half of the same respondents shared a similar perception over urban Kisumu.

According to statistics about the same strategy in rural Kisumu, a low arithmetic mean ($\bar{x}$ = 2.07) and small standard deviation (s = 1.29) were computed. For urban Kisumu, a less moderate mean perception ($\bar{x}$ = 2.57) and less dispersed standard deviation (S = 1.41) were generated. These indices imply that the electronic media were barely used in much of rural areas in Kisumu County for child sensitisation on road use. In a greater part of urban areas in the county, such media were less relatively used for a similar purpose.

The score distribution about strategy 3 in rural Kisumu show that 5.2% of the respondents strongly agreed, and 9.9% agreed that the print media used for child sensitisation on road use in Kisumu County. Comparably, 15.5% of the respondents were neutral about this while 20.2% disagreed and 47.4% strongly disagreed with that perception. The distribution on the same strategy in urban Kisumu show that 6.0% of the respondents strongly agreed,

23.6% others agreed while 21.0% were neutral about the use of such media strategy of child traffic sensitisation. In contrast, 15.6% of the respondents disagreed and 34.3% others strongly disagreed with that prospect. Over two thirds (69.6%) of the respondents had no knowledge about use of any print media for child traffic sensitisation in rural Kisumu. For urban Kisumu less than half of (40.3%) of the respondents were likewise unaware of a similar media strategy being used for such a sensitisation purpose.

Related statistics show that a lower arithmetic mean ($\bar{x} = 2.02$) and small standard deviation ($S = 1.23$) were generated from the frequency distribution on the same media strategy in rural Kisumu. The statistics about urban Kisumu indicate that a less moderate mean ($\bar{x} = 2.52$) and less spread standard deviation were registered. This connotes that the print media were very rarely used in rural areas of Kisumu County to sensitise school children on road use. In the urban areas of the county the print media strategy was less fairly used for a similar purpose.

More detailed findings related to child road use sensitisation were collected from interview and focus group discussions. According to interviews, seven (07) informants strongly agreed and nine (09) others agreed that school children were sensitized about road use in Kisumu County. Eight (08) informants were neutral about this while eight (08) others differed. For specifics, five (05) informants indicated that very often, road safety campaigns and sensitization are done in schools. Four (04) other informants added that regularly, authorities and schools organised for road traffic education of school children in primary and secondary schools in the county. One (1) of these informants said: "……school curricula have lessons on roads safety though not particularly reflective of the local experiences in Kisumu County".

Among those who were neutral about the notion, three (03) informants noted that lectures for school children were rarely organised by the traffic police and schools. One (01) of them reported that, "school children are partly sensitized at school on how to cross roads but to a greater extent there is no campaign on the same". Besides, three (03) of the informants that dissented on school child traffic awareness disclosed that it was very rarely done. In relation, an informant pointed out that, "we have some remote areas where

students have been hardly sensitized, for example Nyangande, Kakola, Ombaka among others".

On extreme end, nine (09) informants revealed that there were no known sensitisation forums organised by Traffic police and NTSA to school children. An informant observed that, "a lot is much needed. There are even no traffic personnel attached to schools to guide crossing, yet they are quick to control motor vehicles and motorcycles or tricycles traffic! Then how about giving lectures to schools?!"Another informant noted that, "…no curriculum and lessons are elaborately provided for road traffic school sensitisation". In addition, an informant indicated that she was not aware of any programmes targeting school children on road use. According to one (01) informant, traffic authorities' contribution was critical because schools no longer trained or sensitised children about road rules and traffic rules.

According to majority of the focus group discussion participants, sensitisation of school children on road traffic and use was generally not enough in most of Kisumu County. The participants particularly reported that this child awareness was widely insufficient in rural than urban areas of the county. Some participants argued that this was mainly due to differences in coverage of child bound traffic education by the mass media. A participant (KARA) revealed that:

> In towns and just like in some rural areas, there are efforts in schools to teach children about road use but that is different when it comes to media education on the subject. The rural child does not, unlike the urban counterpart, benefit from TV and radio traffic education or even the newspapers. This is because, in most of Kisumu County, the rural people have shortage of access to such media.

Many of the participants also observed that, even in urban areas, school based traffic education was the most commonly used approach than the electronic and print media with regard to road use awareness among school children in Kisumu County. One (KARA) of the participants revealed that:

> ……in Kisumu City itself, children may have benefited more at school than through media due to social dynamics. There are educative road traffic related messages on TV or radio, but how enough do school children access this electronic information?"

Three of the participant explained that, in urban Kisumu, child access to the media is curtailed by inability of families to purchase the print media which is largely commercial on one hand, and adult dominance of radio and TV programs at home on the other. One (APDK) of the participants wondered "why road related media information should not be provided at school?" She indicated that, "……related media traffic programs can be better controlled and reserved for the children in schools compared to homes where such regard may not be respected". Majority of the participants recapped that sensitisation of school children on road traffic was mainly dented by little media coverage and accessibility mainly in rural areas.

The survey findings analysed above show that in both rural and urban Kisumu, the print media was the least used of the three awareness approaches adopted for that purpose followed by electronic media and then school based education.

Construct 3: Regularity of road traffic guidance information

This construct jointly captures findings on basic traffic guidelines and road use warnings. Of major concern was the 'regularity' of the two advisories in Table 4.11. Warnings include cautions given to road users ahead of dangerous road scenes and presents findings of the questionnaire survey.

Table 4.11

Descriptive statistics about provision of regular road use guidelines and warnings in Kisumu County

Advisory info	Response Category	Frequency (percent); n = 233		Mean		Standard Deviation	
		RK	UK	RK	UK	RK	UK
1) Basic traffic guidelines	SA	22 (9.4)	25 (10.7)	2.04	2.36	1.314	1.391
	A	18 (7.7)	33 (14.2)				
	N	17 (7.3)	29 (12.4)				
	D	64 (27.5)	56 (24.0)				
	SD	109 (46.8)	87 (37.3)				
2) Road use warnings	SA	24 (10.3)	43 (18.5)	2.51	3.09	1.348	1.413
	A	43 (18.5)	73 (31.3)				
	N	25 (10.7)	23 (9.9)				
	D	73 (31.3)	52 (22.3)				
	SD	66 (28.3)	40 (17.2)				

Source: Field Research (2018)

Regarding basic traffic guidelines in rural Kisumu, the frequency distribution in the table shows that 9.4% of the respondents (n = 233) strongly agreed, 7.7% agreed and 7.3% could not agree or disagree that such guidelines were provided regularly. However, 27.5% disagreed and 46.8% strongly disagreed with that. About urban Kisumu, the distribution shows that 10.7% of the respondents strongly agreed, 14.2% others agreed while 12.4% were neutral about the regularity of similar guidelines. On the other hand, 24.0% of the respondents disagreed and 37.3% others strongly disagreed with that. Almost three quarters (74.3%) of the respondents felt that basic traffic guidelines were not regularly provided in rural Kisumu. In the case of urban Kisumu, more than three fifth (61.3%) of the respondents shared a similar sentiment.

More precise statistics on the same traffic guidelines in rural Kisumu indicate that a low arithmetic mean ($\bar{x}$) of 2.04 and less sparse standard deviation (s) of 1.3 was computed. The statistics on urban Kisumu also show that a low mean perception ($\bar{x}$ = 2.36) and less spread out standard deviation (s = 1.39) were generated for the frequency distribution. The indices suggest that basic traffic guidelines were rarely provided in most rural areas and much of urban areas of Kisumu County.

About road use warnings in rural Kisumu, the distribution shows that 10.3% of the respondents strongly agreed, 18.5% agreed that such cautions were regularly provided in case road use threats a head. On this perception, 10.7% of the respondents were neutral while 31.3% disagreed and 28.3% strongly disagreed with it. For urban Kisumu, the distribution indicates that 18.5% of the respondents strongly agreed, 31.3% others agreed that similar warnings were regularly provided for such purposes on urban road in the county. On the other hand, 9.9% of the respondents were neutral while, 22.3% of the respondents disagreed and 17.2% others strongly disagreed about that. Almost three fifth (59.6%) of the respondents were indicated that in rural Kisumu such warnings were rarely provided while about two fifth (39.5%) had the similar perception about circumstances in urban Kisumu.

Corresponding statistics about the same road use warnings in rural Kisumu show that a less moderate arithmetic mean and less sparse standard deviation were computed. Related

statistics about urban Kisumu indicate that the sample mean ($\bar{x}$ = 3.09) generated as a result was moderate and the allied standard deviation (s = 1.41) was not much spread. These statistics suggest that in rural Kisumu warnings about road use threats were less rarely provided whereas in urban Kisumu similar cautions were less regularly issued.

Comprehensive explanations about traffic guidelines and road use warnings were obtained from interviews and focus group discussions conducted. The interview findings on daily road use traffic regulations show that four (04) of the informants strongly agreed and seven (07) agreed that such guidelines were provided to road users. Three (03) informants were neutral, the majority fourteen (14) others disagreed and the rest three (03) strongly disagreed about the notion. Four (04) of the informants who seemed contented reported that in association with NTSA, police often sensitised road users in Kisumu County. One (01) of them said that, "……most of information is given by means of 'barazas' and lectures to road users".

In addition, six (06) informants pointed out that information on traffic regulations was provided but not often; three (03) of them specified that it was monthly. In relation, an informant said: "such information is mainly given to Boda boda operators. It is assumed that the other public transport operators are familiar with the traffic regulations". On the other hand, seven (07) of the displeased informants revealed that it was on very rare occasions that traffic regulations information was given to road users. In particular, an informant noted that, "traffic regulatory information is rarely provided in urban areas and very rare in rural areas". An informant expressed concern indicating that, "members of the public in Kisumu County have no time for road use information".

In addition, ten (10) of the ostensibly disappointed informants stated that they had never had opportunity of having daily information on road traffic regulations. One of these informants revealed that, "despite being keen on traffic management, I have not received daily updates on road traffic regulations". Another informant stressed that no media, whether broad casting stations or the print media have been used for updates on road use regulations". In relation, an informant wondered: "I do not understand why the departments

concerned have not consistently provided such traffic regulation information for safe road use".

Focus group discussions on daily road use regulations reveal that information on the same was generally not regular enough in Kisumu County. Most participants in the discussions unanimously indicated that such information on traffic rules was very scarcely provided in most of the rural areas in the county. Some participants reported that provision of this information was better in urban areas but still not enough specifically in smaller towns. One (CWA) of these participants disclosed as follows:

> The NTSA and other traffic authorities like Traffic Police endeavour to provide public awareness about road traffic rules and use through various forums like Baraza's, the media and conferences. Nonetheless, this is only concentrated in Kisumu City compared to the rest of the towns in the county.

Some participants pointed out the role of the private- public sector advocacy as a significantly fundamental input in the process of road traffic public awareness in the county and as another reason why awareness is better in urban than rural Kisumu. They cited private-public traffic awareness campaigns such as "*Toa Sauti*" and "Slow down speed kills" as some of the initiatives that have been used to supplement conventional strategies. This study sought to further explore on the cited campaigns and a lot more was discovered.

According to the focus group informed reviews, *Toa Sauti* is a road safety campaign launched in 2012 following the formation of the National Road Safety Trust by Safaricom and Media Owners Association. The campaign is credited for creating social education, emergency response, advocacy, and research on traffic policy and regulations. It produces reports and videos about road carnage in Kenya and works closely with government authorities to mobilize people against traffic offenses (SCOM, 2013). 'Slow Down, Speed Kills' as another social campaign was jointly launched in October 2013 by the Kenyan Ministry of Health and Ministry of Transport and Infrastructure in collaboration with World Health Organization.

The Speed Kills campaign was started with the aim of passing information regarding road safety. Through the use of social media, this campaign highlights the importance of the

efforts to save lives (WHO, 2014). Since its inception, the slowdown advocacy initiatives have intensified and improved on the reinforcement of speed laws and awareness campaigns as reported by some participants in the focus group discussions. This notwithstanding, participants unanimously revealed that Toa Sauti and Slow Down speed kills campaigns are however known almost only in urban areas of Kisimu County. More so, they are significantly known only in Kisumu City and remotely understood in other towns in the county. The participants were not sure about whether the campaigns were known in rural areas.

In order to analyse the level of knowledge on traffic regulations, participants sampled three specific areas of road safety. They singled out personal physical protection, automobile condition and driver behaviour (driving practices). Discussions indicated that two thirds ($\frac{2}{3}$) of the participants had low level of knowledge on related road safety policy requirements. Less than a third ($\frac{1}{3}$) had moderate knowledge. Only 5 of the participants had high level of the related road safety knowledge. In each of the categories, the participants acknowledged their experience with regard to standard road traffic regulation and compliance reflected that of their counterparts in Kisumu County.

Interviews results on road use warnings show that eight (08) informants strongly agreed and eleven (11) others agreed that road users were given warnings ahead of scenes of dangers on the roads in Kisumu County. Three (03) informants were neutral about the same question while seven (07) informants disagreed and the rest three (03) of the informants strongly disagreed with the perception. To illuminate their views, three (03) informants noted that warning signs could be placed strategically some distance from the scenes of dangers on the road. One of the informants said: “in most of Kisumu County, road safety signs are placed at road spots of required distance away from dangerous scenes to warn road users”. In relation, eleven (11) informants indicated that this was done more particularly in urban areas of the county.

Specifically, an informant reported that, “life savers and scene of crime tapes are normally used and seen towards road accident spots”. Another informant added that, “…….road signs are erected at the required points of dangers e.g. sharp corner signs”. An informant noted that, “signboards are placed on roads under construction and similar cautionary road

signs are also indicated on highways in many parts of the county". According to three informants, traffic officers were always swift in responding to scenes of accidents and thus could be useful in cautioning road users especially motorists on the road danger ahead.

The informants who were neutral indicated that such warnings provided were respected in some areas and ignored in other parts of the county. One of the informants also noted that the warnings were provided mainly on the highways but rarely on rural roads. Six (06) of the informants that disagreed explained that enforcement of the law on warnings ahead of scenes was not adequate. One of them also revealed that because of instant scenes, road traffic accidents occurred unexpectedly. In addition, an informant reported that, "most roads have no such signs to indicate scenes of dangers except the presence of traffic police". Another informant pointed out that, "……there is a lapse on the part of the traffic department responsible for giving such warnings ahead of scenes of dangers".

Four of the informants that strongly disagreed noted that no official warnings were given to road users long enough ahead of scenes of danger. One of them lamented: "…..as a road user, I only get to know scenes of danger when I get to the danger scene". Another one admitted that: "there is no attention given to such road safety advance warnings. The police and county government do not get together to agree on road warnings or signs. Each work independently". In relation, an informant said:

> ……moreover in Kisumu City, there are instances where you wait in a traffic jam and have no idea of what is happening a head even when there are road safety threats like accidents. This is because of lack of effort for advance warnings.

In relation to the above revelations on road use warnings, majority of focus group discussion participants admitted there was greater attention on such notices in Kisumu County than public awareness on traffic regulations. They argued that may be warnings were more informal and less costly than traffic education. Nevertheless, many participants still pointed out that a lot more should have been done especially in rural Kisumu with regard to traffic risk warnings. Some participants noted that warning notices/ signs to road users were most consistently indicated in Kisumu City than the rest of the towns and rural areas in the county in that order. They cited the most common scenarios for traffic advance

warnings as road accidents and road constructions. A participant (KARA) further reported that:

> …….such warnings are however instantly provided only in some parts of the county. Even in Kisumu City, road traffic warnings are instant only in certain parts especially the central business district (CBD) compared to informal settlement areas such as Nyalenda, Nyamasaria and Manyatta. They are also instant only in some metropolitan towns of Central Kolwa, Central Kisumu and East Kisumu.

According to some participants, in rural parts of Kisumu such traffic warnings were provided almost only on highways than county roads connecting rural villages. Besides, a section of the participants disclosed some traffic risks had not received due attention in warning road users. Some of such risks identified include insecurity spots, traffic jam prone spots and accident hot spots. They explained that warnings were habitually provided in post accidents. According to a participant, "…this habit is common practice in both urban and rural Kisumu including Kisumu City". Another participant showed regret:

> I hope the government begins initiatives similar to what some private campaigns have adopted. Unlike the NTSA, Traffic Police and County Road Safety Committee, private sector campaigns such as *Toa Sauti* encourage locals to use social media platforms and share their story, inform others about black spot areas and warn people around them against abandoning basic road safety measures".

Two participants cherished such private campaigns but indicated that was not enough without sufficient action from responsible government agencies which Kisumu County residents would take more seriously.

By and large, statistical results, interview and focus group discussion reports specifically indicate that of the two informative advisories, basic traffic guidelines were in both rural and urban Kisumu rarely provided compared to road use warning against likely road threats, which apparently was relatively consistent.

Average indices about sufficiency of traffic information

Descriptive statistics for each of the constructs specified in Tables 4.9- 4.11 were transformed (averaged) into Average Indices to accurately determine respondents' average ratings of the availability of road signages ('avairoduses'), sufficiency of school children

road use sensitisation ('sufschrus') and consistency road traffic guidance ('consrdustrg') in rural and urban areas of Kisumu County. In addition, the ratings were further transformed to generate grand indices depicting the overall perception on the sufficiency of traffic information ('sfrdtrfci') in the two territories in the county. The indices are summarised in Table 4.12

Table 4.12

Average indices on the sufficiency of road traffic information

Construct	Territory	N	Mean ($\bar{x}$)	Mode	Std. Deviation (S)
1) Availability of Road Signages ('avairoduses')	Rural Kisumu	233	2.15	1.00	0.98
	Urban Kisumu	233	3.04	4.00	1.03
2) School children sensitisation on road use ('sufschrus')	Rural Kisumu	233	2.28	1.00	1.09
	Urban Kisumu	233	2.80	4.00	1.17
3) Road traffic guidance information ('cnsrdustrg')	Rural Kisumu	233	2.27	1.00	1.15
	Urban Kisumu	233	2.72	1.50	1.22
Grand Indices ('sfrdtrfci')	Rural Kisumu	233	2.23	1.00	0.90
	Urban Kisumu	233	2.85	4.00	0.96

Source: Descriptive statistics (2018)

According to Table 4.12, the transformed scores on road signages in rural Kisumu led to a low grand arithmetic mean ($\bar{x}$ = 2.15) and very small standard deviation (S) of 0.98. For Urban Kisumu, a moderate grand mean ($\bar{x}$ = 3.04) and equally small standard deviation (S = 1.03) were computed from the respective transformation. This means that most rural roads had less signages, far from the required standards while the majority among urban roads were fairly provided with such signages. This was supported by the modal values which suggest that road signages were uncommon (Mo = 2) in rural Kisumu and fairly common (Mo = 3) in urban Kisumu. The indices suggest that road signages in rural areas of Kisumu County were not sufficient; they were far from being enough. In urban areas of the county, such traffic signages were largely fairly sufficient. They were relatively provided for most urban roads.

The table also shows that regarding sensitisation of school children in rural Kisumu, a low grand mean ($\bar{x}$) of 2.28 and smaller standard deviation (S = 1.09) were computed from the related statistical transformation. On urban Kisumu, the table shows that a moderate grand

mean ($\bar{x}$) of 2.80 and small standard deviation of 1.17 were generated. In view of these indices, the three strategies of child education were less used in most rural Kisumu and fairly used in most urban Kisumu for sensitisation of school children on road use. This is also corroborated by the modal values (*Mo* = 2 & 3) of each of the territories in the county respectively. Generally, the results imply that the level of school child sensitisation on road use was low in rural areas and moderate in urban areas of Kisumu County.

On traffic guidance, the average indices computed about rural Kisumu include a low arithmetic mean ($\bar{x}$) of 2.27and smaller standard deviation (*S*) of 1.15. Similar indices on urban Kisumu comprise a less moderate mean of 2.72 and small standard deviation of 1.22. The indices imply that road traffic guidance was rare in most of rural Kisumu and relatively regular in much of urban Kisumu. Thus, road traffic guidance information was rarely provided in rural areas and less consistently conveyed in urban areas of Kisumu County.

According to the table, grand indices computed from the three constructs about rural Kisumu recorded a low arithmetic mean ($\bar{x}$ = 2.23) and slim standard deviation (*S* = 0.9). The grand indices generated on urban Kisumu comprise a moderate mean ($\bar{x}$ = 2.85) and narrow standard deviation (*S* =0.96). This means, traffic information was scarce in most of rural Kisumu and relatively available in much of urban Kisum.

In relation to the grand statistical perception above, interview informants and focus group discussions, participants were asked for their general comments on the sufficiency of traffic information provided in rural and urban Kisumu. In response, five (05) of the interviewees strongly agreed, and eight (08) others agreed that such information was sufficient for road use. Four (04) of the interview informants were neutral while the majority twelve (12) informants disagreed and the rest three (03) strongly disagreed with that perception. To substantiate their thoughts, three (03) of the informants that agreed clarified that road traffic information reaches evenly to urban and rural areas. One of them said: “it is sufficient because of the role traffic police and NTSA officers play to provide information to road users”. Another informant also attributed the sufficiency of traffic information to traffic personnel that laboured going out to rural and urban areas for road use sensitization.

In relation to the above, five (05) informants believed that traffic information was just enough. One of them remarked: “information available to the public is mainly circulated through mainstream media for all roads users in Kisumu County”. Another informant added that, “…most of the time you will see traffic police officers on roads providing support and guiding the road users”. Lastly two (02) informants indicated that traffic information given was enough as demonstrated by the reduction in accident statistics.

However, three (03) of the neutral informants felt that traffic information was not enough especially in rural but quite enough in urban areas. In relation to this, an informant noted that traffic information was not enough but can be reliable if given frequently. Furthermore, fourteen (14) of the informants that appeared displeased believed most of traffic information does not reach all people in rural and urban areas in Kisumu County. One (01) of the informants pointed out that, “traffic information was not enough for several reasons but it is important that road traffic managers work with area chiefs and other local community representatives as well as schools for the requisite traffic education”.

In addition, an informant asked: “.if traffic management authorities are giving enough information to road users, then why are many accidents rampant in urban and rural areas?” He further noted that, “motorcyclists are notorious in causing accidents partly because not enough information is reliably given”. Two (02) informants specified that it was only the new Kisumu– Nairobi road that had enough road signs compared to others in the county. One of them added that road use in rural areas was the most information deficient. Another informant suggested:

> …due to lack of enough road traffic information, there should be improved use of the media; print, social media platforms, as well as local and national electronic media. This can improve on community road safety awareness in Kisumu County as a whole.

In the focus group discussions, participants unanimously agreed that traffic information was not enough for both rural and urban road use in Kisumu County. According to most of the participants, road signages, school children traffic sensitisation, traffic regulation awareness and warnings about road safety risks were specifically all insufficient in the county but better in urban than in rural Kisumu. Majority of the participants admitted that in urban Kisumu the least provided traffic information was public education on basic road

traffic guidelines followed by school children sensitisation then road signages, and warnings of road safety risks, in that order.

As for rural Kisumu, participants almost entirely agreed that the most insufficiently provided traffic information was community education on basic traffic guidelines, followed by road signages, school children traffic education and then road safety warnings.

The descriptive analyses above generally imply that traffic information was inadequate in most rural areas and fairly sufficient in urban areas of Kisumu County. Even in urban Kisumu, it was not enough though, it should have been sufficient either way!

4.3.1.2 Bivariate analysis: Correlation of traffic information and road safety

Having described the sufficiency of traffic information in section 4.3.1.1 and level of road safety in section 4.2, the covariance between the two was determined using Pearson's Correlation Coefficient Analysis (Asuero, *et al.*, 2006; Beaumont, 2012; Taylor, 2005). This section captures bivariate statistical inferences. Specifically, the analysis measured not only the influence of traffic information but also its level of significance on road safety in rural and urban Kisumu County, respectively. Findings on the two territories were analysed separately due to their contextual differences as reflected and verified in the descriptive report. The results are summarised in Table 4.13.

Table 4.13

Bivariate Pearson's correlation coefficients on the influence of traffic information on road safety in Kisumu County

			Level of Road Safety
Sufficiency of road traffic information	Rural Kisumu	Pearson Correlation	.570**
		Sig. (2-tailed)	.000
		N	228
	Urban Kisumu	Pearson Correlation	.635**
		Sig. (2-tailed)	.000
		N	228

Source: Field research (2018)

Basing on the rule of thumb (scale) adapted (Asuero *et al.*, 2006; Taylor, 1990), the following interpretations were made. At statistic $r = 0.570^{**}$, road traffic information in rural Kisumu positively and moderately influenced road safety. Statistic $r = 0.635^{**}$suggests that similar traffic information in urban Kisumu was also positively and moderately influential on road safety. The *r* notation stands for correlation coefficient. At $p < 0.001$, the influence of traffic information on road safety in either of the territories of Kisumu County was significantly different from zero (0). Notation *p* stands for probability value or simply the *p* - value. This means there was a linearly significant association (H_A) between road traffic information and road safety in rural and urban Kisumu respectively.

4.3.1.3 Multivariate analysis: Influence of traffic information on road safety in rural and urban Kisumu County

This section covers multivariate analysis results generated from multiple regression analysis. The analysis was used to determine how traffic information predicted road safety and specifically explain road safety contributions of each of the traffic information factors under review. The factors include availability of road signage; school children road use sensitisation, and provision of regular traffic guidance information (basic guidelines and warnings). A model summary of the predicative effect of traffic information on road safety for both rural and urban Kisumu was presented in Table 4.14.

Table 4.14

Model Summary

Territory	Model	R	R Square	Adjusted R Square
RK	1	.635[a]	.403	.395
UK	1	. 642[a]	.413	.405

a. Predictors: (Constant), availability of road signage; school children road use sensitisation, and provision of regular traffic guidance information in rural & urban Kisumu

Source: Field research (2018)

Results in Table 4.14 indicate that at statistic $R^2 = 0.403$, traffic information in rural Kisumu predicted 40.3% of road safety, while at $R^2 = 0.413$ such information in urban Kisumu predicted 41.3% of road safety. The rest of road safety in rural (59.7%) and urban (58.7%) Kisumu could have been attributed to other traffic management factors.

The multiple regression results about the effect of individual traffic information factors in rural Kisumu are presented in Table 4.15.

Table 4.15

Regression coefficients about rural Kisumu

Model		Unstandardized Coefficients		Standardized Coefficients			95% Confidence Interval for B	
		B	Std. Error	Beta	t	Sig.	Lower Bound	Upper Bound
1	(Constant)	1.24	.126		9.77	.000	.99	1.49
	Road signages provided	.133	.063	.147	2.10	.037	.01	.26
	School children road use sensitisation	.318	.058	.403	5.47	.000	.20	.43
	Traffic guidance info	.091	.051	.121	1.79	.075	-.01	.19

b. Dependent Variable: Level of Road Safety in Rural Kisumu

Source: Field research (2018)

According to Table 4.15, multiple regression was used to apply the allied equation ($Y= \beta o+ \beta_1X_1+ \beta_2X_2+ \beta_3X_3+ \varepsilon$) and statistically explicate the extent to which the sufficiency of each of the traffic information factors (independent variables) understudy predicts a change in road safety (dependent variable). The equation was converted to read as:

$$Y= 1.24+ 0.133X_1+0.318X_2+0.091X_3$$

The regression equation above established that taking all the three factors (independents) to be zero, the level of road safety was 1.24 (Constant). It also shows that keeping all other independent variables at zero, a unit increase in road signages led to a 0.133 increase in road safety; a unit increase in school children road use sensitisation led to a 0.318 increase in road safety; and a unit increase in the consistency of traffic guidance information led to a 0.091 increase in road safety in the rural areas of Kisumu County.

The statistical equation breakdown infers that, despite all the strategies being at least significant, of all the traffic information constructs under study, school child road use sensitisation (0.318) contributed most to road safety, followed by road signages (0.133), and then traffic guidance information (0.091). It can also be deduced from the Standardized Coefficients; Beta statistics that school child traffic sensitisation (0.403) was the most

important factor, followed by road signages (0.147), and lastly traffic guidance info (0.121).

At 5% level of significance and 95% level of confidence, school children sensitisation had a 0.000 level of significance and road signages generated $p = 0.037$. This shows that the two factor variables were statistically significant ($p < 0.05$) compared to regularity of traffic guidance ($p = 0.075$) that was not significant.

The regression inferences above underscore the significance of each of the traffic information factors in question on road safety in rural areas of Kisumu County. All were positively significant, but school child road use sensitisation was the most required, followed by road signages and then regular traffic guidance information for improved road safety.

Similar regression analysis results about urban Kisumu are summarised in Table 4.16.

Table 4.16

Regression coefficients about urban Kisumu

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	1.067	.135		7.879	.000	.800	1.334
	Road signages provided	.226	.054	.291	4.161	.000	.119	.333
	School children road use sensitisation	.207	.052	.299	3.989	.000	.105	.309
	Traffic guidance infor.	.108	.041	.162	2.632	.009	.027	.189

b. Dependent Variable: Level of Road Safety in Urban Kisumu

Source: Field research (2018)

Also for the statistical results about urban Kisumu in Table 4.16, the same multiple regression equation ($Y= \beta o+ \beta_1X_1+ \beta_2X+ \beta_3X_3+ \varepsilon$) was applied. The results similarly show the predictive effect of each of the traffic information factors (independent variables) on road safety (dependent variable). The equation was applied as:

$$Y= 1.067+ 0.226X_1+0.207X_2+0.108X_3$$

According to the equation, the level of road safety was 1.067 (Constant) taking all the three factors (independents) to be zero. Also, all other factors being zero, a unit increase in road signages led to a 0.226 increase in road safety; a unit increase in school child traffic sensitisation led to a 0.207 increase in road safety; and a unit increase in the consistency of traffic guidance info led to a 0.108 increase in road safety in the urban areas of Kisumu County.

The equation bound analysis indicates that road signages (0.226) contributed most to road safety, followed by school child traffic sensitisation (0.207) and then road traffic guidance info (0.108). It can also be inferred from the Standardized Coefficients; Beta statistics that school child traffic sensitisation (0.299) was the most important factor, followed by road signages (0.291), and lastly traffic guidance info (0.162).

At 5% level of significance and 95% level of confidence, road signages and school children sensitisation had a 0.000 while road traffic guidance generated 0.009 levels of significance. This shows that all the three factor variables were statistically significant ($p < 0.05$).

The inferences above feature the fact that each of the traffic information factors was significantly influential on road safety in urban areas of Kisumu County. Though all the factors were positively significant, school child traffic sensitisation was the most required, followed by road signages and then regular traffic guidance information for improved road safety.

The correlational and regression inferences suggest that increase in each of the three factors of road traffic information led to a rise in the level of road safety in both rural and urban areas of Kisumu County and vice versa. This means that the null hypothesis (H_O) was rejected. Traffic information significantly influence road safety in Kisumu County

4.3.2 Hypothesis Two: Driver support and road safety

Hypothesis two assumed that driver support never significantly affected the level of road safety in Kisumu County. So, this theme describes the sufficiency of driver support and covers bivariate as well as multivariate analyses of the effect of such support on road safety levels in rural and urban Kisumu, respectively.

4.3.2.1 Description of the sufficiency of driver support

This section covers findings describing the adequacy of driver support in the two distinct territories of Kisumu County. The findings spawn from specific constructs sought to measure driver support in this study. The constructs were used as research items in the respective research instruments to generate the findings. The constructs include 1) quality of driving schools for road use training, 2) supportive vehicle safety gadgets, 3) training of boda boda riders on road use, and 4) maintenance of roads to save drivers from accidents. Logically, the same constructs form the following sections of data presentation.

Construct 1: Quality of driving schools in Kisumu County

Like the rest of the construct items, related findings on quality of driving schools were generated from the questionnaire, interview and focus group discussion (FGD) guides. The findings are about Kisumu as a whole since most of the driving schools in the county were used by both rural and urban population for driver training. Table 4.17 presents results from the questionnaire survey.

Table 4.17

Descriptive statistics about the quality of driving schools used for drive road use training

Construct	Response Category	Frequency (Percent); n= 233	Mean	Standard Deviation
Driving schools good for road use training	SA	50 (21.5)		
	A	95 (40.8)		
	N	48 (20.6)	3.61	1.07
	D	35 (15.0)		
	SD	5 (2.1)		

Source: Field Research (2018)

Table 4.17 covers perception frequency distribution, mean and standard deviation of the sample (n = 233) related to quality of driving schools used for driver road use training in Kisumu County. The frequency distribution in the table shows that 21.5% of the respondents strongly agreed, and 40.8% agreed whereas 20.6% neither agreed nor disagreed that driving schools are good for driver road use training. In contrast, 15.0% of the respondents disagreed and 5% strongly disagreed with that. The majority (62.3%) of the respondents felt that the quality of driving schools in Kisumu County was good enough.

For accurate description of respondents' perception on driving school service quality, the arithmetic mean and standard deviation were used. The related statistics indicate that a high arithmetic mean ($\bar{x}$ = 3.61) and smaller standard deviation (s = 1.07) were computed. This suggests that most of the driving schools in Kisumu County were good enough for reliable driver road used training.

Construct 2: Driver support vehicle safety gadgets.

Similarly, findings about vehicle safety gadgets are not distinct between rural and urban Kisumu. They represent Kisumu County in unison because interview and FGD respondents unanimously indicated that almost all the vehicles in Kisumu traverse the entire county. The findings capture "recent" safety gadgets, and "old" gadgets. The recent safety gadgets include intelligent speed adaptor (ISA), also known as 'automatic speed limit adaptor'; alcolocks ('preventive drunk driving device'); sleep and fatigue warning systems (SFWS) or fatigue or sleep detective device, and adaptive Cruise Control Systems (ACCS) also understood as automatic speed brake system meant to keep vehicles a distance apart. Other recent vehicle safety gadgets include electronic stability control (ESC) or automatic detective brakes against vehicle breakdown (or skidding), and lane keeping assist (LKA) or automatic road lane deviation alerts.

The old vehicle safety gadgets include Seat- belt locks (SBL); Maximum speed governors (MSG), and Anti-fatality Air bag (AFAB). Questionnaire survey findings on recent safety gadgets are summarised in Table 4.18 while related results on older gadgets are presented in Table 4.19. The gadgets are separately tabulated because they were investigated in different perspectives. About the recent, the study sought to ascertain basically the extent of their introduction because according to preliminary consultations with NTSA (2016), they are relatively new on the Kenyan market. On the old gadgets, the study was mainly interested in their quality, for they have been around and largely encouraged (NTSA, 2016)

Table 4.18

Descriptive statistics about 'recent' driver support vehicle safety gadgets in Kisumu County

Recent Vehicle Safety Gadgets (VSG)	Response Category	Frequency (%); N = 233	Mean	Standard deviation
	SA	28 (12.0)		
	A	38 (16.3)		

Recent Vehicle Safety Gadgets (VSG)	Response Category	Frequency (%); N = 233	Mean	Standard deviation
1) Automatic speed limit adaptor (Intelligent Speed Adaptor)	N	34 (14.6)	2.39	1.44
	D	38 (16.3)		
	SD	95 (40.8)		
2) Preventive drunk driving device (Alcolocks)	SA	13 (5.6)	1.87	1.204
	A	20 (8.6)		
	N	20 (8.6)		
	D	53 (22.7)		
	SD	127 (54.5)		
3) Fatigue or sleep detective device (Fatigue warning systems)	SA	9 (3.9)	1.78	1.098
	A	14 (6.0)		
	N	18 (7.7)		
	D	64 (27.5)		
	SD	128 (54.9)		
4) Automatic speed brake system (Adaptive Cruise Control Systems)	SA	11 (4.7)	1.85	1.16
	A	19 (8.2)		
	N	20 (8.6)		
	D	59 (25.3)		
	SD	124 (53.2)		
5) Automatic detective brakes (Electronic Stability Control)	SA	17 (7.3)	1.93	1.18
	A	11 (4.7)		
	N	20 (8.6)		
	D	76 (32.6)		
	SD	109 (46.8)		
6) Automatic road lane deviation alerts (Lane Keeping Assist)	SA	21 (9.0)	2.11	1.34
	A	27 (11.6)		
	N	23 (9.9)		
	D	53 (22.7)		
	SD	109 (46.8)		

Source: Field Research (2018)

According to the table above, the vehicle safety gadgets of research were coded VSG 1-6 for easy presentation identity. To start with, the frequency distribution about VSG 1 indicates that 12.0% of the respondents (n = 233) strongly agreed and 16.3% others agreed that they had ever used vehicles fitted with automatic speed limit adaptors (ASLs). However, 14.6% of the respondents were neutral about this experience, 16.3% disagreed and the rest 40.8% strongly disagreed with the related question. Only over a quarter (28.3%) of the respondents were surely aware of vehicles fitted with ASLs. Related descriptive statistics on the same gadget (VSG 1) show that a low arithmetic mean ($\bar{x}$ = 2.39) and fairly spread standard deviation (s = 1.44) were generated. This suggests that vehicles in many parts of Kisumu County never had automatic speed limit adaptors.

The frequency distribution on VSG 2 shows that 5.6% of the respondents strongly agreed and 8.6% others agreed that they had ever used vehicles fitted with preventive drunk driving devices (PDDDs). Relatively, 8.6% of the respondents were neutral about this, while 22.7% disagreed and the rest 54.5% strongly disagreed with that. Over three quarters (77.2%) of the respondents had never travelled in any vehicles fitted with PDDDs (alcolocks) in Kisumu County. The related arithmetic mean ($\bar{x}$ = 1.87) computed was lower and standard deviation (s = 1.204) was small. This means, very few vehicles in Kisumu County had ever been seen with fitted alcolocks.

About VSG 3, the distribution indicates that 3.9% of the respondents strongly agreed, 6% agreed while 7.7% other could not agree or disagree that they ever used vehicles fitted with Fatigue or sleep detective devices (FSDDs). On the contrary, 27.5% of the respondents disagreed and 54.9% strongly disagreed with that experience. In that case, four fifth (82.4%) of the respondents had never used any vehicles in Kisumu County fitted with FSDDs (Fatigue warning systems). In relation, the arithmetic mean ($\bar{x}$ = 1.78) generated was also lower and the standard deviation (s = 1.098) was smaller. This implies over 80% of the vehicles in Kisumu County had not been fitted with such systems.

The findings on VSG 4 show that that 4.7% of the respondents strongly agreed and 8.2% agreed while 8.6% other could not agree or disagree that they had ever used vehicles fitted with automatic speed brake systems (ASBS). On the other hand, while 25.3% of the respondents disagreed and the rest 53.2% strongly disagreed with the prospect. As such, over three quarters (78.5%) of the respondents had never been in a vehicle in Kisumu County fitted with ASBS (adaptive cruise control systems). Of the related descriptive statistics computed arithmetic mean ($\bar{x}$ = 1.85) was low and the standard deviation (s = 1.16) was small. This connotes that over a quarter of the vehicles in Kisumu County were never fitted with automatic speed brake systems, rather useful for keeping vehicles a distance apart.

Concerning VSG 5, the distribution shows that 7.3% of the respondents strongly agreed and 4.7% others agreed that they had ever used vehicles fitted with automatic detective brakes against vehicle breakdown (ADBVB). Comparably 8.6% of the respondents

remained neutral. Contrastingly, 32.6% disagreed and the rest 53.2% strongly disagreed with the related question. Thus almost four fifth (85.8%) of the respondents never used any vehicles in Kisumu County fitted with ADBVB (electronic stability control). The arithmetic mean ($\overline{x}$ = 1.93) computed from scores on the same gadget (VSG 5) was low and the related standard deviation (s = 1.183) was also small. This indicates that far over a quarter of the vehicles in Kisumu County were not fitted with automatic detective brakes against vehicle breakdown.

On VSG 6, the frequency distribution indicates that that 9% of the respondents strongly agreed and 11.6% others agreed that they used vehicles fitted with automatic road lane deviation alerts (ARLDA). Virtually 9.9% of the respondents agreed or disagreed while 22.7% disagreed and 46.8% strongly disagreed with that. In that case, over two thirds (69.5%) of the respondents had never moved in any vehicles in Kisumu County fitted with ARLDAs (lane keeping assists). The arithmetic mean ($\overline{x}$ = 2.11) generated on the same gadget (VSG 6) was low and the related standard deviation (s= 1.336) less spread-out. These statisticss indicate that majority of the vehicles in Kisumu County were not fitted with automatic road lane deviation alerts.

Reading from the above analysis, all the recent vehicle safety gadgets investigated were rare in Kisumu County. The rarest gadget was the fatigue warning system, followed by adaptive cruise control system, then alcolock, electronic stability control, lane keeping assist and intelligent speed adaptor.

As noted earlier, Table 4.19 presents questionnaire results about the old gadgets identified as part of vehicle safety gadgets perceived useful for driver support. This is the continuation of Table 4.18.

Table 4.19

Descriptive statistics about 'old' driver support vehicle safety gadgets in Kisumu County

Old Vehicle Safety Gadget (VSG)	Response Category	Frequency (%); n= 233	Mean	Standard deviation
1) Seat- belt locks	SA	29 (12.4)	2.7	1.44
	A	56 (24.0)		
	N	29 (12.4)		
	D	50 (21.5)		
	SD	69 (29.6)		

Old Vehicle Safety Gadget (VSG)	Response Category	Frequency (%); n= 233	Mean	Standard deviation
2) Maximum speed governors	SA	25 (10.7)	2.9	1.23
	A	53 (22.7)		
	N	64 (27.5)		
	D	54 (23.2)		
	SD	37 (15.9)		
3) Anti-fatality Air bag	SA	21 (9.0)	2.5	1.32
	A	42 (18.0)		
	N	40 (17.2)		
	D	61 (26.2)		
	SD	69 (29.6)		

Source: Field Research (2018)

Regarding VSG 7 in the table, the frequency distribution indicates that 12.4% of the respondents strongly agreed and 24% others agreed that vehicles they used were well fitted well seat- belt locks (SBLs). Further, 12.4% of the respondents could not agree or disagree whereas 21.5% disagreed and 29.6% strongly disagreed with that admission. A little over half (51.1%) of the respondents indicate the vehicles they ever used in Kisumu County had either poorly fitted or no SBLs. The arithmetic mean ($\bar{x}$ = 2.7) computed about the same (VSG 7) was moderate with a fairly spread standard deviation (s = 1.44). This infers more than half of the vehicles in many parts of Kisumu County had largely poorly fitted seat-belt locks.

The distribution about VSG 8, shows that 10.7% of the respondents strongly agreed and 22.7% others agreed that vehicles they had ever used in Kisumu were well fitted maximum speed governors (MSGs). Besides, 22.7% of the respondents remained neutral while 23.2% disagreed and 15.9% strongly disagreed with that revelation. This indicates that almost two fifth (39.1%) of the respondents had ever used vehicles in Kisumu County with either poorly fitted, or no MSGs. The related arithmetic mean ($\bar{x}$ = 2.7) computed was moderate with a small standard deviation (s = 1.232). Thus, more than half of the vehicles in most of Kisumu County had well fitted maximum speed governors. Nonetheless an equally substantial number of vehicles in the county that required such gadget well fitted.

The frequency distribution on VSG 9, demonstrates that 9% of the respondents strongly agreed and 18% agreed that the vehicles they ever used in Kisumu were well fitted with Anti-fatality Air bags (AFAB). In relation, 17.2% of the respondents were about that

whereas 26.2% disagreed and 29.6% strongly disagreed with that response. In that case, that more than half (58.5%) of the respondents had ever used vehicles in Kisumu County with poorly fitted, or no AFABs. The related descriptive statistics indicate that a low arithmetic mean ($\bar{x}$= 2.5) with a small standard deviation (s= 1.32) suggesting that less than half of the vehicles in most of Kisumu County had not well Anti-fatality Air bags.

The revelations concerning the old vehicle safety gadgets specified above indicate that anti-fatality air bag was the rarest of all in public vehicles. It was only common in private vehicles but not well fitted though. Maximum speed governors were more common with public vehicles but not well fitted in many of them. Seat- belt locks were common in both private and public vehicles but were well fitted mainly in the former than the latter.

Basing on reports analysed above, the old vehicle gadgets (seat- belt locks, maximum speed governors and anti-fatality air bag) were not as rare as the recent and mostly automatic gadgets analysed identified in Table 4.17. However, the old were also not enough; they were widely known in Kisumu County but not well fitted in most of the vehicles especially public transport vehicles.

Construct 3: Training of Boda Boda riders on road use

The findings in this section cover perceptions on whether Boda Boda riders in Kisumu County were well trained on how to use roads effectively. The questionnaire findings separately capture experiences in rural and urban Kisumu as presented in Table 4.20.

Table 4.20

Descriptive statistics about road use training of Bod-boda riders in Kisumu County

Item	Response Category	Frequency (percent); n= 233		Mean		Standard Deviation	
		RK	UK	RK	UK	RK	UK
Boda boda riders well trained on road use	SA	15 (6.4)	18 (7.7)	1.99	2.14	1.22	1.31
	A	22 (9.4)	28 (12.0)				
	N	16 (6.9)	20 (8.6)				
	D	72 (30.9)	66 (28.3)				
	SD	107 (45.9)	100 (42.9)				

Source: Field Research (2018)

The frequency distribution about rural Kisumu indicates that 6.4% of the respondents (n = 233) strongly agreed, and 9.4% agreed that Boda boda riders were well trained on road use. On the same prospect, 6.9% neither agreed nor disagreed. In contrast, 30.9% of the respondents disagreed and 45.9% strongly disagreed with that prospect. About urban Kisumu, the distribution shows that 7.7% of the respondents strongly agreed and 12% others agreed that such Boda boda riders were trained well on road use. In relation, 8.4% of the respondents were neutral about this while 28.3% disagreed and the rest 42.9% strongly disagreed with that. Over three quarters (76.8%) of the respondents felt that Boda boda riders in rural Kisumu were not well trained on road traffic while less than three quarter (71.2%) of them had a similar perception about urban Kisumu Boda boda riders.

A low arithmetic mean ($\bar{x}$ = 1.99) and a small standard deviation (s) of 1.22 were computed from perceptions on rural Kisumu. About urban Kisumu, also a low arithmetic mean ($\bar{x}$ = 2.14) and less spread standard deviation (s = 1.31) were generated. This means, Boda boda riders were not well trained on road use in most rural and many urban areas of Kisumu County.

Construct 4: Maintenance of roads to help drivers avoid accidents

In this section, the findings cover perceptions about whether roads in Kusimu County were well maintained to aid drivers avoid accidents. The related questionnaire findings about rural and urban Kisumu are presented in Table 4.21.

Table 4.21

Descriptive statistics on the maintenance of roads in Kisumu County for drivers to avoid accidents

Item	Response Category	Frequency (Percent); n= 233		Mean		Standard Deviation	
		RK	UK	RK	UK	RK	UK
Roads well maintained to help drivers avoid accidents	SA	11 (4.7)	13 (5.6)	2.00	2.52	1.162	1.182
	A	22 (9.4)	47 (20.2)				
	N	15 (6.4)	41 (17.6)				
	D	86 (36.9)	83 (35.6)				
	SD	99 (42.5)	49 (21.0)				

Source: Field Research (2018)

The frequency scores about rural Kisumu show that 4.7% of the respondents strongly agreed, 9.4% agreed and 6.4% were neutral about the prospect that rural roads were well maintained to protect drivers from accidents. However, 36.9% of the respondents disagreed and 42.5% strongly disagreed with the prospect. The scores about urban Kisumu show that 5 .6% of the respondents strongly agreed, 20.2% others agreed while 15.6% were neutral about such a similar prospect with urban roads. On the other hand, 35.6% of the respondents disagreed and 21.0% others strongly disagreed with that perception. Over three quarters (79.4%) of the respondents felt that rural roads were not maintained well enough to prevent motor accidents in rural Kisumu. For urban Kisumu, it was over half (56.6) of the respondents that shared a similar perception over urban roads.

Related descriptive statistics about the road maintenance in rural Kisumu indicate that a low arithmetic mean ($\bar{x}$ = 2.00) and small standard deviation (s = 1.16) were computed. Similar statistics on urban Kisumu show that a less moderate mean perception ($\bar{x}$ = 2.52) and small standard deviation (*s* = 1.18) were generated. This implies that roads in rural areas of Kisumu County were less maintained while those in urban areas were less fairly maintained to save drivers from causing motor accidents.

Average indices about sufficiency of driver support

For purpose of accurately determining how respondents rated the sufficiency of driver support, descriptive statistics of related variable constructs were jointly transformed to generate grand indices. The constructs, earlier analysed, include Quality of driving schools ('Qualds'), Vehicle safety gadgets ('Vhsgdts'), Road use training of Bod-boda riders ('Rustbr'), and Maintenance of roads to avoid accidents ('Mraa'). The indices are summarized in Table 4.22.

Table 4.22

Average indices on the sufficiency of driver support on roads in Kisumu County

Construct	Territory	N	Mean ($\bar{x}$)	Mode (*M*)	Std. Deviation (*S*)
1) Quality of driving schools ('Qualds')	Kisumu County	233	3.61	4.00	1.07
2) Vehicle safety gadgets ('Vhsgdts')	Kisumu County	233	2.23	2.00	0.9

Construct	Territory	N	Mean ($\bar{x}$)	Mode (M)	Std. Deviation (S)
3) Road use training of Bod-boda riders ('Rustbr')	Rural Kisumu	233	1.99	2.00	1.22
	Urban Kisumu	233	2.14	2.00	1.31
4) Maintenance of roads to avoid accidents ('Mraa')	Rural Kisumu	233	2.00	2.00	1.16
	Urban Kisumu	233	2.52	3.00	1.18
Grand Indices ('sufdsupt')	Rural Kisumu	233	2.56	3.00	0.74
	Urban Kisumu	233	2.62	3.00	0.76

Source: Descriptive statistics (2018)

As earlier specified (Table 4.17), results on Construct 1 suggest that quality of driving schools in Kisumu County was good enough for road use training [$\bar{x}$ = 3.61; S = 1.07 (Table 4.21)]. About construct 2, results in Table 4.21 indicate that the transformed scores about the county as a whole generated a low overall arithmetic mean ($\bar{x}$ = 2.23) with a very small standard deviation (s = 09). This implies that most vehicles in the county had no recent safety gadgets or were poorly fitted with the old safety gadgets or both. This was supported by the modal value (Mo = 2) suggesting that the gadgets especially the 'recent' were not common in the county.

In the same table 4.21, the results on Construct 3 indicate that there was poor training of Boda Boda riders on road use in both rural Kisumu ($\bar{x}$ = 1.99; S = 1.22) and urban Kisumu ($\bar{x}$ = 2.14; S = 1.31). However, it was a little a bit better in urban than rural areas in the county. In addition, the average indices on Construct 4 suggest that road maintenance was less consistent in rural Kisumu ($\bar{x}$ = 2.00; S = 1.16) and moderately consistent in urban Kisumu ($\bar{x}$ = 2.52; S = 1.18). This means that road maintenance was not as consistent in rural areas as in urban areas of Kisumu County.

The grand average indices about rural Kisumu led to less moderate arithmetic mean ($\bar{x}$ = 2.56) and slim standard deviation (S = 0.74). The indices transformed about urban Kisumu generated a moderate mean perception ($\bar{x}$ = 2.62) and similarly slim standard deviation (S = 0.76). Therefore, driver support was less fairly sufficient in most rural areas and fairly sufficient in much of urban areas of Kisumu County.

Relative to the above statistical results, interview informants and focus group discussion participants shared their opinions in response to the question of whether drivers were sufficiently supported on road use in Kisumu County. According to the interview findings, five (05) informants strongly agreed and other seven (07) informants agrees with the question. Five (05) informants were neutral about the question while the majority fourteen (14) disagreed and one (01) informant strongly disagreed with the same question. Three (03) of the contented informants explained that there were clear road lane lines and signs drawn. Three (03) other informants indicated that bumps were erected. One related informant noted traffic officers were also very helpful drivers in urban and rural Kisumu.

In addition, eight (08) informants specified that drivers were supported by NTSA officials beside traffic police personnel. They also cited road signages particularly in Kisumu City and towns as being helpful for effective drivers' road use. One (01) of these informants further noted that, "drivers are not harassed by the police or NTSA, only few members of public will overreact when an accident occurs against pedestrians". However, two (02) informants disclosed that drivers are halfway supported. More troublingly, as many as nine (09) informants revealed that there were no well-known support mechanisms for drivers in Kisumu County.

One of the malcontent informants above expressed concern that drivers did not have a body or association or union to ensure that this was done. Another informant retorted that, "…..if drivers are well supported on road in Kisumu County, then there should be minimal accidents occurring". To the extreme end five (05) informants were concerned that drivers in the county, rural areas in particular were never supported and as no care was given to them.

Of these informants, a respondent said: "instead drivers are supported negatively by corrupt police officers in both urban and rural Kisumu, who aid them to abuse regulations and perpetrate road traffic crimes. This is more common on rural roads". In relation, another informant added that, "…there is also total lack of proactive communication between the traffic Police/ NTSA and the drivers". Nonetheless, three informants could not understand

exactly what driver support meant because they had never been informed about that in the county.

Participants in focus group discussions were elaborate on each of the constructs used to describe the sufficiency of driver support in Kisumu County. On the construct about Quality of driving schools, all the participants acknowledged that the driving schools in the county were meant for and accessed by all in the county; urban or rural. However they unanimously pointed out that they were not affordable by all potential drivers in any parts of the county. They charged exorbitant driver training fees. One of the participants (KARA) lamented:

> ... it is unfortunate training rates are forcing many people to seek other options than fully attending schools required by law. People resort to informal ways, avoiding schools though some of them (names withheld on request) offer quality services. They charge exorbitant rates (also unspecified). This is particularly common among schools in Kisumu City, which would otherwise benefit the entire County.

Some participants explained that due to high training fees, many drivers may have connived with schools to forge attendance in order to secure driving licences from Kenya Revenue Authority's (KRA) - Road Transport Department. This unscrupulous habit, according to participants, was common among drivers in towns, mainly from Kisumu City. It was also widely revealed that this cheating was most common among Matatu drivers in the event of licence class upgrade and among Boda boda riders seeking licences.

In addition, some participants revealed that not all driving schools in the county were of good quality. A participant (CWA) reported: "….. despite being licenced, some driving schools, be it in Kisumu City but especially in other towns like Ahero, Muthoroni, Chemelil and the like, are struggling to give the good training to drivers!" A couple of participants observed that drivers would be heard saying that they learnt on the job including the operators of public transport. A participant argued that, "…..this is because some driving schools do not offer enough training even when they can".

Participants also had mixed revelations on school service quality for driver training of people with disabilities. While some participants acknowledged steps taken among driving schools to empower a driver with a disability, there was a lot of concern among others

especially from the Association of the Physically Disabled- Kisumu Chapter. A lead participant (APDK) noted: “whereas there are some schools in Kisumu City that have tried to effectively train our people with a disability, many similar schools in the county, including the city, either struggle or deliberately careless to provide special needs driver training”. Majority of the participants generally believed most driving schools in the county had enough capacity for better driver training but the issue was unwarranted social dynamics.

About vehicle safety gadgets, discussion participants were much aware of the old gadgets than others perceived to be recent. They unanimously revealed that they only used to the perceivably old gadgets such as seat- belt locks, maximum speed governors and anti-fatality air bag. Many of the participants reported that such gadgets, as required by law, were supposed to be fitted in all vehicles operating in Kisumu County, urban or rural. They however indicated that most vehicle owners were on the safety gadgets due to fear of clampdown on vehicles by authorities not because they were cautious about own or passenger security. One of the participants (KARA) noted:

> Vehicle owners widely mind about seatbelts than any other gadgets much scrutiny from authorities on some roads because they are the most easily noticed. They give little attention to speed governors, airbags and others perhaps because they do not attract!

Another participant (APDK) explained and added:

> “.moreover, the use of seatbelts is commonly respected by private government and civil society vehicles far more than public service vehicles. In the PSVs, they are hardly replaced when old and are only used out of watch from the NTSA or Traffic Police”.

In relation, a participant (CWA) asked: “why should PSVs mind about and use seatbelts when they are fond of overloading? This careless habit is common on highways and rural roads because authorities are not routinely out there to help correct transport operators”. Some participants observed that this also exacerbated by passengers who do not care or question vehicle operators about using seatbelts. One of them (APDK) added that, “..yet it is socially an obligation of passengers to help transport operators (through insistency) to adhere to such safety requirements”.

On other common gadgets, participants indicated that speed governors were mainly fitted in PSVs plying long routes from Kisumu City to Siaya, Nyando, Bondo and other destinations like Kisii, Kakamega and Busia among others. Participants unanimously revealed that they hardly heard about safety airbags in commercial vehicles especially Matatus. Some of them specified vehicles with such a gadget as private and recent model vehicles owned by mainly urban dwellers compared to largely old rural owned vehicles. Generally, the focus group discussants agreed that most fitted of the common vehicle safety gadgets in Kisumu County was seatbelts although as a safety requirement they were also largely and persistently abused in terms of maintenance and utilisation.

Vehicles safety gadgets perceived more recent and unfamiliar in the context of Kisumu County were almost unheard of among Kisumu Vehicles particularly amongst PSVs. Most of the participants in the group discussions learnt the following gadgets for the first time; Automatic speed limit adaptor, Preventive drunk driving, Fatigue and sleep detective device, Automatic speed brake system, Automatic detective brakes, and Automatic road lane alerts. Some participants acknowledged they could not deny that such gadgets exist in Kenya but definitely not Kisumu. Nonetheless, a few of the participants indicated that some of the gadgets did exist but were limited to a class of people.

A participant (KARA) said: “gadgets automatic speed adaptor, preventive drunk driving and automatic brake systems are possibly fitted in vehicles of the rich especially private vehicles. And there are rich people with such gargets in Kisumu particularly in the city”. She added that, “otherwise automatic detective brakes and road lane alerts could already be adopted elsewhere in Kenya and Kisumu yet”. Accordingly, participants concurred that the apparently old vehicle safety gadgets were more commonly enforced by authorities than the so perceived recent gadgets most of which many revealed can only be read about.

The discussion findings on training of Boda Boda riders show that it was not enough in Kisumu County and more particularly in rural areas. Participants in the discussions noted that Boda boda training was more corrective than proactive due to lack of emphasis on formal driving school training in the initial stage riding. Some participants indicated that there are no riding schools in Kisumu County and moreover in Kisumu City itself. Participants stressed that Boda boda motorcycle and Tuk-tuk riders were not supported due

to misperception by all stakeholders; what would have been education is otherwise reduced to riding.

One of the participants observed; “in Kisumu, whether rural or urban, operating a boda boda is only thought to be all about knowing how to ride. It is not about understanding of traffic rules”. In fact, participants estimated that over 75% of urban and 90% of rural riders, active in the boda boda industry in Kisumu County, were self-taught or informally taught before rushing into operations. This, according to participants, left a lot to be desired. No wonder a participant (APDK) reported:

> In Kisumu City alone authorities have announced that more than 500 boda boda operators from Kisumu City were at the weekend trained in road safety to reduce the road accidents. This should have initially been provided to such operators if they had attended formal riding schools.

Another participant (CWA) revealed that:

> Kisumu Traffic Police recently said most of the road accidents in Kisumu County are caused by negligence and ignorance on the part of drivers and boda boda riders. They explained that the training was aimed at equipping reckless riders with basic knowledge of traffic rules to enhance their personal safety and those of other road users.

Some participants recounted that Traffic Police had disclosed that authorities aimed to train 600 riders and cyclist in Kisumu County every year to restore sanity on the roads. That they had partnered with local driving schools in urban Kisumu to ensure the riders and cyclists get the right skills. One participant (APDK) posed: “what about riders and cyclists in rural areas? What about riders and cyclists with disabilities that hadn’t acquired formal training?

With regard to maintenance of roads, discussants indicated that this was attended to more in urban areas than rural Kisumu. One of the participants (KARA) reported: “….there has been tremendous maintenance of roads in Kisumu County but this is more visible in Kisumu City. It is not common in smaller towns like Koru, Amimos, Esabalu and Mutet”. Another participant added that, “if roads in some towns cannot be sufficiently improved, how about the rural roads? Administratively, National and the county governments have an obligation to support road users in every corner of Kisumu equally”.

Besides concerns on road maintenance, participants pointed out that road encroachment common in Kisumu County as a habit that interferes with efforts to support drivers and riders operate efficiently and safety. According to them, this is common in many parts of the county including Kisumu City. Some participants singled out Ahero as one of the townships experiencing this habit. They revealed that the Ahero Juakali sector has gradually moved closer to the road, by encroaching the public land and area demarcated along the road. One of the participants lamented: “moreover there is not meaningful efforts from authorities to monitor and fine or evict such encroachers”.

Participants also complained about lack of good will to support transport operators especially the cyclists to navigate roads safely and peacefully. They reported that there was an impending ban of Boda boda to Kisumu City central business district (CBD). They urged the county government to designate stages for Motorcycle and Tuk-tuk riders to operate in harmony with Matatu before they could be barred from accessing town. In addition, a participant lamented: “instead of lighting the roads Kisumu authorities resort to pushing riders yet most of them are law abiding. Kisumu is a city but there are no traffic lights leading to several accidents”

Notably, the above analysis on driver support entirely implies that only driving schools in the county were sufficiently good to equip rural and urban drivers with safe driving skills. Road maintenance was relatively consistent in urban and less consistent in rural areas of the county. Vehicle safety gadgets and motorcycle training were less sufficient in both rural and urban Kisumu to enable drivers avert accidents.

4.3.2.2 Bivariate analysis: association of the sufficiency driver support and level of road safety

In this section, the analysis measured the effect of driver support and its level of significance on road safety in rural and urban Kisumu County, respectively. The related results are presented in Table 4.23.

Table 4.23

Bivariate Pearson's correlation between the sufficiency of driver support and level of road safety in Kisumu County

			Level of Road Safety
Sufficiency of driver support	Rural Kisumu	Pearson Correlation	.590**
		Sig. (2-tailed)	.000
		N	230
	Urban Kisumu	Pearson Correlation	.642**
		Sig. (2-tailed)	.000
		N	230

Source: Field Research (2018)

Statistics show that driver support in rural Kisumu had a positive and moderate effect on road safety at $r = 0.590^{**}$. Similar driver support in urban Kisumu positively and moderately affected road safety at $r = 0.642^{**}$. The p value ($p < 0.001$) generated about each of the territories suggests that the effect of driver support on road safety was significantly different from zero (0). There was therefore a linearly significant association (H_A) between the drivers support and road safety in rural and urban areas of Kisumu County, respectively.

4.3.2.3 Multivariate analysis: effect of driver support on road safety in rural and urban Kisumu County

In this section, multiple regression analysis was used to determine how driver support predicted road safety. It was also used to show the extent to which each of the factors of driver support predicted such safety in rural and urban Kisumu respectively. The factors include quality of driving schools, sufficiency of vehicle safety gadgets, training of motorcycle riders, and consistency of road maintenance. A model summary of road safety prediction from driver support for rural and urban Kisumu is presented in Table 4.24

Table 4.24

Model Summary

Territory	Model	R	R Square	Adjusted R Square
RK	1	.645[a]	.417	.406
UK	1	.670[a]	.449	.439

a. Predictors: (Constant), quality of driving schools, sufficiency of vehicle safety gadgets, training of motorcycle riders, and consistency of road maintenance in rural & urban Kisumu

Source: Field research (2018)

According to results in Table 4.24, statistic R^2= 0.417 means that driver support in rural Kisumu predicted 41.7% of road safety, whereas R^2= 0.449 implies similar support in urban Kisumu predicted 44.9% of road safety. The rest of road safety in rural (58.3%) and urban (55.1%) Kisumu could be explained by other factors related to traffic management.

Specific regression coefficients about individual driver support factors in Rural Kisumu County are presented in Table 4.25

Table 4.25

Regression coefficients

Model		Un-standardized Coefficients		Standardized Coefficients			95% Confidence Interval for B	
		B	Std. Error	Beta	t	Sig.	Lower Bound	Upper Bound
1	(Constant)	.830	.178		4.67	.000	.480	1.180
	Driving schools good for road use training	.061	.043	.074	1.41	.159	-.024	.145
	Safety gadgets well fitted in Vehicles	.458	.059	.476	7.75	.000	.342	.575
	Motorcyclists well trained about road use	.103	.043	.144	2.38	.018	.018	.189
	Roads well maintained to help drivers avoid accidents	.093	.043	.123	2.15	.033	.008	.178

b. Dependent Variable: Level of road safety in rural Kisumu

Source: Field research (2018)

The multiple regression results in Table 4.25 also were generated based on equation $Y= \beta o+ \beta_1 X_1+ \beta_2 X+ \beta_3 X_3+\beta_4 X_4+ \varepsilon$. The equation was useful for determining how much each of the factors of driver support (independent variables) predicted a change in road safety (dependent variable). The equation was applied as follows:

$$Y= 0.830+ 0.061X_1+0.458X_2+0.103X_3+0.093X_4$$

The equation above demonstrates that taking all the four factors (independents) to be zero, the level of road safety was 0.830 (Constant). It also shows that other independent variables being zero, a unit increase in the quality of driving schools led to a 0.061 increase in road safety; a unit increase in the sufficiency of vehicle safety gadgets led to a 0.458 increase in road safety; a unit increase in the quality of motorcycle training led to a 0.103 increase in road safety, and a unit increase in the consistency of road maintenance led to 0.093 increase in road safety in rural areas of Kisumu County. .

The statistical equation indicates that of the driver support factors of study vehicle safety gadgets (0.458) contributed most to road safety, followed by motorcycle training (0.103), then road maintenance (0.093) and lastly driving school quality (0.061). It was inferred from the Standardized Coefficients; Beta statistics that vehicle safety gadgets (0.476) were the most important factor, followed by motorcycle training (0.144), road maintenance (0.123) and then quality of driving schools (0.074).

At 95% level of confidence and 5% level of significance, vehicle safety gadgets had a p = 0.000, Motorcycle training had p = 0.018, and road maintenance had p = 0.033 while driving schools had p = 0.159 levels of significance, respectively. The first three factor variables were statistically significant (p <0.05) compared to the quality of driving schools (0.159) proved not significant.

Similar multiple regression analysis results about driver support factors and road safety in Urban Kisumu are summarised in Table 4.26.

Table 4.26

Regression coefficients

Model		Unstandardized Coefficients		Standardized Coefficients			95% Confidence Interval for B	
		B	Std. Error	Beta	t	Sig.	Lower Bound	Upper Bound
1	(Constant)	.968	.164		5.90	.000	.645	1.29
	Driving schools good for road use training	.045	.039	.059	1.14	.258	-.033	.122
	Safety gadgets well fitted in Vehicles	.293	.052	.328	5.68	.000	.191	.394
	Motorcycle well trained about road use	.143	.037	.232	3.90	.000	.071	.215
	Roads well maintained to help drivers avoid accidents	.215	.036	.312	5.93	.000	.143	.286

b. Dependent Variable: Level of Road Safety in Urban Kisumu

Source: Field research (2018)

The results about urban Kisumu in Table 4.26 were similarly anchored on the same multiple regression equation; $Y= \beta o+ \beta_1X_1+ \beta_2X+ \beta_3X_3+ \varepsilon$, to determine the road safety prediction of each of driver support precursors research. Below is how the equation was applied:

$$Y= 0.968+ 0.045X_1+0.293X_2+0.143X_3+0.215X_4$$

According to the equation, the level of road safety was 0.968 (Constant) taking all the four predictive factors (independents) to be zero, In addition, the equation shows that keeping other factors at zero, a unit increase in the quality of driving schools led to a 0.045 increase in road safety; a unit increase in the sufficiency of vehicle safety gadgets led to a 0.293 increase in road safety; a unit increase in the quality of motorcycle training led to a 0.143 increase in road safety, and a unit increase in consistency of road maintenance led to 0.215 increase in road safety in urban areas of Kisumu County.

Particularly, the equation indicates that in urban Kisumu the factor of vehicle safety gadgets (0.293) was the most predictive on road safety of all the driver support, followed by road maintenance (0.215), motorcycle training (0.143), and then the insignificant

driving school quality (0.045). It was also concluded from the Standardized Beta statistics that vehicle safety gadgets (0.328) were the most important factor, closely followed by road maintenance (0.312), then motorcycle training (0.232), and quality of driving schools (0.059).

At 95% level of confidence and 5% level of significance, quality of driving schools (p= 0.258) was the only factor not significant in predicting road safety (> 0.05) compared to the rest of all, which were very significant (< 0.001); vehicle safety gadgets, Motorcycle riders' training and road maintenance all with p= 0.000.

Correlations and regressions analysed above generally suggest that fitting vehicles well with safety gadgets, consistent road maintenance and training motorcycle riders well would improve on road safety in rural and urban areas of Kisumu County. The reverse is true. Therefore, the null hypothesis (H_O) was rejected. Drivers support significantly influenced road safety in Kisumu County.

4.3.3 Hypothesis Three: Traffic control and road safety

Hypothesis three presumed that traffic control did not significantly affect on road safety in Kisumu County. For conscious verification of the hypothesis, this theme begins with describing the quality of road traffic control. The theme then presents bivariate and multivariate analyses measuring the significance of such traffic control on road safety in rural and urban Kisumu, respectively.

4.3.3.1 Describing quality of road traffic control

Findings in this section describe the quality of road traffic control in rural and urban Kisumu. The findings brood from constructs specifically conceptualised to measure the traffic practice. Similarly, the constructs were adapted as research items in the respective research instruments to generate findings. The constructs include 1) operation against vehicles in dangerous mechanical conditions; 2) designation of road sideways for fragile road users; 3) enforcing vehicle basic safety requirements; 4) enforcing motorcycle basic safety requirements; 5) regulation of vehicle speed and safe driving on road; 6) penalising

vehicle traffic offences, and 7) operation against motorbike traffic offences. Logically, the same constructs formed the following sections of findings.

Construct 1: Operation against vehicles in dangerous mechanical conditions

In this section, include perceptions about restrictions against the use of dangerous mechanical condition (DMC) vehicles in rural and urban Kisumu. The findings were generated from the questionnaire survey, interviews and focus group discussions. The questionnaire findings are presented in Table 4.27.

Table 4.27

Descriptive statistics about traffic field operation against the use of DMC vehicles in Kisumu County

Item	Response Category	Frequency (Percent); n = 233		Mean		Standard Deviation	
		RK	UK	RK	UK	RK	UK
Traffic field operation made to stop use of DMC vehicles	SA	23 (9.9)	27 (11.6)	2.23	2.45	1.38	1.45
	A	27 (11.6)	47 (20.2)				
	N	30 (12.9)	22 (9.4)				
	D	51 (21.9)	48 (20.6)				
	SD	102 (43.8)	89 (38.2)				

Source: Field Research (2018)

The findings in table 4.27 capture perception frequency distribution, mean and standard deviation of the sample (n =233) about field operations against DMC vehicles in Kisumu County. Specifically, the frequency distribution about rural Kisumu shows that 9.9% of the respondents strongly agreed, and 11.6% others agreed that there were field operations made to stop the use of DMC vehicles. In relation, 12.9% were about that. In contrast, 21.9% of the respondents disagreed and 43.8% strongly disagreed with that. The distribution about urban Kisumu indicates that 11.6% of the respondents strongly agreed, 20.2% agreed and 9.4% could not agree or disagree that similar operations were held. On the contrary, 20.6% of the respondents disagreed and the rest 38.2% strongly disagreed with that. Almost two thirds (65.7%) of the respondents indicated that anti- DMC vehicle operations were very rarely or not held in rural areas of Kisumu County. As for urban areas, less than three fifth (58.8%) of the respondents shared a similar perception.

The arithmetic mean and standard deviation were used to provide more accurate description of respondents' perception on anti-DMC vehicle operations. The related statistics about rural Kisumu indicate that a low arithmetic mean ($\bar{x}$ = 2.23) and less strewed standard deviation (s = 1.38) were computed. In the case of urban Kisumu, a relatively low mean perception ($\bar{x}$ = 2.45) generated with less dispersed standard deviation of 1.45. These statistics imply that operations against vehicles in DMCs were rare in most rural areas and fairly rare in many urban areas of Kisumu County.

Findings generated from interviews and focus group discussions provided more details as follows. In the interviews, nine (09) informants strongly agreed, ten (10) agreed while two (02) informants were neutral when asked if there were operations to stop vehicles in dangerous mechanical conditions in Kisumu County. However, six (06) informants disagreed (06) and five (05) strongly disagreed with this. When asked to clarify their perceptions, ten (10) informants noted that there was regular operation by Traffic Police and NTSA on un-roadworthy motor vehicles to reduce road carnage.

In relation, five (05) of the informants specified that all un-roadworthy vehicles be it in urban and rural areas of the county were impounded and then prosecuted. One of them stated that, "there are regular crackdowns on roads". Another informant explained: "…we have various teams from traffic headquarters that normally come in to reinforce the NTSA in the crackdown on un roadworthy vehicles. Other officials come from the weighbridge". Besides, two (02) informants admitted that anti DMC operations were carried out but the related crackdowns on urban and rural roads were not systematic, were random.

Among the dissatisfied, eight (08) informants indicated that anti- DMC vehicle operations were done once in a while. One of them divulged that, "…such operations are haphazard with no systematic direction. The Traffic Police & NTSA put up infrequent and uncoordinated roadblocks. PSVs with no rear lights regularly pass the road blocks at night with impunity". Another informant added that most of Matatus operating within Kisumu City were un-roadworthy**.** In addition, two (02) indicated that very many faulty vehicles could be found on the roads in any parts of Kisumu County despite the presence of police. An informant reasoned that, "un-roadworthy vehicles have persisted on rural and urban

Kisumu roads partly because Traffic Police do conduct punitive crackdowns only when they want money".

In addition, six (06) of the sturdily displeased informants reported that **t**here had been no any crackdown in Kisumu County against un-roadworthy vehicles. One of these informants alleged that, "the traffic police department has failed as some individual officers resort to corruption instead of punitive measures against the culprits. This has caused mishaps and confusions". This misconduct was corroborated by another informant saying that, "…Traffic Police officers receive bribes which make them not to bother checking on the un-roadworthy vehicle".

In the focus group discussions, more than half of the participants were contented with restrictions on MDC vehicles in urban Kisumu particularly Kisumu City. According to some participants, all un-roadworthy vehicles in urban and rural parts of Kisumu were impounded for prosecution. The participants reported that crackdowns were regular on the roads. They specified that the operations were done through team work of Traffic Police and NTSA officials. However, many participants felt this was not sustainable. Others completely faulted the related operations especially on rural roads.

While regular operations were mounted to weed out un-roadworthy motor vehicles in the county, according to some participants, similar vehicles could again be seen on the roads. In fact, one of the participants (CWA) lamented: "…. sometimes it is the same vehicle resurfacing on the roads, yet it had been earlier arrested due to DMCs! This has been witnessed even in Kisumu City especially in the suburbs". This was blamed sporadic nature of the crackdowns. Actually, about a quarter of the participants revealed that DMC vehicle operations were not commonly done. A participant pointed out that "related crackdowns are messy; they seem not well synchronised".

Participants added that anti- MDC campaigns were selective. Some of them complained that MDC vehicles among PSVs especially Matatus in rural areas of Kisumu operated with impunity in broad day light. A participant (APDK) claimed: "there are still a lot of un-roadworthy Matatus and Taxis in Kisumu City operating in the evening hours and at night"**.** Two participants also noted that faulty vehicles usually operated Kisumu County although the

claims of clampdowns on MDCVs. One of the participants (KARA) attributed the discrepancy in such operation to lack of good will but corrupt tendencies even on part of the very institutions mandated to streamline traffic for road safety.

Some participants lamented that there was no meaningfully genuine restriction against DMCVs in Kisumu County if the intentions of institutions were to raise money through punitive fines. One of the participants (KARA) asserted: “un-roadworthy vehicles would have completely disappeared from our roads if the fight was genuine!” The participants agreed that even if there were corners with good intentions, the supposed campaign to stop DMC driving was curtailed by individual and institutional corrupt intentions. One of them (CWA) concluded that “most of the clampdowns usually seen on the roads in Kisumu County are not actually real but traps of suspicious revenue”.

Construct 2: Designation of Road sideways for fragile road users

Findings in this section cover perceptions on designation of road sideways for fragile road users such as pedestrians, school children, the elderly, and disabled in rural and urban Kisumu, respectively. Results for the questionnaire summarised in Table 4.28.

Table 4.28

Descriptive statistics about whether road sideways were designated for fragile road users in Kisumu County

	Response Category	Frequency (percent); n= 233				Mean		Standard Deviation	
		RK		UK		RK	UK	RK	UK
Roads have designated sideways for fragile road users	SA	15	(6.4)	19	(8.2)	2.02	2.39	1.12	1.09
	A	21	(9.0)	35	(15.0)				
	N	16	(6.9)	31	(13.3)				
	D	71	(30.5)	77	(33.0)				
	SD	110	(47.2)	71	(30.5)				

Source: Field Research (2018)

Distribution the sample (n = 233) on rural Kisumu indicates that 6.4% of the respondents strongly agreed, and 9.0% agreed that roads have designated sideways for fragile users. On the same question, 6.9% neither agreed nor disagreed while 30.5% of the respondents disagreed and 47.2% strongly disagreed with the prospect. The distribution on urban Kisumu shows that 8.2% of the respondents strongly agreed and 15.0% others agreed that

roads had such fragile user sideways. In relation 13.3% of the respondents were neutral about this while 33.2% disagreed and the rest 30.5% strongly disagreed with that. Over three quarters (77.7%) of the respondents indicated that roads in rural Kisumu had no sideways for fragile road users while almost a third (63.5%) of them had a similar perception about urban Kisumu.

The related arithmetic mean ($\bar{x}$ = 2.02) computed from perceptions on rural Kisumu was low with a small standard deviation (*s*) of 1.12. About urban Kisumu, also relatively low arithmetic mean ($\bar{x}$ = 2.39) and smaller standard deviation (s = 1.09) were generated. This means that, in rural areas of Kisumu County, only a few parts of roads had limited or short and not well designated sideways for fragile road users. In urban areas of the county, such sideways were relatively limited to a few roads.

Findings from interviews and FGDs cover much detail on the availability of road sideways for fragile users in the county. Interview findings show that two (02) strongly agreed and ten (10) agreed that roads in Kisumu County have designated sideways for the fragile road users. Four (04) informants were however neutral about this while eleven (11) disagreed and five (05) strongly disagreed with that. Of those that agreed seven (07) informants indicated that many roads in Kisumu City had clear road sideways. According to four (04) similar informants only some roads in other towns in Kisumu County had such sideways. Only two (02) of those informants indicated just a few paved roads could be found in rural areas.

In relation to the above, an informant explained that, “paved roads in Kisumu City are designed in such a way that at each side there is space left for such high risk such as school children, the disabled, elderly and other pedestrians”. Another informant added that most of the roads especially in Kisumu City have well designated sideways, for example the Awasi- Kisumu Road, followed by other towns and some roads in rural areas. Nonetheless, eight (08) informants revealed that not all roads had designated sideways for fragile road users except in Kisumu city.

Five (05) of the informants lamented that some roads do have, some don’t have! One (01) of them said: “the road to Nairobi is the best. Other roads do not have such designated

sideways" and another indicated that, "only the newly constructed roads have designated sideways. The old roads are yet to be upgraded". On the contrary, eleven (11) of the contesting informants reported that most of the roads don't have sideways though it is better in town centres than the rest of the county. One of the informants noted: "… few roads have sideways while for many other pedestrians and vehicles are competing". Another informant added that, "most roads are narrow and thus hardly have sideways designated for fragile road users".

According to three (03) other informants, for many roads especially in busy towns like Kisumu City, the sidewalks that would have supported the most vulnerable road users were occupied by traders with little or no restriction from road traffic managers. Another informant revealed that at some road spots, sideways were occupied by illegal structures. In addition, an informant explained that, "the statistics on accidents against pedestrians is an indication of the absence of sideways". For another respondent, there was lack of walkways for some roads in urban and rural Kisumu because such roads were designed long time ago. Seven (07) informants particularly indicated that safety walk road side ways were not provided mainly in rural areas. One (01) of them asserted: "…none whatsoever. Government had planned for pedestrian and cycle lanes. This didn't occur. Even the fly-overs in Kisumu City do not have pedestrian ways or cycle lanes".

In the deliberations of the focus groups, most participants reported that there were designated road sideways for vulnerable road users in most of Kisumu County. The participants indicated that many roads had well gazetted side walkways particularly in Kisumu City. They also reported that such walkways were well designed in some other towns and along a few rural roads. Some participants said some roads in Kisumu City, had pavements with enough space for safer walking of pedestrians including children, elderly, disabled and other foot road users. There were such walkways as reported but, according to equally many participants, the challenge was selective availability; whereas some roads had such pathways, many others didn't have.

Some participants revealed that it was only in Kisumu City that roads had flawless road sideways. Others however revealed that many roads in outskirts of the city didn't have well

designated or any sideways for pedestrian road use. A participant (KARA) added that, "roads with good walkway pavements in Kisumu city have just been constructed recently. As for the old roads, such roadways are either wanting or have been destroyed". On the other hand, some participants there are new roads in Kisumu City or other towns like Ahero that were developed with walkways ideal for pedestrian use. One of them (CWA) explained that, "…. this is partly because some new roads are narrow. And that has been common particularly in smaller towns such as Komu, Kamuga, Mutet, and etcetera". Besides, some participants revealed that for some roads even in Kisumu City had narrow walkways ways forcing pedestrians walk on the roads.

Several participants pointed out that it was common for roadside walkways in Kisumu County to be encroached on despite the law. This means there was not enough effort from enforcers to fight the vice. One participant (APDK) singled out "…Kisumu city suburbs and towns like Ahero, Sondu, Kibigori, Muhoroni among others as being used by traders with impunity leaving pedestrians including the most vulnerable disabled to negotiate with automobiles and bicycles on the roads". Participants added that road reserves in towns and along rural roads were illegally occupied by structures making road walkways susceptible to infringement. Participants also indicated that in rural areas roads, there were largely marram roads which could hardly bear walkways. A participant noted: "….in rural Kisumu road pavements could only be found on highways".

Construct 3: Vehicle basic safety requirements enforced

The findings in this section include perceptions on the enforcement of vehicle basic safety requirements in Kisumu County. Statistical findings on each of the requirements findings are presented in Table 4.29.

Table 4.29

Descriptive statistics about enforcement of vehicle basic safety requirements in Kisumu County

Vehicle basic safety requirements (VBSR) enforced	Response Category	Frequency (percent); n= 233		Mean		Standard Deviation	
		RK	UK	RK	UK	RK	UK
1. Safety seat belts	SA	18 (7.70)	29 (12.4)	2.42	2.85	1.32	1.37
	A	46 (19.7)	64 (27.5)				
	N	31 (13.3)	40 (17.2)				
	D	64 (27.5)	48 (20.6)				

Vehicle basic safety requirements (VBSR) enforced	Response Category	Frequency (percent); n= 233				Mean		Standard Deviation	
		RK		UK		RK	UK	RK	UK
	SD	74	(31.8)	52	(22.3)				
2. Side mirrors	SA	25	(10.7)	32	(13.7)	2.65	3.12	1.32	1.29
	A	50	(21.5)	82	(35.2)				
	N	32	(13.7)	40	(17.2)				
	D	73	(31.3)	45	(19.3)				
	SD	53	(22.7)	34	(14.6)				
3. Side indicators	SA	27	(11.6)	37	(15.9)	2.63	3.14	1.33	1.29
	A	45	(19.3)	70	(30.0)				
	N	34	(14.6)	47	(20.2)				
	D	73	(31.3)	47	(20.2)				
	SD	54	(23.2)	32	(13.7)				
4. Driving Mirrors	SA	29	(12.4)	30	(12.9)	2.61	2.83	1.42	1.40
	A	46	(19.7)	62	(26.6)				
	N	36	(15.5)	39	(16.7)				
	D	49	(21.0)	42	(18.0)				
	SD	73	(31.3)	60	(25.8)				
5. Wind screen Wipers	SA	28	(12.0)	32	(13.7)	2.6	2.78	1.40	1.44
	A	48	(20.6)	60	(25.8)				
	N	33	(14.2)	34	(14.6)				
	D	55	(23.6)	42	(18.0)				
	SD	69	(29.6)	65	(27.9)				
6. Night vision lights	SA	29	(12.4)	29	(12.4)	2.59	2.79	1.37	1.40
	A	38	(16.3)	60	(25.8)				
	N	42	(18.0)	40	(17.2)				
	D	58	(24.9)	42	(18.0)				
	SD	66	(28.3)	62	(26.6)				
7. Vehicle Hooter	SA	25	(10.7)	33	(14.2)	2.44	2.65	1.43	1.45
	A	42	(18.0)	43	(18.5)				
	N	31	(13.3)	41	(17.6)				
	D	45	(19.3)	41	(17.6)				
	SD	88	(37.8)	74	(31.8)				

Source: Field Research (2018)

In the following description about Table 4.29, the vehicle basic safety requirements were coded VBSR 1-7 for simplicity purposes. The frequency scores about VBSR 1 in rural Kisumu show that 7.7% of the respondents strongly agreed, 19.7% agreed and 13.3% were neutral about the question whether safety seat belts were enforced. However, 27.5% of the

respondents disagreed and 31.8% strongly disagreed with the question. The scores about urban Kisumu showthat12.4% of the respondents strongly agreed, 27.5% others agreed while 17.2% were neutral about the same question. On the other hand, 20.6% of the respondents disagreed and 22.3% others strongly disagreed with that question. Almost three fifth (59.3%) of the respondents indicated that vehicle safety seat belts were not effectively enforced in rural areas of Kisumu County. Over two fifth (42.9%) of the respondents had a similar perception over vehicle seat belts in urban areas in the county.

Related descriptive statistics about rural Kisumu indicate that a relatively low arithmetic mean ($\bar{x}$= 2.42) and less spread standard deviation (s= 1.32) were computed. Similar stats on urban Kisumu show that a moderate mean perception ($\bar{x}$= 2.85) and an equally less spread standard deviation (s= 1.18) were generated. This implies that in rural areas of Kisumu County, use of vehicle seat belts was largely less effectively enforced while in urban areas it was mostly fairly enforced.

About VBSR 2 in rural Kisumu the distribution shows that 10.7% of the respondents strongly agreed and 21.5% agreed that side mirrors were effectively enforced as a vehicle basic safety requirement. Besides, 13.7% were neutral about this this. In contrast, 31.3% of the respondents disagreed and 22.7% strongly disagreed with that prospect. For urban Kisumu the distribution specifies that 13.7% of the respondents strongly agreed and 35.2% others agreed that there was similar vehicle safety enforcement. The rest 17.2% of the respondents couldn't agree or disagree, 19.3% disagreed and 14.6% strongly disagreed with that enforcement prospect. Over half (54%) of the respondents felt that vehicle side mirrors were not effectively enforced in rural Kisumu while only a third (33.9%) of the respondents shared a similar sentiment about urban Kisumu.

A moderate arithmetic mean ($\bar{x}$) of 2.65was generated from same perceptions on VBSR 2 in rural Kisumu along with a less spread standard deviation (s) of 1.32. Similar stats computed about urban Kisumu include a high mean perception of 3.14and a less spread standard deviation of 1.29. This means, enforcement of vehicle side mirrors as a basic safety requirement was relatively effective in several parts of rural and highly effective in many parts urban Kisumu.

The frequency distribution on VBSR 3 in rural Kisumu indicates that 11.6% of the respondents strongly agreed, and 19.3% agreed that vehicle side indicators were enforced as a basic safety requirement. In relation, 14.6% were neutral about this enforcement while 31.3% of the respondents disagreed and 23.2% strongly disagreed with that. The distribution about urban Kisumu show that 15.9% of the respondents strongly agreed, 30% others agreed while 17.2% were neutral about the same safety requirement enforcement. On the contrary, 20.2% of the respondents disagreed and 13.7% others strongly disagreed with that prospect. Over half (54.5%) of the respondents indicated that vehicle side indicators were not effectively enforced in rural areas of Kisumu County while only a third (33.9%) of the respondents had a similar perception for vehicles in urban areas of the county.

The arithmetic mean ($\bar{x}$ = 2.63) computed about rural Kisumu was moderate and the related standard deviation (s = 1.33) was less spread. On urban Kisumu, the mean perception ($\bar{x}$= 3.14) was high and the standard deviation (s = 1.29) was equally less spread. Accordingly, as a basic safety requirement, vehicle side indicators were relatively enforced in many rural areas and highly enforced in many urban areas of Kisumu County.

The frequency scores on VBSR 4 in rural Kisumu show that 12.4% of the respondents strongly agreed, 19.7% agreed and 15.5% were neutral about the question whether driving mirrors were effectively enforced as a basic vehicle safety requirement. However, 21% of the respondents disagreed and 31.3% strongly disagreed with the question. The scores about urban Kisumu indicate that 12.9% of the respondents strongly agreed, 26.6% others agreed while 16.7% were neutral about the same question. In contrast, 18% of the respondents disagreed and 25.8% others strongly disagreed with that question. Over half (52.3%) of the respondents believed that vehicle driving mirrors were not effectively enforced in rural Kisumu by traffic authorities, and over two fifth (43.8%) of them shared a similar perception about vehicles in urban Kisumu.

Related descriptive stats about the same safety requirement (VBSR 4) in rural Kisumu indicate that a less moderate arithmetic mean ($\bar{x}$ = 2.61) and less dispersed standard deviation (S= 1.42) were computed. Similar stats on urban Kisumu show that a moderate

mean perception ($\bar{x}$ = 2.83) was generated with less sparsed standard deviation (S= 1.40). In this case traffic enforcement of vehicle driving mirrors was less relatively effective in several parts of rural Kisumu County while in many urban areas of county the enforcement was fairly effective.

The findings on VBSR 5 in rural Kisumu indicates that 12 % of the respondents strongly agreed, and 20.6% agreed whereas 14.2% could not agree or disagree that vehicle wind screen wipers were effectively enforced by authorities. However, 23% of the respondents disagreed and 29.6% strongly disagreed with that perception. About urban Kisumu, the findings show that 13.7% of the respondents strongly agreed and 25.8% others agreed that such a vehicle safety requirement was effectively enforced. In relation, 14.6% of the respondents were neutral, while 18% disagreed and the rest 27.9% strongly disagreed with that perception. More than half (53.2%) of the respondents indicated that vehicle wind screen wipers were not effectively enforced in rural Kisumu while less than half (45.9%) of them shared a similar sentiment about the same enforcement in urban Kisumu.

The mean perception computed about the same vehicle safety requirement (VBSR 5) in rural Kisumu was less moderate ($\bar{x}$ = 2.60) and the related standard deviation (S = 1.40) was less spread-out. In the case of urban Kisumu, a high arithmetic mean ($\bar{x}$ = 2.78) with generated with a less spread standard deviation (S = 1.44). This suggests that enforcement of vehicle wind screen wipers was largely less fairly effective in rural areas and relatively effective in urban areas of Kisumu County.

The distribution about VBSR 6in rural Kisumu shows that 12.4% of the respondents strongly agreed and 16.3% agreed that vehicle night vision lights were effectively enforced by authorities. However, 18% of the respondents were neutral about this perception while 24.9% disagreed and 28.3% strongly disagreed with that perception. The distribution about urban Kisumu indicates that 12.4% of the respondents strongly agreed and 25.8% others agreed that as a safety requirement night such lights were effectively enforced. Comparably 14.6% of the respondents were neutral, while 18% disagreed and the rest 26.6% strongly disagreed with that revelation. More than half (53.2%) of the respondents indicated that the requirement of vehicle night vision lights was not effectively enforced in rural Kisumu. In

relation, over two fifth (44.6%) of the respondents had the same perception about enforcing similar safety requirement in urban Kisumu.

Related to the safety requirement (VBSR 6) in rural Kisumu was a less moderate mean perception ($\bar{x}$ = 2.59) and less spread standard deviation (S = 1.37) were generated. The stats about urban Kisumu indicate that a high arithmetic mean ($\bar{x}$ = 2.79) was computed with a less sparsed standard deviation (S = 1.40). The stats imply that enforcement of vehicle night vision lights was largely less relatively effective in rural areas and fairly effective in urban areas of Kisumu County.

The frequency distribution about VBSR 7 in rural Kisumu shows that 10.7% of the respondents strongly agreed, and 18% agreed that vehicle hooter as a safety requirement was effectively enforced by authorities. The rest 13.3% of the respondents could not agree or disagree, whereas19.3% disagreed and 37.8% strongly disagreed with that perception. About urban Kisumu the distribution specifies that 14.2% of the respondents strongly agreed and 18.5% agreed that the same safety requirement was effectively enforced. On the other hand, 17.6% of the respondents were neutral, while another 17.6% disagreed and the rest 26.6% strongly disagreed about that vehicle safety enforcement. Almost three fifth (57.1%) of the respondents felt that the requirement of vehicle hooter was not effectively enforced in rural Kisumu and over two fifth (44.6%) of them shared a similar perception about the same safety requirement in urban Kisumu.

A low arithmetic mean ($\bar{x}$ = 2.44) and less spread standard deviation (S = 1.43) were generated about the same safety requirement (VBSR 7) in rural Kisumu. In relation to urban Kisumu moderate mean ($\bar{x}$ = 2.65) was computed while the related standard deviation (S = 1.45) little spread from the mean. In that case, enforcement of vehicle hooters was only less effective various parts in rural Kisumu and fairly effective only in some urban areas of Kisumu County.

Interviews and focus group discussions raised related explanations on the enforcement of the same vehicle basic safety requirements specified in Table 4.27. The interview results specify that five (05) informants strongly agreed and eight (08) informants agreed that there was such enforcement. Eight (08) others remained neutral while another eight (08)

disagreed and the rest three (03) strongly disagreed about that. To clarify their positions, eight (08) of the acquiescent informants reported NTSA and Traffic Police officials carry out regular checks against noncompliant vehicles. Five (05) of these informants particularly singled out the Traffic Police as the consistent enforcers cracking down day in day out on vehicles lacking mainly side mirror**s,** side indicators, wind screen wipers, safety seat belts, night vision lights and driving Mirrors.

According to four (04) of the neutral informants, enforcement of such basic vehicle safety requirements was however average and with significant inconsistencies. One of the informants noted that, "long distance P.S.V vehicles have vehicle safety requirements while the local vehicles and other private vehicle don't comply". Another informant added that local drivers could not comply with impunity. To this end, an informant explained that the impunity and inconsistencies were partly due to corruption. According to two (02) informants, such vehicle safety enforcement in most of Kisumu County could only be intensified once an accident occurred and when fingers were pointed to the laxity of the Traffic Police or the NTSA.

Conversely, ten (10) of the informants that differed felt this kind of vehicle safety enforcement was inadequate while four (04) others indicated that it was very insufficient. An informant expounded that, "…. there is inadequacy because enforcement is not regulated and it is haphazardly carried out". Three (03) informants added that nobody bothers with private/ personnel vehicles. An informant attributed all this to the fact that, "enforcers are compromised and highly corrupt". Another was suggestively lamenting that, "……we should have had an integrated NTSA police solely responsible for such safety enforcement rather the current clumsy Traffic Police and NTSA partnership that otherwise abets evasion". Virtually, the rest four (04) informants alluded enforcement was very insufficient particularly in rural areas.

Majority of the participants in focus group discussions reported that there was regular but inconsistent enforcement of basic vehicle safety gadgets in Kisumu County. Participants also specified the following and same gadgets as the requirements of interest in the clampdown on vehicles in the county; wind screen wipers, safety seat belts, driving

Mirrors, side mirrors side indicators, and night vision lights. Enforcement was asserted to be inconsistent especially in rural areas. Participants indicated that in Kisumu City, Traffic Police officers regularly enforced such safety necessities only on routes moreover in the outskirts considered safer for extortion. The Traffic Police was reported to be genuinely consistent only on some roads in the city.

Some participants revealed that such enforcement was more consistent in events of partnerships between NTSA and the Traffic Police stage along some specific routes in the county. A participant (KARA) said: "….. such a team-up has done marvellous job along highways from Kisumu City and/or other major towns like Ahero and Maseno". Another participant (CWA) cited PSVs as the most combed vehicles for such safety requirements and thus, she noted, "they have increasingly become compliant despite some evasions". Participants also noted the introduction of NTSA operations in the county had improved and streamlined vehicle safety inspection, crackdown and compliance for vehicles plying routes known for rigorous enforcement. This also, it was said, included highways, like Kisumu- Kakamega, Nairobi Road (Kisumu- Kerocho), Kisumu- Kisii, Busia highway, etcetera

According to participants, the NSTA had revolutionised enforcement targeting. Prior to its introduction, it was revealed, Traffic Police, like they still do per a participant (APDK), mainly targeted PSVs and heavy commercial vehicles. NTSA stirred focus and private and public vehicles (including the government and civil society owned) were now targets by enforcement teams. Nonetheless, participants also lamented that all was not well yet despite some improvements; there were still many PSVs, heavy commercial vehicles, private and public vehicles that hardly complied and widely noticed in towns and particularly rural areas. This was mainly blamed by participants on bribery abated by drivers and supposed individual law enforcers. As a result, a participant (CWA) disclosed, "…. drivers hardly conform to the traffic safety requirements with impunity".

Quite a number of participants revealed that traffic agencies in some cases acted just because of public outcry. This was clarified by a participant (APDK) who disclosed: "sometimes the NTSA and Traffic Police strengthened enforcement of vehicle safety

requirements in the event of accidents that usually cause public discontent". But even then, participants regretted that such efforts were short lived and unsystematic. The sporadic enforcement was said to be targeted to some kinds of vehicles blamed for road carnage at the time. For instance, participants noted that private vehicles were usually not targeted yet they were equally vulnerable. When it comes to rural areas, participants revealed that private vehicle drivers were untouchable kings. In all dimensions, therefore participants agreed that enforcement of vehicle safety was worse in rural than in urban areas in the county.

The analyses about construct 3 specifically point to two things: one, each of the vehicle safety requirements investigated in Kisumu County was enforced more in urban than rural areas. Two, in each of rural and urban Kisumu, some safety requirements were enforced more than others; in rural Kisumu, the most enforced was side mirrors, followed by side indicators, then driving mirrors, wind screen wipers, night vision lights, vehicle hooter and lastly seat belts. In urban areas side indicators were the most enforced, side mirrors, seat belts, driving mirrors, night vision lights wind screen wipers and lastly vehicle hooter.

Construct 4: Motorcycle basic safety requirements enforced

Findings about this construct consist of perceptions on the enforcement of motorbike basic safety requirements in Kisumu County. The requirements that were investigated included motorbike side mirrors, side indicators, helmets, reflector jacket, night vision lights and hooter. Descriptive statistics for each of these requirements are summarised in Table 4.30.

Table 4.30

Descriptive statistics of the perceptions concerning enforcement of motorbike basic safety requirements in Kisumu County

Motor cycle basic safety requirements (MBSR) enforced	Response Category	Frequency (percent); n= 233		Mean		Standard Deviation	
		RK	UK	RK	UK	RK	UK
1) Side mirrors	SA	25 (10.7)	32 (13.7)	2.25	2.71	1.36	1.41
	A	29 (12.4)	47 (20.2)				
	N	23 (9.9)	37 (15.9)				
	D	64 (27.5)	55 (23.6)				
	SD	92 (39.5)	62 (26.6)				
2) Side indicators	SA	24 (10.3)	30 (12.9)				

Motor cycle basic safety requirements (MBSR) enforced	Response Category	Frequency (percent); n= 233		Mean		Standard Deviation	
		RK	UK	RK	UK	RK	UK
	A	28 (12)	43 (18.5)				
	N	20 (8.6)	38 (16.3)	2.22	2.61	1.35	1.40
	D	69 (29.6)	55 (23.6)				
	SD	92 (39.5)	67 (28.8)				
3) Helmets	SA	28 (12)	33 (14.2)				
	A	37 (15.9)	56 (24)				
	N	20 (8.6)	33 (14.2)	2.37	2.77	1.42	1.42
	D	61 (26.2)	52 (22.3)				
	SD	87 (37.3)	59 (25.3)				
4) Reflector jacket	SA	23 (9.9)	32 (13.7)				
	A	45 (19.3)	67 (28.8)				
	N	29 (12.4)	41 (17.6)	2.46	2.96	1.35	1.34
	D	64 (27.5)	51 (21.9)				
	SD	72 (30.9)	42 (18)				
5) Night vision lights	SA	20 (8.6)	26 (11.2)				
	A	36 (15.5)	50 (21.5)				
	N	37 (15.9)	48 (20.6)	2.38	2.69	1.31	1.36
	D	64 (27.5)	47 (20.2)				
	SD	76 (32.6)	62 (26.6)				
6) Motorcycle Hooter	SA	23 (9.9)	23 (9.9)				
	A	26 (11.2)	45 (19.3)				
	N	28 (12)	31 (13.3)	2.21	2.42	1.34	1.4
	D	59 (25.3)	47 (20.2)				
	SD	97 (41.6)	87 (37.3)				

Source: Field research (2018)

Similarly, the motorcycle basic safety requirements in Table 4.30 were coded MBSR 1-7 for purpose of simple identity in the following description. The frequency distribution about MBSR 1 in rural Kisumu show that 10.7% of the respondents strongly agreed and 12.4% agreed when asked whether motorcycle side mirrors were effectively enforced. However, 9.9% of the respondents were neutral, 27.5% disagreed and 39.5% strongly disagreed about the question. The distribution about urban Kisumu indicatesthat13.7% of the respondents strongly agreed, 20.2% others agreed whereas 15.9% were neutral about the same question. On the other hand, 20.6% of the respondents disagreed and 22.3% others strongly disagreed with that question. Almost three fifth (57%) of the respondents felt that

motorcycle side mirrors were not effectively enforced in rural Kisumu and half (50.2%) of the respondents felt the same about motorcycles urban Kisumu.

The related arithmetic mean about the same motorcycle requirement (MBSR 1) in rural Kisumu was low ($\bar{x}$ = 2.25) with less spread standard deviation (*s*) of 1.36. With regard to urban Kisumu a moderate arithmetic mean ($\bar{x}$ = 2.85) and similarly less spread-out standard deviation of 1.41 were computed. In that case, enforcement of motorcycle side mirrors was less effective in several rural areas of Kisumu County and was fairly effective in many parts of urban Kisumu. Vehemently

In relation to MBSR 2 in rural Kisumu the table shows that 10.3% of the respondents strongly agreed and 12% agreed that motorcycle side indicators were effectively enforced. Related this perception, 8.6% of the respondents were neutral while 29.6% of the respondents disagreed and 39.5% strongly disagreed. The distribution about urban Kisumu shows that 12.9% of the respondents strongly agreed and 18.5% agreed that there was similar motorcycle safety enforcement was effective. However, 16.3% of the respondents were neutral, 23.6% disagreed and 28.8% strongly disagreed about the related question. More two thirds (69.1%) of the respondents indicated that motorcycle side indicators were not effectively enforced in rural Kisumu while over half (52.4%) of the respondents expressed a similar perception about urban Kisumu.

Related descriptive stats about rural Kisumu show that a low arithmetic mean ($\bar{x}$ = 2.22) and a less spread standard deviation (*S* = 1.35) were generated. The stats about urban Kisumu indicate that a moderate mean ($\bar{x}$) of 3.14and less dispersed standard deviation (*S*= 1.40) were computed. This implies enforcement of motorcycle side indicators as a safety requirement was less effective in numerous rural areas of and fairly effective in several urban areas of Kisumu County.

The statistical distribution on MBSR 3 in rural Kisumu specifies that 12% of the respondents strongly agreed and 15.9% agreed that enforcement of motorcycle helmets was effective. About the related question 8.6% remained neutral whilst26.2% of the respondents disagreed and 37.3% strongly disagreed. As for urban Kisumu 14.2% of the respondents strongly agreed, 24% others agreed while 14.2% were neutral about the same

question on such motorcycle safety enforcement. However, 22.3% of the respondents disagreed and 25.3% others strongly disagreed with that question. Over half (63.5%) of the respondents indicated that motorcycle helmets were not effectively enforced in rural areas of Kisumu County while almost half (47.6%) of them shared a similar perception about motorcycles in urban areas of the county.

With less strewed standard deviation of 1.42, the arithmetic mean about the motorcycle helmet enforcement in rural Kisumu was low ($\bar{x}$ = 2.37). The mean perception on urban Kisumu was moderated ($\bar{x}$ = 2.77) and the related the standard deviation (S= 1.29) was less spread out. These stats imply that motorcycle helmets were largely less effectively enforced in rural areas and moderately enforced in many urban areas of Kisumu County.

The frequency distribution on MBSR 4 in rural Kisumu indicates that 9.9% of the respondents strongly agreed, 19.3% agreed and 12.4% were neutral about whether reflector jackets were effectively enforced on motorcyclists. Conversely, 27.5% of the respondents disagreed and 30.9% strongly disagreed with the question. The distribution about urban Kisumu shows that 13.7% of the respondents strongly agreed, 28.8% others agreed whereas 17.6% were neutral about the same question. On the contrary, 21.9% of the respondents disagreed and 18% others strongly disagreed with that question. Almost three fifth (58.4%) of the respondents indicated that motor cyclist reflector jackets were not effectively enforced in rural Kisumu, and nearly two fifth (39.9%) of them had similar experience in urban Kisumu.

The descriptive stats a about the same safety requirement (MBSR 4) in rural Kisumu show that a low arithmetic mean ($\bar{x}$ = 2.46) and less spread standard deviation (S = 1.35) were computed. Similar stats on urban Kisumu show that a highly moderate mean static ($\bar{x}$ = 2.96) was generated with less sparsed standard deviation (S = 1.34). Thus, enforcement of motorcyclist helmet was less effective in most of rural Kisumu County while moderately effective in much of urban areas in the county.

The scores on MBSR 5 in rural Kisumu show that 8.6 % of the respondents strongly agreed and 15.5% agreed whereas 14.2% could not agree or disagree that motorcycle night vision lights were effectively enforced by authorities. Contrariwise, 15.9% of the respondents

disagreed and 27.5% strongly disagreed with that perception. In the case of urban Kisumu, the scores show that 112% of the respondents strongly agreed and 21.5% others agreed that such a safety night vision lights were effectively enforced. In relation, 20.6% of the respondents were neutral, while 20.2% disagreed and the rest 26.6% strongly disagreed with that perception. Slightly over three fifth (60.1%) of the respondents felt that motorcycle night vision lights were not effectively enforced in rural Kisumu while less than half (46.8%) of them had a similar feeling over the same enforcement in urban Kisumu.

A low arithmetic mean ($\bar{x}$ = 2.38) and less spread standard deviation (S = 131) were generated from perception on MBSR 5 IN in rural Kisumu. Similar stats about urban Kisumu included moderate arithmetic mean ($\bar{x}$ = 2.69) and less dispersed standard deviation (S= 1.36). The stats connote that enforcement of motorcycle night vision lights was largely less effective in rural areas and fairly effective in urban areas of Kisumu County.

The frequency distribution about MBSR 6 in rural Kisumu indicates that 9.9% of the respondents strongly agreed, and 11.2% agreed that traffic enforcement of motorcycle hooter was effective. The rest 12% of the respondents were neutral about this while 25.3% disagreed and 41.6% strongly disagreed with that perception though. About urban Kisumu the distribution shows that 9.9% of the respondents strongly agreed and 19.3% others agreed that such hooter as a safety requirement were effectively enforced by traffic authorities. On the other hand 13.36% of the respondents were neutral, while 20.2% disagreed and the rest 37.3% strongly disagreed with that admission. Two thirds (66.9%) of the respondents believed that the requirement of motorcycle hooter was not effectively enforced in rural Kisumu. Almost three fifth (57.5%) of the respondents conveyed a similar perception such motorcycle safety requirement in urban Kisumu.

On the same safety requirement (MBSR 6) in rural Kisumu a low mean perception ($\bar{x}$ = 2.21) and less spread standard deviation (S = 1.34) were generated. Similar stats about urban Kisumu show that also a low arithmetic mean ($\bar{x}$ = 2.42) was computed with a less strewn standard deviation (S = 1.40). This means, enforcement of motorcycle hooter was

largely less effective in rural areas and relatively less effective in urban areas of Kisumu County.

Similar findings gathered from interviews and FGDs entail much explanation as follows. Interviews revealed that four (04) informants strongly agreed, four (04) agreed while three (03) others were neutral about the question of whether the basic motorcycle safety requirements were adequately enforced in Kisumu County. In contrast, eleven (11) informants disagreed and the rest ten (10) strongly disagreed with the question. To shed more light on their insights, two (02) of the informants that seemed comfortable indicated that Traffic Police regularly enforced such motorcycle basic safety requirements as helmets, side mirrors, reflector jackets, and night vision lights. One (01) of the informants reported that, "beside public sensitization made regularly, there is regular crackdown on operators not compliant with regulations about motorcycle basic safety requirements".

Compared to the above, five (05) in formants revealed that in Kisumu County, motorcycle safety requirements were fairly enforced. One (01) of these informants disclosed that, "…….at times officers are few and motorcycles are many and operate 24 hours in 7 days and so, basic safety enforcement is not effective". Another informant lamented that, "efforts are made but motorcycle operators, particularly the Bodaboda in urban and rural areas, have to change their attitude. On the other hand, nineteen (19) informants indicated that enforcement of motorcycle safety basics was inadequate and not effective enough. Two (02) informants noted such enforcement was constrained by a lot of impunity of motorcycle riders; among tricycles and mainly Bodabodas.

In addition to the above, an informant stressed that because of impunity "Bodaboda riders for example insistently refused to wear head helmets, reflector jackets and some of them declined to secure driving licences". Besides, one informant stated that enforcement of such motorcycle safety requirements was neither systematic nor sustained. In relation, another informant explained that, "…… most of the motorcycle riders including tricycles do not attend driving schools and are thus not well trained to understand safety requirements. And they end up flouting related traffic safety rules. On the extreme side, two (02) informants lamented that very little was done to enforce such basic safety rules

particularly among Boda bodas and/or Tuk-tuk. In relation, one of these informants added that, "…...no measures or procedures are made for regulation of motorcycles/ Boda boda and even tricycles/ Tuk-tuk. Besides there little will to do that".

Similarly, in the focus group discussions, less than half of the participants felt that enough was not done by authorities to enforce basic motorcycle safety requirements such as night vision lights, side mirrors, and helmets, reflector jackets as well as wind screens for tricycles. Nevertheless, the majority participants believed the enforcement was not enough considering the safety menace posed by motorcycles, most especially Boda bodas anywhere in Kisumu County. A few participants felt the enforcement was fair enough though.

Participants that showed satisfaction said there were regular compliance campaigns especially in towns to enhance operators' compliance of required road safety standards including the safety gadgets specified in traffic regulations on motor and tri-cycles. One of the participants (KARA) said: "this is done countywide". Another participant identified "traffic education as a primary strategy the authorities including Traffic Police, NTSA and the county government have adopted to build capacity of riders to observe safety requirements without necessarily resorting to clampdown". In addition, the related participants asserted that traffic management in the county had resorted to proactive than reactive enforcement.

Although proactive enforcement was not denied by dissatisfied participants, they maintained that all was not well as most of the riders could not willingly comply without punitive measures. They argued that habit was everywhere; in rural and urban areas. They also acknowledged that crackdowns made in the county operations were marred by distortions including corrupt tendencies of some enforcers, personnel constraints, and evasion tricks of riders. A participant (APDK) noted that, "……corruption and evasion were common along roads away from central business centres of the towns in the county and on rural roads". For the personnel constraints, another participant (KARA) explained:

> …… at times traffic safety enforcers are not enough to effectively administer best and safe practice among massive numbers of Boda bodas and Tuk-tuks,

especially in Kisumu City. In rural areas, some parts are simply ignored by enforcers as remote and hard to cope with areas.

Participants also citied lack of effort to organise effectively the management of commercial transport motorcycles, riders' night operations and arrogance as other reasons behind the inconsistency of safety enforcement. A participant (CWA) said: "Boda boda riders arrogantly snub wearing reflector jackets and head helmets". Some participants noted that there were no well streamlined operators' SACCOs that would have made it easy to coordinate and support safety enforcement from government authorities.

According to a participant (KARA), SACCOs or proactive associations were well known among PSVs but not Boda bodas, neither Tuk-tuk in the county. Participants revealed that it is possible traffic education programs were dodged by many riders, after-all many in the county never learnt riding or driving through driving schools. "That was common in rural areas of Kisumu", a participant (CWA) Said.

The statistical and qualitative reports analysed in relation to construct 4 suggest that motorcycle safety requirements under review were not quite well enforced in the Kisumu County most especially in rural areas. Reports also imply that in both rural and urban Kisumu, some safety requirements were enforced more consistently than others. In rural areas, the safety requirement most enforced was motorcyclist reflector jacket, followed by night vision lights, then helmets, side mirrors, side indicators and last motorcycle hooter. In urban areas, reflector jacket was similarly the most enforced, then side mirrors, helmets, night vision lights, side indicators and finally motorcycle hooter likewise.

Construct 5: Regulation of vehicle speed and safe driving on road

Findings related to this construct comprise perceptions about the use of relevant mechanisms to regulate vehicle speed and safe driving on the road in Kisumu County. The mechanisms include Speed gun, Road bumps, Fitting speed governors, and Alcoblow. Descriptive statistics (questionnaire) for each of the mechanisms are summarised in Table 4.31.

Table 4.31

Descriptive statistics about regulation mechanisms of vehicle speed and safe driving in Kisumu County

Mechanisms (Mech.) used to regulate vehicle speed and safe driving	Response Category	Frequency (percent); n= 233		Mean		Standard Deviation	
		RK	UK	RK	UK	RK	UK
1) Speed gun	SA	16 (6.9)	22 (9.4)	2.34	2.61	1.31	1.35
	A	43 (18.5)	55 (23.6)				
	N	38 (16.3)	35 (15)				
	D	50 (21.5)	56 (24)				
	SD	86 (36.9)	65 (27.9)				
2) Enforcing speed governors	SA	26 (11.2)	30 (12.9)	2.62	3.03	1.32	1.3
	A	42 (18)	73 (31.3)				
	N	44 (18.9)	45 (19.3)				
	D	64 (27.5)	47 (20.2)				
	SD	57 (24.5)	38 (16.3)				
3) Road bumps	SA	29 (12.4)	30 (12.9)	2.85	3.27	1.33	1.21
	A	60 (25.8)	93 (39.9)				
	N	38 (16.3)	54 (23.2)				
	D	62 (26.6)	26 (11.2)				
	SD	44 (18.9)	30 (12.9)				
4) AlcoBlow	SA	24 (10.3)	27 (11.6)	2.24	2.59	1.38	1.42
	A	29 (12.4)	51 (21.9)				
	N	29 (12.4)	32 (13.7)				
	D	51 (21.9)	49 (21)				
	SD	100 (42.9)	74 (31.8)				

Source: Field Research (2016)

The mechanisms covered in Table 4.31 are also coded ranging from Mech 1- 4 for easy specification. Similarly, the table presents frequency distributions, arithmetic mean and standard deviation statistics on each of the mechanisms in rural and urban Kisumu. Specifically, the frequency distribution on Mech 1 in rural Kisumu shows that 6.9% of the respondents (n = 233) strongly agreed and 18.5% agreed that speed gun was reliably used regulated vehicle speed and safe driving. In relation16.3% of the respondents could not agree or disagree while21.5% other disagreed and the rest 37.3% strongly disagreed with that perception. On urban Kisumu, the distribution indicates that 9.4% of the respondents strongly agreed, 23.6% others agreed whereas 15% were neutral about the same question on speed gun. On the contrary, 24% of the respondents disagreed and 27.9% others strongly

disagreed with the question. Nearly two fifth (58.4%) of the respondents believed that the speed gun was not relied on the regulate speed and safe driving in rural areas of Kisumu County. Over half (51.9%) of the respondent shared a similar revelation about the use of the gadgets urban Kisumu.

The arithmetic mean about the use of the same mechanism (Mech 1) in rural Kisumu was low ($\bar{x}$ = 2.34) with less dispersed standard deviation of 1.31. The mean statistic about urban Kisumu was moderate ($\bar{x}$ = 2.61) and the related the standard deviation (s = 1.29) was equally less spread out. This implies, speed guns were less relied in the best part of rural Kisumu and relatively used in the greater part urban Kisumu.

The sample distribution on Mech 2 in rural Kisumu indicates that 11.2% of the respondents strongly agreed, 18% agreed and 18.9% were neutral about whether speed governors are consistently enforced to regulate vehicle speed. Contrastingly, 27.5% of the respondents disagreed and 24.5% strongly disagreed with the question. On urban Kisumu the distribution shows that 12.9% of the respondents strongly agreed, 31.3% others agreed while 19.3% were neutral about that question. However, 20.2% of the respondents disagreed and 16.3% others strongly disagreed with the question. Over half (52%) of the respondents felt that there was no consistency in enforcing the use of speed governors in rural Kisumu. Over a third (36.5%) expressed the same feeling about similar speed control mechanism urban Kisumu.

Related to the same mechanism (Mech 2) in rural Kisumu a less moderate arithmetic mean ($\bar{x}$ = 2.62) and less spread standard deviation (s= 1.32) were computed. Similar stats on urban Kisumu indicate that a less high mean static ($\bar{x}$= 3.03) was generated with less dispersed standard deviation (s = 1.3). In that case, enforcement of speed governors was less relatively consistent in most of rural Kisumu County and was less highly consistent in much of urban Kisumu.

Scores about Mech 3 in rural Kisumu show that 12.4% of the respondents strongly agreed, 25.8% agreed while 16.3% were neutral about whether road bumps are sufficiently relied on to regulate vehicle speed and safe driving. On the other hand, 26.6% of the respondents disagreed and 18.9% strongly disagreed with the question. The scores on urban Kisumu

shows that 12.9% of the respondents strongly agreed, 39.9% others agreed whereas 23.2% were neutral about the same question. On the contrary, 11.2% of the respondents disagreed and 12.9% others strongly disagreed with that question. Almost half (45.5%) of the respondents refuted perception that road bumps were sufficient to regulate vehicle speed in rural Kisumu, and only less quarter (24.1%) of them had a similar objection about urban Kisumu.

The related arithmetic mean generated on road bumps in rural Kisumu moderate ($\bar{x}$= 2.85) with less spread standard deviation (S= 1.33). Similar stats computed on urban Kisumu include a high mean perception ($\bar{x}$= 3.27) and small standard deviation (S= 1.21). These stats suggest that road bumps were relatively relied on in most of rural Kisumu and highly used in much of urban Kisumu for regulating vehicle speed and safe driving.

Results about Mech 4 in rural Kisumu indicate that 10.3% of the respondents strongly agreed and 12.4% agreed when asked whether alcoblow was used as mechanism for regulate safe vehicle driving. Another 12.4% of the respondents were neutral about while, 21.9% disagreed and 42.9% strongly disagreed with the question. In the case of urban Kisumu, the results show that 11.6% of the respondents strongly agreed, 21.9% others agreed whilst 13.7% were neutral about the same question. On the other hand, 21% of the respondents disagreed and 31.8% others strongly disagreed with that question. Almost two thirds (64.8%) of the respondents felt that alcoblows were not sufficiently used safe driving regulation in rural Kisumu. Over half (52.8%) of the respondents felt the same about use of alcoblows in urban Kisumu.

The related arithmetic mean about the same safe driving mechanism (Mech4) in rural Kisumu was low ($\bar{x}$= 2.24) with less spread standard deviation (s) of 1.38. Regarding a similar measure in urban Kisumu, a less moderate arithmetic mean ($\bar{x}$= 2.59) and likewise less spread-out standard deviation of 1.42 were computed. As such, Alcoblows were rarely used in rural areas of Kisumu County and less often employed urban areas to check on drunk driving.

Related findings from interviews and FGDs provide in-depth description of the vehicle speed and safe driving mechanisms specified above. Interview findings show that five (05)

of the informants strongly agreed and nine (09) agreed that vehicle speed was well regulated on road in Kisumu County. Three (03) informants were neutral about this while nine (09) others disagreed and the rest six (06) strongly disagreed with that. Three (03) of the informants that strongly agreed, indicated that speed checks were done daily, in addition to bumps created to slow down vehicles. In addition, seven (07) of the informants that agreed vehicle speed and safe driving were regulated by enforcing speed governors and road bumps and the through the use of speed guns and alcoblow. An informant added that, "……beside these tools offenders among drivers are arraigned before court".

Apart from the revelations above, four (04) of the neutral informants noted that vehicle speed was relatively regulated. One of the informants stated: "……speed limit notifications exist but enforcement is not adequate". Another informant disclosed that, "in the absence of road humps drivers usually control speed only in the presence of enforcement officers along the routes of travel road". On the contrary, the majority twelve (12) formants revealed that such vehicle drivers were poorly regulated. An informant stated: "if vehicle speed and safety on road are well regulated in Kisumu County then we could not have had accidents particularly at the notorious Mamboleo junction and other black spots".

Another informant noted: "……in Kisumu CDB, the speed is regulated by the road conditions not any other mechanisms". An informant indicated that, "vehicle safety driving was not regulated on the feeder roads in rural areas and some roads in towns in the county. According to an informant, public Matatu's dissemble speed governors even when on highways without police enforcing strict regulation. Two other informants lamented that in most rural areas of the county vehicle safety driving was not regulated at all.

Focus group discussants unanimously concurred that there were efforts and mechanisms adopted to regulate speed and promote safe driving on the roads in Kisumu County. They again agreed that this was better in towns than rural areas of the county. Some indicated that among towns Kisumu City took the lead as regards regulation of speed and safe driving. The participants identified similar mechanisms specified in the interviews; use of speed guns, enforcing speed governors, erecting road humps and use of Alco-blows. They also pointed out the use of civic education and driver capacity development. Some

participants also reported employment of punitive measures through court prosecution of offenders.

Despite acknowledging reliance on such regulatory methods, majority of the participants expressed concern over the sufficiency of safe driving promotion from traffic managers in the county. Many of the participants revealed that regulation of vehicle speed and driving safety was, among towns, only considerable in Kisumu County compared to the rest of the towns in the county. In the rural areas, it was said to be less priority considering the manners in which drivers drove recklessly. A participant (KARA) cited Ahero, as one of the urban examples of less regulated traffic. She said: "…….in Ahero, there are only two speed bumps in total, located at the entrance and exit, and there is hardly any presence of NTSA officers who should monitor speeding above the recommended limit of 30/50 km/h. There isn't also adequate speed limit road signage".

Other participants noted that there were speed limit notifications in some other towns in the county but then, enforcement was insufficient. A participant (CWA) said: "the humps at highway spots approaching rural trading centres were not well marked; instead of helping curb over speeding, rather such humps cause unprecedented accidents". Some participants observed that drivers could have been educated about the dangers of over speeding and unsafe driving but that was not necessarily replicated. One of them (APDK) noted: "……vehicle operators only reduce speed and strap their seatbelts only when approaching NTSA and Traffic Police checkpoints signalled to them earlier by colleagues"

Participants explained that speed and safety regulation in rural areas of Kisumu County was not any better because it was negligible one rural feeder roads. It was revealed some mechanisms used were not consistent enough, for example they noted that long route vehicles, especially Matatus, across and around the county had a tendency of dissembling speed governors before enforcement officers interrupt. In addition, some participants lamented that night travels made vehicle safety regulation a bit tricky and inconsistent leading to road carnage. In fact, participants reacted that if speed and safe driving were sufficiently regulated, avoidable accidents would be reduced in Kisumu County, especially in rural areas.

As analysed, the survey findings about this construct specifically reveal that, in both rural and urban Kisumu, alcoblow was the least used by traffic authorities of the four vehicle speed and safety regulation mechanisms studied. This was followed by use of speed guns, enforcing speed governors and then road bumps. Only road bumps were highly relied on urban areas for vehicle speed and safety regulation.

Construct 6: Penalty against vehicle traffic offences

This construct was used to generate findings on the consistency of penalty against vehicle traffic offences on the road in Kisumu County. The offenses investigated include overloading, improper parking, unlicensed driving, and reckless driving. Descriptive statistics about each of the offenses are presented in Table 4.32.

Table 4.32

Descriptive statistics about the level to which vehicle traffic offenses are penalised in Kisumu County

Vehicle traffic offenses (VTOs) penalised	Response Category	Frequency (percent); n= 233		Mean		Standard Deviation	
		RK	UK	RK	UK	RK	UK
1) Overloading	SA	33 (14.2)	34 (14.6)	2.38	2.65	1.46	1.48
	A	31 (13.3)	51 (21.9)				
	N	25 (10.7)	29 (12.4)				
	D	51 (21.9)	41 (17.6)				
	SD	93 (39.9)	78 (33.5)				
2) Improper parking	SA	24 (10.3)	29 (12.4)	2.18	2.71	1.37	1.42
	A	26 (11.2)	60 (25.8)				
	N	25 (10.7)	28 (12.0)				
	D	56 (24.0)	50 (21.5)				
	SD	102 (43.8)	66 (28.3)				
3) Unlicensed driving	SA	25 (10.7)	29 (12.4)	2.56	2.95	1.35	1.35
	A	45 (19.3)	74 (31.8)				
	N	33 (14.2)	38 (16.3)				
	D	66 (28.3)	45 (19.3)				
	SD	64 (27.5)	47 (20.2)				
4) Reckless driving	SA	23 (9.90)	29 (12.4)	2.46	2.91	1.35	1.32
	A	42 (18.0)	62 (26.6)				
	N	32 (13.7)	50 (21.5)				
	D	63 (27.0)	47 (20.2)				
	SD	73 (31.3)	45 (19.3)				

Source: Field research (2016)

The vehicle traffic offenses identified in Table 4.32 were coded VTO 1-4 for clarity in the following description. The frequency distribution about VTO 1 in rural Kisumu show that 14.2% of the respondents (n =233) strongly agreed, 13.3% agreed and 10.7% were neutral about whether vehicle overloading was consistently penalised. However, 21.9% of the respondents disagreed and 39.9% strongly disagreed with the question. On urban Kisumu the distribution indicates that 14.6% of the respondents strongly agreed, 21.9% others agreed while 12.4% could not agree or disagree with the same question. Conversely, 17.6% of the respondents disagreed and 33.5% others strongly disagreed with the question. Over three fifth (61.8%) of the respondents felt that vehicle overloading was not consistently penalised in rural areas of Kisumu County. Over half (51.1%) of the respondents shared a similar feeling about vehicle overloading in urban areas in the county.

The related arithmetic mean computed about rural Kisumu low ($\bar{x}$ = 2.38) with less spread standard deviation (S=1.48). Similar statistics on urban Kisumu include a moderate mean ($\bar{x}$ = 2.65) and an equally less spread standard deviation (S = 1.48). The descriptive statistics simply that in rural areas of Kisumu County vehicle overloading was largely less consistently not penalised while in many urban areas it was only fairly penalised.

The sample distribution about VTO 2 in rural Kisumu indicates that 10.3% of the respondents strongly agreed, and 11.2% agreed that improper parking of vehicles was consistently penalised. Others equivalent to 10.7% of the respondents were neutral about this whereas 24.0% disagreed and 43.8% strongly disagreed with that perception. The distribution about urban Kisumu shows that 12.4% of the respondents strongly agreed and 25.8% others agreed that such a vehicle offense was consistently penalised by traffic authorities. On the other hand, 12.0% of the respondents were neutral, while 21.5% disagreed and the rest 28.3% strongly disagreed with that perception. Two thirds (67.8%) of the respondents indicated that improper vehicle parking was not consistently penalised in rural Kisumu. Almost half (49.8%) of the respondents had a similar perception about vehicle parking anomaly in urban Kisumu.

Descriptive stats about the same vehicle traffic offense (VTO2) in rural Kisumu show that a low mean perception ($\bar{x}$ = 2.18) and less spread standard deviation (S = 1.37) were

computed. Similar stats about urban Kisumu show that a moderate arithmetic mean ($\bar{x}$ = 2.71) was generated with a less dispersed standard deviation of 1.42. This suggest that, improper vehicle parking was largely less consistently penalised in most rural areas and fairly consistently punished in urban areas of Kisumu County

The perception frequency distribution about VTO 3 in rural Kisumu includes 10.7% of the respondents that strongly agreed and 19.3% others who agreed that unlicensed driving was consistently punished by authorities. The rest 14.2% of the respondents could not agree or disagree, whereas 28.3% disagreed and 27.5% strongly disagreed with that perception. About urban Kisumu the distribution specifies that 12.4% of the respondents strongly agreed and 31.8% agreed that the same vehicle offense was consistently penalised. However, 16.3% of the respondents were neutral, another 19.3% disagreed and the rest 20.2% strongly disagreed about that vehicle offense penalty. Over half (55.8%) of the respondents dismissed the prospect that there was consistency in curbing unlicensed vehicle driving in rural Kisumu and almost two fifth (39.4%) of them refuted a similar prospect against such illegal driving in urban Kisumu.

The arithmetic mean about same traffic offense penalty (VTO 3) in rural Kisumu was less moderate ($\bar{x}$ = 2.56) with a less spread standard deviation (S = 1.35). As for urban Kisumu the arithmetic mean ($\bar{x}$ = 2.95) generated was highly moderate and related a standard deviation of 1.35 was equally less spread. In that case, penalising unlicensed vehicle driving was largely less relatively consistent in rural areas and fairly consistent in a greater part of urban areas in Kisumu County

The sample distribution about VTO 4 in rural Kisumu show that 9.9% of the respondents strongly agreed, 18.0% agreed and 13.7% were neutral about whether reckless vehicle driving was consistently penalised. On the contrary, 27.0% of the respondents disagreed and 31.3% strongly disagreed with the question. About urban Kisumu the distribution indicates that 12.4% of the respondents strongly agreed, 26.6% others agreed while 21.5% could not agree or disagree with the same question. In contrast, 20.2% of the respondents disagreed and 19.3% others strongly disagreed with the question.

Almost three fifth (58.3%) of the respondents indicated that reckless vehicle driving was not consistently penalised in rural areas of Kisumu County. About two fifth (39.5%) of the respondents expressed the same perception about similar vehicle driving in urban areas in the county.

The arithmetic mean computed about same traffic offense (VTO 4) in rural Kisumu was low ($\bar{x}$= 2.46) with less spread standard deviation (S=1.35). Related stats about urban Kisumu show that a moderate mean ($\bar{x}$= 2.95) and an equally less spread standard deviation (S= 1.32) were generated. Accordingly, penalty against reckless vehicle driving was less consistent in rural areas of Kisumu County and largely fairly consistent in much of urban areas in the county.

The related findings from interviews and FGDs provide greater detail about control of vehicle offenses in rural and urban Kisumu. The interview findings show that six (06) of the informants strongly agreed and eleven (11) others agreed that vehicle traffic offences are effectively controlled by traffic authorities in Kisumu County. Six (06) were neutral whereas six (06) others disagreed and the rest three (03) informants strongly disagreed with that. Two (02) of the informants that agreed indicated that Traffic Police and NTSA checkpoints could be randomly stationed on all major roads connecting to Kisumu County and they effectively executed their work of countering traffic offenses. The informants identified such offenses as careless driving, unlicensed driving, and overloading. Other nine (09) informants noted that control of vehicle traffic offenses was effective in urban Kisumu and less effective in rural areas of the counties.

In light of the above, one (01) informant specified that, "……vehicle traffic offenses in unban Kisumu were controlled by way of use of Notice to Attend Court (NTACs), court prosecution and use of cash bail tickets". Another informant added that daily convictions of traffic offenders were evidence of effective control. That aside, eight (08) other informants reported that control of vehicle traffic offenses had been just fairly effective. In relation to this, an informant revealed, "that kind of traffic safety control depends on the nature of offense" and that "some offences pass as normal, are ignored". Another informant noted that, "vehicle traffic offenses are only controlled when the traffic officers are on the

roads. Any other time, they are not". According to two (02) informants, vehicle traffic offences would be efficiently controlled by Traffic Police officers if it was not the effect of impunity of some locals.

The above notwithstanding, ten (10) of the informants that differed indicated that vehicle traffic offenses are less effectively controlled most especially in rural areas of the county. The most poorly controlled were vehicle speed, illegal driving and overloading. An informant specified that, "vehicle offense control is not really enough since the traffic officers are concentrating on Matatus and Lorries compared to the rest of the vehicles". Another informant lamented that traffic officers, particularly, police paralyse effective control of traffic offences by being bribed. In relation, an informant disclosed: "…I have seen cases of overloaded vehicles just let to go through roadblocks even after having been stopped for inspection". It was because of a similar accusation that one (01) informant stressed that vehicle traffic offenses were generally not effectively controlled.

Findings raised from FGDs show that there were efforts made to penalise traffic offenses in all parts of Kisumu County. However, there were issues of territorial balance, regularity, consistency and transparency. They singled out similar offenses for which vehicle operators were commonly punished in the county; overloading; improper parking, unlicensed driving, reckless driving. According to most of the participants, fighting traffic offenses was more decisive in towns than rural areas in the county. It was reported to be most decisive in Kisumu City. Nonetheless, several participants revealed that there were equally overwhelming loopholes.

One of the participants (APDK) stressed: "crackdown on traffic offenses was mainly for monetary intentions. Therefore, offenders are used to traffic fines and don't bother much to assume collective responsibility to do away or fight safety threatening offenses". In addition, participants noted that traffic offenses in the county are prosecuted in courts of law. However, they noted this had instead exacerbated bribery of enforcers otherwise supposed to stop traffic offense. A participant (KARA) argued that:

> …..Prosecution of traffic offences is real but sometimes in Kisumu County it instead misused for bribery by the corrupt individual traffic enforcement and transport operators or drivers. Individual officers use it to intimidate and

> extort bribes while culprit drivers, out of fear, yearning to pay the same themselves".

Some participants claimed that fighting traffic offences was less effective especially on the highways and rural roads because it was not equally exercised. They noted that traffic regulation enforcers mainly targeted drivers, and most times spared passengers yet they were equally culprits on many transport routes crisscrossing the county. In fact, one of the participants (CWA) indicated that:

> Passengers promote overloading. It is common to notice a passenger very eager and crumbling to enter a Matatu already full to capacity. Some passengers deliberately refused to strap themselves with seatbelts. They can commit offences, but they are usually not blamed and held accountable than the transport service providers.

According to participants, traffic offenses were less effectively controlled in rural areas of Kisumu because traffic managers posted to oversee rural roads were not consistently inspected by supervisors. As a result, "they don't regularly perform their mandate of clamping down on traffic offenses as expected", said participants. It was also revealed that officers also freely indulged in corruption. They also subjectively interacted with self-styled guides, widely perceived as cartels, and corrupt transport operators instead of tightening the noose against traffic offenses. The corrupt operators included some Matatu drivers and conductors. Offenses rampant due to duty disregard in rural areas included overloading, over speeding and unlicensed driving.

The above report analyses about construct 6 suggest that it was not entirely enough in the Kisumu County, but each of the vehicle offenses of study was penalised more in urban than rural areas. Also, in both rural and urban Kisumu, some vehicle offenses were penalised more than others. In rural Kisumu, only unlicensed driving was somewhat consistently penalised, otherwise traffic authorities were less strict on the rest with least penalised being improper vehicle parking, followed by overloading, then reckless driving. In urban Kisumu, unlicensed driving was the most consistently penalised followed by reckless driving, improper parking and then overloading.

Construct 7: Operation against motorcycle traffic offences

For this construct, findings cover perceptions about whether motorcycle traffic offences on the road were penalised in Kisumu County. The offenses that were queried include motorcycle overloading, unlicensed driving, and reckless driving. Descriptive statistics for each of the offenses are summarised in Table 4.33.

Table 4.33

Descriptive statistics of the perceptions on whether motorbike traffic offenses are penalised in Kisumu County

Motorcycle traffic offenses (MTOs) penalised	Response Category	Frequency (percent); n= 233				Mean		Standard Deviation	
		RK		UK		RK	UK	RK	UK
1) Overloading	SA	29	(12.4)	33	(14.2)	2.15	2.55	1.43	1.49
	A	22	(9.40)	47	(20.2)				
	N	21	(9.00)	22	(9.40)				
	D	47	(20.2)	46	(19.7)				
	SD	114	(48.9)	85	(36.5)				
2) Unlicensed driving	SA	25	(10.7)	29	(12.4)	2.12	2.59	1.40	1.44
	A	27	(11.6)	50	(21.5)				
	N	19	(8.20)	31	(13.3)				
	D	46	(19.7)	46	(19.7)				
	SD	116	(49.8)	77	(33.0)				
3) Reckless driving	SA	26	(11.2)	32	(13.7)	2.11	2.63	1.37	1.45
	A	22	(9.40)	48	(20.6)				
	N	17	(7.30)	29	(12.4)				
	D	58	(24.9)	50	(21.5)				
	SD	110	(47.2)	74	(31.8)				

Source: Field research (2016)

The motorcycle traffic offenses specified in Table 4.33 are also coded as MTO 1- 3 for easy precise identity in the following description. To start with, the frequency distribution on MTO 1 in rural Kisumu shows that 12.4% of the respondents (n= 233) strongly agreed and 9.4% agreed that motorcycle overloading was compliantly penalised. In relation 9% of the respondents could not agree or disagree while 20.2% others disagreed and the rest48.9% strongly disagreed with that perception. About urban Kisumu, the distribution indicates that 14.2% of the respondents strongly agreed, 20.2% others agreed whereas 9.4% were neutral about the question related to penalty against motorcycle overloading. On the contrary, 19.7% of the respondents disagreed and 36.5% others strongly disagreed with the question. Over two third (69.1%) of the respondents felt that motorcycle overloading was

not compliantly penalised in rural areas of Kisumu County. Over half (56.2%) of the respondents had a similar feeling about the motorcycle overload in urban Kisumu.

The arithmetic mean about the penalty of motorcycle overloading in rural Kisumu was low ($\bar{x}$= 2.15) with less dispersed standard deviation of 1.43. The mean perception about urban Kisumu was moderate ($\bar{x}$= 2.55) and the related the standard deviation (s= 1.49) was equally less spread out. This suggests that speed penalty of motorcycle overloading was less compliant many parts of rural Kisumu and relatively compliant in greater part of urban Kisumu.

The perception distribution on MTO 2 in rural Kisumu indicates that 10.7% of the respondents strongly agreed, 11.6% agreed and 8.2% were neutral about whether unlicensed motorcycle driving was compliantly penalised by authorities. Comparably 19.7% of the respondents disagreed and 49.8% strongly disagreed with the question. The distribution on urban Kisumu shows that 12.4% of the respondents strongly agreed, 21.5% others agreed while 19.7% were neutral about that question. However, similarly 19.7% of the respondents disagreed and 33.3% others strongly disagreed with the question. More than two third (69.5%) of the respondents indicated unlicensed motorcycle driving was not compliantly penalised in rural Kisumu. Over a third (52.7%) of them had the same perception about similar motorcycle offense in urban Kisumu.

Related to the same offense (MTO 2) in rural Kisumu a low arithmetic mean ($\bar{x}$ = 2.12) and less wide standard deviation (s= 1.40) were computed. Similar stats on urban Kisumu show that a less moderate mean static ($\bar{x}$ = 2.59) was generated with less dispersed standard deviation (s= 1.44). Thus, penalty of unlicensed motorcycle driving was less compliant in many parts of rural Kisumu County and was less relatively complaint in greater part of urban Kisumu.

Perception scores about MTO 3 in rural Kisumu show that 11.2% of the respondents strongly agreed, 9.4% agreed while 7.3% were neutral about whether reckless motorcycle driving was compliantly penalised by traffic authorities. On the other hand, 24.9% of the respondents disagreed and 47.2% strongly disagreed with the question. The scores on urban Kisumu shows that 13.7% of the respondents strongly agreed, 20.6% others agreed whereas

12.4% were neutral about the same question. In contrast, 21.5% of the respondents disagreed and 31.8% others strongly disagreed with that question. Almost three quarters (72.1%) of the respondents refuted the prospect that reckless motorcycle driving was compliantly penalised in rural Kisumu, and over three fifth (63.3%) of them had a same objection about similar traffic offense penalty in urban Kisumu.

The arithmetic mean generated on such traffic penalty (MTO 3) in rural Kisumu was low ($\bar{x}$ = 2.11) with less spread standard deviation (s = 1.37). Similar stats computed on urban Kisumu include a moderate mean perception ($\bar{x}$= 2.63) and less dispersed standard deviation (s= 1.45). The stats suggest that penalty of reckless motorcycle driving was less compliant in most of rural Kisumu and fairly compliant greater part of urban Kisumu.

More detailed account on the penalty of motorcycle traffic offenses in Kisumu County was generated from interviews and FGDs conducted. Interview findings indicate that three (03) informants strongly agreed and nine (09) others agreed that motorcycle traffic offences were effectively controlled by traffic managers (officers) in Kisumu County. Three (03) other informants remained neutral while nine (09) informants disagreed and the rest eight (08) strongly disagreed with that. When asked to clarity their perceptions, six (06) informants indicated that control of motorcycle traffic offenses was to large extent effective mainly in urban Kisumu and to some extent in rural areas. In support of this, one (01) informant said: "…...this is done by making sure that all riders meet requirements for them to be on the road".

Four (04) of the informants identified the offenses as over speeding, reckless riding, overloading, and unlicensed riding. They also reported that motorcycle riders including Boda-boda and Tuk-tuk could be charged or fined according to their offences through courts of law. With some reservations, five (05) of the informants indicated that though traffic officials endeavoured to curb offences of motorcycles they faced challenges of controlling riders. One (01) of the informants specified that motorcycle riders particularly of Boda-bodas were hostile. This was further reflected in the revelations of fifteen (15) informants who indicated that motorcycle riders were delicate to handle. An informant

explained that, "……this is because most of them have not undergone basic training to understand the law".

In addition, another informant said: "control of their road safety offenses is very frustrating since the motorcyclists don't stop whenever signalled to". According to three (03) informants, this task was hardly efficacious due to lack of enough traffic personnel to handle the motorcycle operators. In relation, an informant added that, "this was worse with feeder roads in rural areas where traffic officers are hardly found". Besides another informant noted that, "…. irrespective of urban or rural areas, most of motorcyclists operate during odd hours without reflector jackets, helmets and driving licence". In addition, two informants singled out corruption as one the major factors that frustrated the fight against motorcycle traffic offenses especially among Boda boda and Tuk-tuk.

Another informant cited the lack of political goodwill as another constraint to the control of motorcycle offenses. Also, noteworthy, an informant revealed that, "……motorcyclists use their large numbers to intimidate the traffic managers & get away with offences". Also according an informant, the traffic officers including the police were very hesitant to involve themselves with Boda-boda due to the aggressive behaviour of the riders. Two (02) informants justified their discontent by noting that rampant accidents suggest that Motorcycle offenses were not effectively controlled not only in rural but also urban areas including Kisumu County.

The findings gathered from focus group discussions show all the participants concurred that there was always restriction against motorcycle offenses in Kisumu County. The offenses specified by participants include like unlicensed riding, overloading, over speeding, reckless riding, and lack of safety implements. However, almost all the participants agreed that clamping down on such offenses was not equally done in all parts of the county. In fact, most of the participants noted that even in Kisumu City many such restrictions were limited to the CBD and so was to the central business areas of the rest of the towns in the county. In rural areas, some participants reported, the fight against some of the offenses was mainly done on the highways; over speeding, overloading, and lack of safety gadgets like helmets.

Three of the participants indicated that motorcycle or tricycle offense clampdown was very rare on rural access roads. In support of this some participants argued that on rural roads traffic managers rarely amounted checkpoints, were not enough and never shrewdly active compared to traffic regulation activity along the highways. Regarding the laxity in urban areas, a participant (KARA) said: “Boda Boda riders have a tendency of confining themselves to the outskirts of towns for fear of rigorous crackdown in the central business areas. A good example is Kisumu County and other major towns like Muhoroni, Ahero and Chemelil, among others”.

Participants indicated that while offending Boda bodas and Tuk-tuk could be fined or prosecuted for their offences, individual traffic officers were fond of using such punitive measures as a scare to ask for bribes from culprits. In addition, some participants noted that traffic officials faced challenges of controlling riders despite endeavours to curb motorcycle offences particularly in towns. It was reported that Boda boda operators were hostile, thus not simple to handle. Participants also revealed motorcycle offenses were common in many parts of Kisumu because most of the motorcyclists, particularly Boda bodas, operate during strange hours, when traffic managers are not expected on the roads.

Several participants also blamed failure in controlling motorcycle offenses partly on political interference. One of them said: “…politicians all over Kisumu have a tendency of using Boda boda and Tuk-tuk operators for political capital. They therefore tend to defend them even where they break the law, or it isn’t necessary!”. Participants generally agreed Boda bodas were synonymous with rampant road accidents in several parts of the county just because of insufficient clamp down on the offenses they commit. Most of offenses, it was noted, induce road fatality.

The research survey reports analysed above indicate that, though not enough in either territory, penalties against the offenses of study were more consistent in urban than rural areas. In rural Kisumu, penalty of reckless motorcycle driving was the least consistent followed by unlicensed driving and then motorcycle overloading. In urban Kisumu it was the reverse. Important to note, not enough was done by traffic authorities in either of the territories in Kisumu County; generally in rural Kisumu, penalty against motorcycle traffic

offenses was less compliant and in urban Kisumu, it was only fairly compliant with the law.

Average indices about quality of road traffic control

In this section, grand average indices ('Qltyrdtrfc') are presented to accurately show how quality of road traffic control was rated in this study. The indices were transformed from the constructs earlier specified; Traffic operation against DMC vehicles ('Topadmcs'), designated road sideways for fragile road users ('Rsdwfru'), enforcing vehicle basic safety requirements ('EnfVebsrq'), motorcycle basic safety requirements enforced ('EnfMvbsrq'), regulating vehicle safe driving ('rgltvsd'), penalty against vehicle traffic offenses ('Penasvetofs'), and penalising motorcycle traffic offenses ('Penlmotofs'). The indices are presented in the Table 4.34.

Table 4.34

Average indices on quality of road traffic control

Construct	Territory	N	Mean ($\bar{x}$)	Mode (M)	Std. Deviation (S)
5) Traffic operation against DMC vehicles ('Topadmcs')	Rural Kisumu	233	2.23	2.00	1.38
	Urban Kisumu	233	2.45	2.00	1.45
6) Road sideways designated for fragile road users ('Rsdwfru')	Rural Kisumu	233	2.02	2.00	1.12
	Urban Kisumu	233	2.39	2.00	1.09
7) Enforcing vehicle basic safety requirements ('EnfVebsrq')	Rural Kisumu	233	2.57	3.00	1.18
	Urban Kisumu	233	2.89	3.00	1.12
8) Motorcycle basic safety requirements enforced ('EnfMvbsrq')	Rural Kisumu	233	2.32	2.00	1.19
	Urban Kisumu	233	2.69	3.00	1.19
9) Regulating vehicle safe driving('rgltvsd')	Rural Kisumu	233	2.52	3.00	1.13
	Urban Kisumu	233	2.87	3.00	1.05
10)Penalty against vehicle traffic offenses ('Penasvetofs')	Rural Kisumu	233	2.40	2.00	1.23
	Urban Kisumu	233	2.81	3.00	1.19
11)Penalising motorcycle traffic offenses ('Penlmotofs')	Rural Kisumu	233	2.13	2.00	1.32
	Urban Kisumu	233	2.59	3.00	1.36
Grand Indices ('Qltyrdtrfc')	Rural Kisumu	233	2.31	2.00	1.02
	Urban Kisumu	233	2.67	3.00	0.98

Source: Descriptive statistics (2017)

According to Table 4.34, statistics on Construct 1 suggest that traffic operation against DMC vehicles ('Topadmcs') was poor in much of Kisumu County and particularly poorer in most of rural Kisumu. On Construct 2, the statistical results show that designation of road sideways for fragile road users ('Rsdwfru') was still enough in Kisumu County. It was much little in rural areas than urban areas.

Regarding construct 3, descriptive statistics about rural Kisumu a transformed into a less moderate arithmetic mean ($\bar{x}$ = 2.57) and a small standard deviation (S = 1.18). The indices about urban Kisumu indicate that a moderate arithmetic mean ($\bar{x}$ = 2.89) and smaller standard deviation (S = 1.12) were generated from a similar transformation. The indices thus suggest that enforcement of vehicle basic safety requirements of study was less relatively effective in most of rural Kisumu and fairly effective in much of urban Kisumu. Nonetheless, the enforcement of was not enough in the county.

About construct 4, the indices transformed from individual descriptive stats about rural Kisumu show that a low arithmetic mean ($\bar{x}$= 2.32) was generated with small standard deviation (S= 1.19). Of the indices about urban Kisumu, a less moderate mean ($\bar{x}$= 2.69) and similarly small standard deviation (S= 1.19) were computed. These statistical results imply that enforcement of the motorcycle basic safety requirements investigated was less effectively in most of rural areas and less fairly effective in much of urban areas of Kisumu County. Despite the territorial variation, the enforcement of such traffic requirements was not enough even in urban Kisumu; there was still a lot to do in the county as a whole.

Indices about construct 5 show that for rural Kisumu, a less moderated grand arithmetic mean ($\bar{x}$) of 2.52 and smaller standard deviation (S= 1.13) were computed. Related indices about urban Kisumu indicate that a moderate average mean ($\bar{x}$) of 2.87 and similarly smaller standard deviation (S) of 1.05 were generated. In view of these statistics, the four traffic regulation mechanisms were less relatively used in most rural Kisumu and more fairly used in much of urban Kisumu for control of vehicle speed and safe driving. Generally, regulation of vehicle speed and safe driving was less relative in rural areas and fairly sufficient in urban areas of Kisumu County.

The average indices about penalty against vehicle traffic offences in rural Kisumu show that a low arithmetic mean ($\bar{x}$) of 2.40 was transformed from respective descriptive statistics with a small standard deviation (S) of 1.23. The indices about the same construct in urban Kisumu include a moderate arithmetic mean ($\bar{x}$ = 2.81) and smaller standard deviation (S = 1.19). This implies that penalising vehicle offenses of study was less consistent in most of rural Kisumu and fairly consistent in much of urban Kisumu. The average indices connote, more was done to chastise vehicle traffic offenses in urban areas than rural areas in Kisumu County. The overall observation was however traffic authorities in either territory were not strict enough on all the vehicle offenses investigated; none was consistently penalised throughout the county despite some lead in urban areas.

The average indices computed about anti motorcycle offense penalty in rural Kisumu include a low arithmetic mean ($\bar{x}$) of 2.13and less spread standard deviation (S) of 1.32. Similar indices on urban Kisumu comprise a less moderate mean ($\bar{x}$) of 2.59 and less strewn standard deviation of 1.36. The indices imply that penalties against motorcycle traffic offenses were less compliant in most of rural Kisumu and less relatively compliant in greater part of urban Kisumu. Accordingly motorcycle offenses investigated were not sufficiently penalised in both urban and rural areas of Kisumu County but it was better in the former. Penalty against the offenses of study was fairly consistent in urban and less consistent in rural Kisumu.

Grand average indices about rural Kisumu generated into a low grand arithmetic mean ($\bar{x}$ = 2.31) and small standard deviation (S = 1.02). Similar indices on urban Kisumu transformed into a less moderate mean ($\bar{x}$ = 2.67) and smaller standard deviation (S=0.98). The grand indices imply that, road traffic control was less efficacious in most rural areas and fairly efficacious in urban areas of Kisumu County. Though it was better in urban Kisumu, generally control of road traffic in the whole county was not enough. It was very poor in rural areas and significantly discrepant in urban.

Of all the constructs used to describe road traffic control in Kisumu county, in rural areas only enforcement of vehicle basic safety requirements followed by regulation of vehicle speed and safe driving were fairly efficacious, in fact less fairly efficacious. The rest were

less efficacious with the least being designation of road sideways for fragile users, then penalising motorcycle traffic offenses, restricting DMC vehicles, enforcing motorcycle basic safety requirements and penalty of vehicle traffic offenses.

In urban areas, none of these control practices was highly efficacious either, though most of them were better than rural practice. The designation of road sideways for fragile users was less and the least efficacious followed by restriction of DMC vehicles, also less efficacious. The rest were fairly efficacious led by regulation of vehicle speed and safe driving as the most active, followed by enforcing vehicle basic safety requirements, then penalty of vehicle traffic offenses, enforcing motorcycle basic safety requirements, and lastly penalty of motorcycle traffic offenses.

4.3.3.2 Bivariate analysis: Association of efficacy of traffic control and level of road safety

The analysis in this section measured the significance of traffic control on road safety in rural and urban Kisumu County, respectively. Pearson's Correlation Coefficient test was used for this purpose. The results generated are summarised in Table 4.35.

Table 4.35

Bivariate Pearson's correlation between the efficacy of traffic control and level of road safety in Kisumu County

			Level of Road Safety
Efficacy of traffic control	Rural Kisumu	Pearson Correlation	.682**
		Sig. (2-tailed)	.000
		N	229
	Urban Kisumu	Pearson Correlation	.695**
		Sig. (2-tailed)	.000
		N	230

Source: Field research (2018)

The results show that at $r = 0.68^{**}$, efficacy of traffic control in rural Kisumu had a positively strong significance on road safety. Similarly, the efficacy of traffic control in urban Kisumu was positively and strongly significant on road safety at $r = 0.695^{**}$. At $p <$ 0.001, the association of traffic control with road safety in both rural and urban Kisumu was significantly different from zero (0). Therefore, there was a linearly significant

correlation (H_A) between the traffic control and road safety in rural and urban areas of Kisumu County, respectively.

4.3.3.3 Multivariate analysis: effect of traffic control on road safety

The analysis in this section measures the contribution of traffic control to road safety and how each of the practices (constructs) of such control predicts the level of road safety in rural and urban areas of Kisumu County. This was generated from multiple regression analysis. The model summary about the contribution traffic control is indicated in Table 4.36.

Table 4.36

Model Summary

Territory	Model	R	R Square	Adjusted R Square
RK	1	.713[a]	.508	.492
UK	1	.749[a]	.562	.548

a. Predictors: (Constant), Restricting DMC vehicles, Designation of road sideways, Enforcing vehicle basic safety requirements, Enforcing Motorbike safety requirements, Regulation of vehicle speed and safe driving, Penalty of Vehicle & motorcycle traffic offenses traffic offenses

Table 4.24 shows that at statistic $R^2 = 0.508$ traffic Control in rural Kisumu predicted 50.8% of road safety, and at $R^2 = 0.562$ such control in urban Kisumu predicted 56.2% of road safety. The rest of road safety in rural (49.2%) and urban (43.8%) Kisumu could be dues to other factors of traffic management.

The regression results about multiple traffic control factors in Rural Kisumu are presented in Table 4.37.

Table 4.37

Regression coefficients

Model		Unstandardized Coefficients		Standardized Coefficients
		B	Std. Error	Beta
1	(Constant)	.971	.110	
	Restricting DMC vehicles	.018	.043	.029
	Designation of road sideways for fragile users	.184	.053	.239
	Enforcing vehicle basic safety requirements	.205	.058	.278
	Enforcing Motorcycle basic safety requirements	.017	.060	.024
	Regulation of vehicle speed and safe driving	.219	.056	.286
	Penalising vehicle traffic offenses	.054	.072	.077
	Penalising of motorcycle traffic offenses	.043	.059	.066

b. Dependent Variable: Level of Road Safety in rural Kisumu

Source: Field research (2018)

The results in Table 4.37 were generated based on equation $Y= \beta o+ \beta_1X_1+ \beta_2X+ \beta_3X_3+ \beta_4{}^{X}4+\beta_5{}^{X}5+\beta_6{}^{X}6+\beta_7{}^{X}7+^{\varepsilon}$. The equation was used to determine how much each of the factors of traffic control (precursors of independent variables) predicted a change in road safety (criterion or dependent variable). The equation was applied as follows:

$$Y= 0.971+ 0.018X_1+0.184X_2+0.205X_3+0.017X_4+0.219X_5+0.054X_6+0.043X_7$$

The equation above shows that taking all the seven factors (independents) to be zero, the level of road safety was 0.971 (Constant). It also indicates that other independent variables being zero, a unit increase in restricting DMC vehicles led to a 0.018 increase in road safety; a unit increase in road sideways for fragile users led to a 0.184 increase in road safety; a unit increase in enforcing vehicle basic safety requirements led to a 0.205 increase in road safety, and a unit increase in enforcing motorcycle basic safety requirements led to 0.017increase in road safety in rural areas of Kisumu County. It further demonstrates that a unit increase in regulation of vehicle speed and safe driving led to 0.219 increase in road safety, a unit increase in consistency of penalty against vehicle offenses led to 0.054 increase in road safety and that a unit increase in compliancy of penalty against motorcycle offenses led to 0.043 increase in road safety in such rural areas.

The statistical equation indicates that of all the traffic control factors above regulation of vehicle speed and safe driving (0.219) contributed most to road safety, followed by enforcement of vehicle basic safety requirements (0.205), then designation of road sideways for fragile users (0.184), consistency in penalty of vehicle offenses (0.054), compliancy in penalty of motorcycle offenses (0.043), restriction of DMC vehicles (0.018),and lastly enforcement of motorcycle basic safety requirements (0.017).

It is inferred from the Standardized Coefficients; Beta statistics that regulation of vehicle speed and safe driving (0.286) was the most important traffic control factor in rural Kisumu, followed by enforcement of vehicle basic safety requirements (0.278), designation of road sideways for fragile users (0.239), penalty of vehicle offenses (0.077), penalty of motorcycle offenses (0.066), restriction of DMC vehicles (0.029) and then enforcement of motorcycle basic safety requirements (0.024).

The results of regression analysis of traffic specific control parameters and road safety in Urban Kisumu County are summarised in Table 4.38:

Table 4.38

Regression coefficients

Model		Unstandardized Coefficients		Standardized Coefficients
		B	Std. Error	Beta
1	(Constant)	.874	.116	
	Restricting DMC vehicles	.026	.034	.047
	Designation of road sideways for fragile users	.310	.040	.419
	Enforcing vehicle basic safety requirements	.097	.055	.135
	Enforcing Motorcycle basic safety requirements	.005	.053	.007
	Regulation of vehicle speed and safe driving	.140	.055	.181
	Penalising vehicle traffic offenses	.094	.065	.139
	Penalising of motorcycle traffic offenses	.005	.049	.008

b. Dependent Variable: Level of Road Safety in urban Kisumu

Source: Field research (2018)

The multiple regression results in Table 4.38 were generated based on a similar equation: $Y= \beta o+ \beta_1X_1+ \beta_2X+ \beta_3X_3+ \beta_4X_4+\beta_5X_5+\beta_6X_6+\beta_7X_7+\varepsilon$.The equation was suitable for determining how much each of the factors of traffic control (independent variables)

specified in the table predicted a change in road safety (dependent variable). The equation was applied as follows:

$Y= 0.874+ 0.026X_1+0.310X_2+0.097X_3+0.05X_4+0.140X_5+0.094X_6+0.005X_7$

The equation above indicates that all the seven factors of traffic control (independents) being zero, the level of road safety was 0.874 (Constant). It also shows that taking other independent variables to be zero, a unit increase in restriction of DMC vehicles led to a 0.026 increase in road safety; a unit increase in road sideways for fragile users led to a 0.310 increase in road safety; a unit increase in enforcing vehicle basic safety requirements led to a 0.097 increase in road safety, and a unit increase in enforcing motorcycle basic safety requirements led to 0.005 increase in road safety in urban Kisumu. Furthermore, a unit increase in regulation of vehicle speed and safe driving led to 0.140 increase in road safety, a unit increase in consistency of penalty against vehicle offenses led to 0.094 increase in road safety and that a unit increase in compliancy of penalty against motorcycle offenses led to 0.005 increase in road safety in such urban areas of the county.

The statistical equation implies that of among the traffic control factors of study designation of road sideways for fragile users (0.310) contributed most to road safety, followed by regulation of vehicle speed and safe driving (0.140), then enforcement of vehicle basic safety requirements (0.097), consistency of penalty against vehicle offenses (0.094), restriction of DMC vehicles (0.026), enforcement of motorcycle basic safety requirements (0.005), and lastly compliancy in penalty of motorcycle offenses (0.005).

It is also inferred from the Standardized Coefficients; Beta statistics that designation of road sideways for fragile users (0.419) was the most important traffic control factor in urban Kisumu, followed by regulation of vehicle speed and safe driving (0.181), then consistency of penalty against vehicle offenses (0.139), enforcing vehicle basic safety requirements (0.135), restriction of DMC vehicles (0.047), compliancy in penalty of motorcycle offenses (0.008) and enforcement of motorcycle basic safety requirements (0.007).

Correlation and regression analyses above point to one thing; traffic control factors specified above were significant for improved road safety in rural and urban areas of

Kisumu County. Improvement in each of them potentially increased the level of road safety and vice versa. In that case, the related null hypothesis (H_O) was rejected. Traffic control significantly influenced road safety in Kisumu County.

4.3.4 Grand Multivariate analysis

This section covers the main multivariate analysis results of the grand multiple regression analyses. The analyses were made to determine the extent road safety was predicted by traffic management and specifically its main factors conceptualised in this study as road traffic information, driver support and road traffic control. The related regression results about Rural Kisumu are summarised in Tables 4.39-41.

Table 4.39

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.711[a]	.505	.498	.615

a. Predictors: (Constant), Sufficiency of road traffic information, Sufficiency of driver support, Efficacy of road traffic control in rural Kisumu

The R^2 in Table 4.39 shows that traffic management (independent variable) in rural Kisumu predicted 50.5% of road safety. Road traffic management in this study was measured as road traffic information and driver support as well as road traffic control.

This result means, other factors not researched contributed 49.5% of the road safety. As such, further research should be conducted to ascertain more determinants (49.5%) of road safety in rural areas of Kisumu County.

Table 4.40

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	85.565	3	28.522	75.451	.000[a]
	Residual	83.919	222	.378		
	Total	169.484	225			

a. Predictors: (Constant), Sufficiency of road traffic information, Sufficiency of driver support, Efficacy of road traffic control

b. Dependent Variable: Level of Road Safety in Rural Kisumu

Source: Field research (2018)

Based on Table 4.40, the significance (*p*) value of 0.000 (< 0.05) suggests that road traffic management was statistically significant in predicting the level of road safety in rural Kisumu. The calculated F value (75.451) shows that the overall model was significant.

Table 4.41

Regression coefficients

Model		Unstandardized Coefficients		Standardized Coefficients			95% Confidence Interval for B	
		B	Std. Error	Beta	t	Sig.	Lower Bound	Upper Bound
1	(Constant)	.660	.144		4.566	.000	.375	.944
	Sufficiency of road traffic information	.154	.064	.159	2.428	.016	.029	.280
	Sufficiency of driver support	.244	.076	.208	3.200	.002	.094	.395
	Efficacy of road traffic control	.370	.060	.433	6.176	.000	.252	.488

a. Dependent Variable: Level of Road Safety in Rural Kisumu

Source: Field research (2018)

The results in Table 4.41 were generated based on equation $Y= \beta o+ \beta_1X_1+ \beta_2X+ \beta_3X_3+ \varepsilon$. The equation was used to determine how much each of the factors of road traffic management (precursors or independent variables) predicted a change in road safety (dependent variable) in rural Kisumu. The equation was applied as follows:

$$Y= 0.660+ 0.154X_1+ 0.244X_2+ 0.370X_3$$

This equation application shows that taking all the three independent variables to be zero, the level of road safety was 0.660 (Constant). It also shows that other independent variables held to be zero, a unit increase in road traffic information led to a 0.154 increase in road safety; a unit increase in driver support led to a 0.244 increase in road safety and a unit increase in the efficacy of road traffic control led to a 0.370 increase in road safety in rural areas of Kisumu County. .

The equation indicates that the efficacy of road traffic control (0.370) contributed most to road safety, followed by driver support (0.244), and then road traffic information (0.154). It was inferred from the Standardized Coefficients; Beta statistics that efficacy of road traffic control (0.433) was the most important factor, followed by driver support (0.208), and then road traffic information (0.159).

At 95% level of confidence and 5% level of significance, road traffic info had a *p*-vale of 0.016, driver support $p = 0.002$, and road traffic control had $p = 0.000$. All the three factor variables were statistically significant because $p < 0.05$.

According to the results above, all the road traffic management factors of study significantly predicted road safety in rural Kisumu. Bearing in mind the descriptive reports presented earlier, practices associated with the three factors were nonetheless not sufficient. Thus, because they were inadequate and yet significantly predictive more was required of them for better rural road safety led by road traffic information ($\overline{x} = 2.23$), then road traffic control ($\overline{x} = 2.30$), and driver support ($\overline{x} = 2.44$).

Similar regression analysis results about Urban Kisumu are presented in Tables 4.42-44.

Table 4.42

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.753[a]	.567	.561	.535

a. Predictors: (Constant), Sufficiency of road traffic information, Sufficiency of driver support, Efficacy of road traffic control in Urban Kisumu

Source: Field research (2018)

The R^2 in Table 4.42 shows that traffic management in urban Kisumu predicted 56.7% of road safety in urban Kisumu. Road traffic management covers road traffic information and driver support as well as road traffic control. That means, other factors contributed 43.3% of the road safety. As such, further research should be conducted to ascertain more factors (43.3%) influencing road safety in urban areas of Kisumu County.

Table 4.43

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	83.543	3	27.848	97.230	.000[a]
	Residual	63.869	223	.286		
	Total	147.412	226			

a. Predictors: (Constant), Sufficiency of road traffic information, Sufficiency of driver support, Efficacy of road traffic control

b. Dependent Variable: Level of Road Safety in Urban Kisumu

Source: Field research (2018)

According to results in Table 4.43, the *p*- value of 0.000 (<0.05) suggests that road traffic management was statistically significant in predicting the level of road safety in urban Kisumu. The calculated F value (97.230) shows that the overall model was significant.

Table 4.44

Regression coefficients

Model		Unstandardized Coefficients		Standardized Coefficients			95% Confidence Interval for B	
		B	Std. Error	Beta	t	Sig.	Lower Bound	Upper Bound
1	(Constant)	.549	.133		4.118	.000	.286	.811
	Sufficiency of road traffic information	.167	.055	.198	3.042	.003	.059	.275
	Sufficiency of driver support	.296	.064	.281	4.628	.000	.170	.423
	Efficacy of road traffic control	.308	.055	.375	5.595	.000	.200	.417

a. Dependent Variable: Level of Road Safety in Urban Kisumu

Source: Field research (2018)

The results in Table 4.44 were also generated along equation $Y= \beta o+ \beta_1X_1+ \beta_2X+ \beta_3X_3+ \varepsilon$. The equation was adopted to determine how much each of the factors of road traffic management predicted a change in road safety in urban Kisumu. The equation was applied as follows:

$$Y= 0.549+ 0.167X_1+ 0.296X_2+ 0.308X_3$$

Application of the equation shows that holding all the three independents at zero, the level of road safety was 0.549 (Constant). It also shows that other independent variables being zero, a unit increase in road traffic information led to a 0.167 increase in road safety; a unit increase in driver support led to a 0.296 increase in road safety and a unit increase in the efficacy of road traffic control led to a 0.308 increase in road safety in urban areas of Kisumu County. .

The equation indicates that road traffic control (0.308) contributed most to road safety, followed by driver support (0.296), and then road traffic information (0.167). It was inferred from the Standardized Coefficients; Beta statistics that efficacy of road traffic control (0.375) was the most important factor, followed by driver support (0.281), and then

road traffic information (0.198). At 95% level of confidence and 5% level of significance, road traffic info had a p - vale of 0.003, driver support $p = 0.000$, and road traffic control had $p = 0.000$. All the three factors were statistically significant since $p < 0.05$.

The regression results above imply that the road traffic management factors of study were significantly predictive on road safety in urban Kisumu. A review of the descriptive reports earlier presented reveals that all the three factors in urban Kisumu were only moderately sufficient meaning that they were not enough. In that case, since they were significantly predictive more was required for better urban road safety led by road driver support ($\overline{x} = 2.63$), then road traffic control ($\overline{x} = 2.68$), and then road traffic information ($\overline{x} = 2.86$).

According to the bivariate and multivariate inferential analysis above, sufficient road traffic information, driver support and traffic control were all significant for improved road safety in rural and urban areas of Kisumu County. Much more of these factors was needed to bolster road safety in rural areas that lagged behind urban areas in the county.

4.4 Proposed road safety model

As a result of inferential research results above, this study proposed a new road safety model dubbed, “McOpiyo road traffic safety model (McORTSM)”. The model builds on the research model adopted to guide the research process of this very study. While the research model demonstrated how road safety measures influence intermediate safety performance indicators and final road safety outcomes, the proposed model presents a more informed, applied and explicit policy-outcome relationship as illustrated in Figure 4.15.

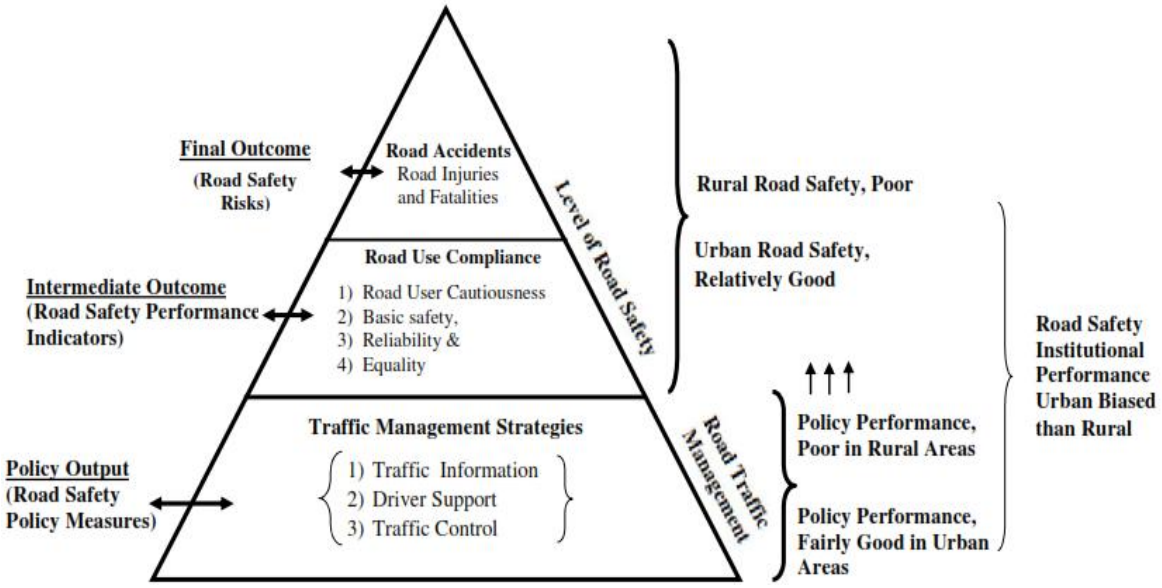


Figure 4.15. McOpiyo's road traffic safety model (McORTSM)

According to the above the proposed model introduces in an explicit fashion a new version of road safety policy implementation that can be useful for sustainable road safety through strategies of traffic management identified. Than ever before, the strategies were well specified, investigated and used to explain the level of road safety. They include traffic information, driver support and traffic control. The model positions these traffic management factors as reliable road safety policy measures that can be valuable for addressing any mishaps in road safety. This is because they can positively and significantly propel road use compliance and help reduce road injuries and fatalities. In Kisumu County for example, each of the measures significantly predicted a change in road safety and they were all rated as key road safety interventions. With these insights, the proposed McOpiyo Model is a justifiable supplement to the research model and the Target hierarchy model from which the adopted model was drawn. Unlike the previous models, McOpiyo Model is road safety specific and explicit based on a contextually practical road use experience.

CHAPTER FIVE

DISCUSSION OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.0 Introduction

This chapter presents a discussion of findings, conclusions and recommendations of the study. The three sections were coherently structured in a fashion consistent with the research objectives.

5.1 Discussion of Findings

This section covers discussion of findings, hypothesis by hypothesis, in the precincts of the research objectives.

5.1.1 Traffic information and road safety

In the hypothesis about this section, it was stated that traffic information does not significantly influence road safety in Kisumu County. To verify the hypothesis, the variable of traffic information was broken down into the following explicit variables or constructs along which its influence on the level of road safety was analysed. One of the constructs concerns availability of road signages, and others include sensitization of school children on road use, provision of road use guidelines and issuance of warnings ahead of dangerous road scenes and/or spots. The null hypothesis was however rejected. There was a linearly positive association between traffic information and road safety in the county as implied in the study findings. This realisation corroborates the observation in Arnau-Sabatés *et al.* (2013), with which it was acknowledged that knowledge of traffic conditions and controls was a pertinent determinant of road safety. This conforms to the actively caring model of total culture theory which recommends such proactive interventions such as the traffic information factors are critical for road safety (Rakowska, & Szubielska, 2013). According to theory, traffic information was entirely proactive because of its potentially preventive role of potential road use risks.

This association was consistently defined by the sufficiency of traffic information which varied between territories in the County. The findings show that traffic information was generally inadequate in most rural areas and fairly sufficient in urban areas of Kisumu County. Even in Urban Kisumu, it was not enough and it should have been sufficient either

way! Traffic information differentials between rural and urban Kisumu contrast what Aarts and Wegman (2010) noted about equality of territorial road safety controls. Although the two areas cannot be mutually the same, according to Aarts and Wegman, any traffic management practices including traffic information should be appropriately adopted to ensure road safety anywhere. Besides, any traffic information discrepancies noticed even in urban Kisumu diverged from expectation because in McMahon, (2010), it was pointed out, that road safety is a human right to everyone. The rural-urban Kisumu situation was specifically mirrored in the performance of each of the constructs of traffic information.

Findings on road signage, perhaps one of the most fundamental components of traffic information, indicate that key signages in rural areas of Kisumu County were not sufficient; they were far from being enough. In urban areas of the county, such traffic signages were largely fairly sufficient. They were relatively provided for most urban roads. A part from such sufficiency gaps, the signages in each of the territories in Kisumu County were not equally available. In rural Kisumu, zebra crossings were the least noticed of the signages of study, followed by children crossing signs, then parking signs, route signs, road gradient signs, road lane markings, speed reduction signs and hump signs.

In the case of urban Kisumu, the most noticed was road lane marks, then hump signs, followed by parking signs, route signs, zebra crossings, children crossing signs, speed reduction signs, and road gradient signs. First, sufficiency gaps associated with individual signages whether in rural or urban areas of Kisumu County were a breach of best practice recommended in Ezeibe et al. (2017). It was recommended that any road signage deemed essential should be adequately provided in relation to the traffic needs of road users to ensure road safety. Secondly, the inequality between signages reflected in either territories of rural and urban Kisumu were not necessary according to the UK Department of Transport (2013). This is because there should not be a compromise between signages, for each signage has an essential and yet complementary benefit for comprehensive traffic information.

Given the insufficiency of such road signages in rural Kisumu, the findings indicate that the signages were significant for improving road safety in that side of Kisumu County. In

fact, it was verified that a unit increase in such road signages, altogether, led to a 0.133 increase in road safety. It was also realized that, of the traffic information strategies investigated, road signages were the second most contributor (at 0.133) to the plight of road safety. They were therefore the second most important (at 0.147) and required determinant of the much-needed road safety in such rural areas of Kisumu County. In urban Kisumu, the study findings show, a unit increase in similar road signages led to a 0.226 increase in road safety. They contributed most (0.226) to road safety deficiency but were second most important and needed factor (0.291) of all the traffic information variables of study in that part of Kisumu County. The implications of road signages on road safety in rural and urban Kisumu uphold an earlier finding in Manyara, (2016) about road fatality, death and economic costs. Although the current study was specifically for Kisumu County and necessary for microanalysis, Manyara, had identified road signages as one of Kenya's prominent causes of road accidents both urban and rural areas of the country.

About school child sensitisation on road use, evidence shows, the level at which it was provided was low in rural areas and moderate in urban areas of Kisumu County. It should also be noted that in both rural and urban Kisumu, the print media was the least used of the three child awareness methods adopted for that purpose followed by electronic media and then school-based education. Irrespective of the differing levels of school child sensitisation, the findings suggest that there was still need for much more in the two territories, including Kisumu City supposedly a leading urban centre in the county. It should have been enough in either territory just as recommended in Mirza and Seema (2013) due to high vulnerability of the school child. Mirza and Seema identify school children as one of the high risk road users whose road traffic awareness was paramount for reducing incidences of child road accidents.

In rural areas of Kisumu County, the use of such methods defined road safety contribution of such child awareness. The study results revealed the following: a unit increase in school children road use sensitisation led to a 0.318 increase in road safety. This traffic information strategy was equally a significant factor because its insufficiency contributed most (0.318) to the road safety situation in that rural territory. It was accordingly the most important (0.403) and required of the survey factors of traffic information to boost road

safety in rural Kisumu. In urban Kisumu, the level of school child traffic awareness was also responsible for the road safety needs among school goers especially the young. There was such a significant relationship that a unit increase in school child traffic sensitisation led to a 0.207 increase in road safety in urban Kisumu. The traffic information practice in the case of urban areas contributed second most (0.207) to road safety behind road signages. The strategy was however was the most important (0.299) and the second most required factor considering the boost it would cause to child road safety it was improved. The effect of school child sensitization in rural and urban Kisumu corresponds with Swami, Puri & Bhatia (2006) findings, though conversely. His study underscores the significance of child awareness about road safety; children vulnerability to accidents had reduced as a result of increased traffic sensitisation of the child, especially school children.

Road traffic guidance information investigated in this study included information on traffic guidelines or regulations and warnings on dangerous traffic spots. The findings show that such information was rarely provided in rural areas and less consistently conveyed in urban areas of Kisumu County. Of the two informative advisories, basic traffic guidelines were in both rural and urban Kisumu rarely provided compared to road use warning against likely road threats, which apparently was relatively consistent. Traffic guidelines enshrined in Kenya's road transport policy were comparable to India's policy reported in Bhargavi and Kannaiya (2011), however the findings connote that Kenya could be lagging behind with regard to public awareness about the policy. This disparity can be evidenced by facts about Kenya's Kisumu County compared to India's Tamilnad about which Bhargavi and Kannaiya report that such awareness was vigorously provided to curtail losses of life and resources from road accidents. The difference between levels of public awareness on traffic guidelines and warnings about dangerous traffic spots reported in Kisumu cannot be surprising if assertions from Harun (2015) and Ezeibe et al. (2017) are to go by. Harun notes that traffic guidelines are usually not sufficiently educated to the road users because they are a routine requirement and thus demanding for road use. On the other hand, warnings about traffic threats ahead of road users are according to Ezeibe et al., accessional; they are given especially after there is an accident or undesirable incidence or event on the road.

In rural Kisumu, the two traffic directions, altogether, significantly constrained road safety. Because of this, findings reveal that a unit increase in the consistency of such traffic guidance information led to a 0.091 increase in road safety in that part of the county. In relation to this, results show, traffic guidance information was the least contributor (0.091) to the road safety discrepancy, was the least important (0.121) and least required of all the practices traffic information in rural Kisumu. Similar traffic guidance in urban Kisumu, was unlike in rural areas significantly enabling as regards road safety despite need for improvement. In relation, findings show, a unit increase in such traffic guidance information led to a 0.108 increase in road safety in such urban territories of the County. It was also learnt that the road traffic guidance information contributed the least (0.108) to the road safety plight and was the least important (0.162) and required factor to behind road signages and school children traffic awareness. The impact of providing traffic guidelines and warnings on the plight of Kisumu's road safety was not as enormous as road signages and school child sensitisation. Nonetheless, public awareness gaps on such guidance were equally significant to warrant equally significant improvement from road traffic managers as recommended in Manyara (2016).

Pearson's Correlation Coefficient Analysis results indicated that road traffic information practices specified above significantly and moderately influenced road safety in rural Kisumu at $r = 0.570$ and in urban Kisumu at $r = 0.635^{**}$, respectively. At $p < 0.001$, this influence in either territories of Kisumu County was significantly different from zero (0) contrary to the null hypotheses. Once again, in Kisumu County, areas provided with more traffic information had a higher level of road safety. The reverse was correct. This corresponds to assertions in Aarts and Wegman (2010) and Arnau-Sabatés *et al.* (2013), which emphasise the importance of traffic information due to the influence it enjoys on road safety promotion.

As one of the traffic management practices, a unit increase in road traffic information led to an increase in road safety of 0.154 in rural Kisumu and 0.167 in urban Kisumu. It was also learnt that the practice contributed the least to road safety deaths in rural Kisumu (0.154) and urban Kisumu (0.167). In the same disposition, traffic information was equally the least important in rural Kisumu (0.159) and urban Kisumu (0.198). In that case, due to

its level of availability, traffic information was the least required factor in either territories of Kisumu County behind traffic control and driver support in that order. Traffic information could have been the least required among traffic managing needs in Kisumu County, but according to previous research by Manyara, (2016), public road use guidance and awareness should not lack even a bit due to its incomparable value in empowering the road user with proactive ability to cautiously navigate road safety dynamics. That according to Manyara, is what Kenya needed most to combat road traffic fatality and the costs involved.

5.1.2 Driver support and road safety

Hypothesis Two stated that, "driver support does not affect road safety in Kisumu County". Driver support was also broken down into the following explicit variables or constructs to verify the hypothesis; quality of driving schools for road use training, supportive vehicle safety gadgets, training of boda boda riders on road use, and maintenance of roads to save drivers from accidents. It is along these constructs that the effect of driver support on the level of road safety was ascertained. This was motivated by the behavioural theory (Aubrey, 2015) and the actively caring model (Cole et al, 2013). Driver support was considered as an intervention, a motivation, scientific application and therefore as principle of the behavioural theory with which drivers were expected to behave in a desirably safe manner once well supported. In the actively caring sense, such support was perceived and thus investigated as a proactive action supposed to help prevent any road safety risk.

The effect of driver support on road safety in both rural and urban Kisumu County was, according to the study findings, also defined by availability of the forms in which it was investigated. Of these forms, only driving schools were sufficiently good in the county. Road maintenance was relatively consistent in urban and less consistent in rural areas of the county. Vehicle safety gadgets and motorcycle training were less sufficient in both rural and urban Kisumu. Road maintenance discrepancies that were reported in any part of Kisumu County contrasts best practice reflected in Gichaga (2016). Best practice according to Gichaga, requires consistency in keeping roads free from infrastructural breaches that can induce traffic risks. Regarding vehicle safety gadgets, any insufficiencies reported in the county breached recommendations from previous research (Truls et al., 2012) although

what was widely perceived as recent safety gadgets had been reported to be largely lacking in much of the developing world (Tanya, 2017). Motorcycle training gaps common in most Kisumu County corroborates experiences reported by Moraa (2016) about Kenya as a whole. This confirms that steps had not been taken to curb such a vice of unqualified cycling in societies, especially in the development, that have in the recent times increasingly adopted motorcycle transport commonly known as Boda boda as a prominent alternative for youth employment.

Vehicle safety gadgets included the recent and old on Kenya's market. Old vehicle gadgets, namely seat- belt locks, maximum speed governors and anti-fatality air bag, were not as rare as the recent gadgets. All the recent vehicle safety gadgets investigated were rare in Kisumu County. The rarest gadget was the fatigue warning system, followed by adaptive cruise control system, then alcolock, electronic stability control, lane keeping assist and intelligent speed adaptor. Nonetheless, it is worth noting that the old gadgets were also not enough; they were widely known in Kisumu County but not well fitted in most of the vehicles. Lack of adoption of the so called recent vehicle safety gadgets widely reported in Kisumu County was not surprising, and validates reports in EU's (2006) Barometer that such gadgets were costly and perceived distractive and thus, had not been widely introduced on the automobile markets of most of Sub-Saharan Africa. As for the perceivably old safety gadgets, any inconsistencies associated and observed among most of the vehicles in rural Kisumu confirm earlier discontents noticed in previous research (Girma, 2013), which reported that such incompliances were common in much of Africa due to deliberate habit of vehicle owners and operators.

Specifically, study results indicated that driving schools were reported to be the only driver support that was largely good of the associated practices investigated in Kisumu County. Most of the driving schools especially located in Kisumu City were good enough for reliable driver road used training. This is consistent with Chitere (2014) reports that Kenya was commended in East and Central Africa as a good example for model driving schools, due to which Kenya's trained drivers were unparalleled from the region on the international labour market.

Although majority of the driving schools were located in Kisumu City, they served almost the entire county in rural areas. Due to their commendable quality, the findings suggest they could not be blamed for the road safety dilemma in the county. In fact, statistics show that a unit increase in the quality of driving schools led to an increase in road safety of 0.061 in rural Kisumu and 0.045 in urban Kisumu. The schools contributed the least to the road safety impasse in the County compared the rest of drivers support factors of research. Quality of such schools was the least important factor in rural areas (at 0.074), and urban areas (0.059). It should be noted though, that driving schools enhanced road safety in urban Kisumu than rural areas. Despite the widely commendable quality of driving schools in Kisumu County, that alone could not deter the road safety risks and indeed rising road fatality in the county particularly in rural areas. In fact, similarly to the current research, a study by Chitere (2014) had also pointed out that reckless driving in Nairobi County could to some extent be attributed to poor training or unqualified drivers that had shunned proper driver schooling most especially from rural areas.

Findings on the recent vehicle safety gadgets investigated show that they were all rare in Kisumu County. The rarest gadget was the fatigue warning system, followed by adaptive cruise control system, then alcolock, electronic stability control, lane keeping assist and intelligent speed adaptor. Applicability of these gadgets was now well-known after this study than previously despite Truls, Terje and Rune's (2012) research report that had shed light on such ostensibly recent gadgets. Nonetheless, related inconsistencies in Kisumu County were contrary to Norway's experiences reported in Truls, Terje and Rune, (2012). Their study indicated that such automatic driver support systems were adequately used to reduce the number of fatalities in the country.

Old vehicle safety gadgets investigated, though not as rare as the recent and mostly automatic gadgets, were also not enough. The old safety gadgets were widely known in Kisumu County but not well fitted in most of the vehicles, especially rural bound and public vehicles in the county. It was reported that anti-fatality air bag was the rarest of all in public vehicles in both rural and urban Kisumu. It was only common in private vehicles but not well fitted though. Maximum speed governors were more common with public vehicles but not well fitted in many of them. Seat- belt locks were common in both private and

public vehicles but were well fitted mainly in the former than the latter. It should also be noted that rural areas lagged behind urban counterparts in the county even with the old safety gadgets. These realisations echo what had been reported by Girma, (2013) on the commonality of such old vehicle safety gadgets. According to Girma, in Africa gadgets like airbag were not so common with public vehicles or old models even among private vehicles. Also safety gadgets were never largely respected on the continent especially in rural areas due to poor regulation in such remote parts of the country.

Vehicle safety gadgets affected road safety in the county depending on their sufficiency levels. Research results show that a unit increase in the use of vehicle safety gadgets led to an increase in road safety of 0.458 in rural areas and 0.293 in urban areas of Kisumu County. They contributed most to the road safety wishes in rural Kisumu (0.458) and in urban Kisumu (0.293). Due to their deficiency and implications on road safety, the study results show, such vehicle safety gadgets were the most important factor and the most required of driver support in both rural areas (0.476) and urban areas (0.328) of Kisumu County. The gadgets were the most required not because they outwit other driver support practices in significance, rather because they could have hurt road safety the most since they were the most insufficiently adopted, especially the perceivably recent gadgets. Yet according to Shunichi (2006), driving support and cruise assist systems are of growing importance in achieving both road traffic safety and convenience. A good example cited was Japan in which the support systems had been used to achieve, with the highest possible quality, nothing less than “driver-vehicle symbiosis under all conditions” (Shunichi, 2006, p.39).

The slip-up in Kisumu County is also regrettable basing on Kazunori and Takeshi (n.d.) who too underscore the importance of driver support gadgets. Although they reported scepticism about change of drivers’ behaviour, they acknowledged the immense benefits of most of the automatic driving assistive technology. They only had reservation on systems such as Adaptive Cruise Controls and Lane Keeping Assists. It was believed drivers take for granted these assistive systems and ignore the duty to oversee the assisted tasks yet such systems can malfunction in the due course and cause road safety mishaps.

Training motorcycle riders, as another parameter of driver support, was never well done in Kisumu County. Research results show that mainly Boda boda riders were not well trained on road use in most rural and many urban areas of the county. This has a corresponding effect on road safety. The results indicate that a unit increase in the quality of motorcycle training led to a 0.103 increase in road safety in rural Kisumu. It was also indicated that this training contributed second most to the road safety difficulty in rural Kisumu and was therefore the second important factor (0.144) and was equally the second most required in such rural territory of the county. In urban Kisumu, results specify, a unit increase in the quality of motorcycle training led to a 0.143 increase in road safety. It was the third most contributor (0.143) to road safety struggles and the third most important (0.232) and required input to boost road safety in the territory. Accordingly, motorcycle rider training contributed to road safety more in urban areas than rural areas in Kisumu County. Motorcycle training was one of the most contributors of Kisumu's road traffic mishaps just as it was previously reported about Kisumu City by Moraa (2016). Like the current study, Moraa had reported that motorcycle induced road accidents were attributed to lack of enough formal training of operators especially among Boda bodas.

Roads, according to the study findings, were less maintained in rural areas of Kisumu County while those in urban areas were less fairly maintained to save drivers from causing motor accidents. Similarly, the implication of road maintenance on road safety in either areas of the county was consistent with the level at which the driver support practice was done.

Particularly, the study results indicate that a unit increase in consistency of road maintenance led to 0.093 increase in road safety in rural areas of Kisumu County. It was also realised, road maintenance (0.093) was the third most contributor to road safety, the third most important factor (0.123) required to enhance road safety in the rural side of the county. In urban Kisumu, results show a unit increase in consistency of road maintenance led to 0.215 increase in road safety. It was also indicated the practice was the second most contributor (0.215) to road safety troubles and was therefore the second most important (0.312) and required input closely after vehicle safety gadgets. The findings on rural and urban Kisumu demonstrate the significance of renovation and development of roads on

road safety as earlier mirrored in Gichaga (2016) research. This previous research about Kenya's infrastructural development had indicated that areas of consistent road maintenance had reduced rates of accidents and vice-versa.

In light of road safety predictions of each of the practices of driver support, bivariate analysis revealed that the support in rural Kisumu had a positive and moderate effect on road safety at $r = 0.590^{**}$. Similar driver support in urban Kisumu positively and moderately affected road safety at $r = 0.642^{**}$. At $p < 0.001$, the effect of driver support on road safety in each of the territories was significantly different from zero (0). It was thus deduced that better driver support led to better road safety and vice versa, in contrast to the null hypothesis. With the preceding discussions made on the related driver support constructs, the above correlational result can be surprising. Driver support in Kisumu County was indeed statistically significant on road safety as earlier reported about South Africa by Khan & Sinclair (2016) and Vanderschuren, & Irvine (2002).

Driver support, as part of traffic management practices investigated in Kisumu County, was significant that a unit increase in its provision led to an increase in road safety of 0.244 in Kisumu and 0.296 in urban Kisumu. It was however not enough to stir better road safety in the county. According to study results, driver support was second most contributor to the road safety problem in rural areas (0.244) and urban areas (0.296) of the county. It was therefore the second most important factor required to boost road safety in rural areas (0.208) and urban areas (0.281) of the county. This is still consistent with Girma's (2013) observations on driver support in Africa. It was observed that in the absence of driving efficiency which can be boosted by extraordinary support, it was always highly likely for drivers to be vulnerable to road traffic misadventures. Otherwise drivers would develop great efficiency when well supported, which could in turn be translated into road safety.

5.1.3 Traffic control and road safety

Hypothesis Three stated that, "Traffic control is not significant on road safety in Kisumu County". To verify the hypothesis, traffic control was also broken down into the following constructs; operation against vehicles in dangerous mechanical conditions; designation of road sideways for fragile road users; enforcing vehicle basic safety requirements; enforcing

motorcycle basic safety requirements; regulation of vehicle speed and safe driving on road; penalising vehicle traffic offences, and operation against motorbike traffic offences. Along these constructs, the significance of traffic control on the level of road safety was assessed. The assessment was made basing on the systems theory (Salmon and Michael, 2009) that underscores such constructs as ideal interventions to enhance road safety perceived as a control problem between the road user, vehicle and the road. The constructs were also according to the classical approach of the total culture theory regarded reactionary and proactive actions (Hale, 2000) of traffic management.

It was reported that such road traffic control was less efficacious in most rural areas and fairly efficacious in urban areas of Kisumu County. Of all the constructs used to describe road traffic control in the county, in rural areas only enforcement of vehicle basic safety requirements followed by regulation of vehicle speed and safe driving were fairly efficacious, in fact less fairly efficacious. The rest were less efficacious with the least being designation of road sideways for fragile users, then penalising motorcycle traffic offenses, restricting DMC vehicles, enforcing motorcycle basic safety requirements and penalty of vehicle traffic offenses. The efficacy of traffic control was comparably largely inadequate in rural Kisumu because it was rural, basing on observations made in Guerrero, Bishop, Jinadasa & Witte (2013) the analysis of rural transport management in Tanzania. The analysis indicates that rural areas were not as attractive as urban areas which enjoyed the advantageous of better social amenities.

In urban areas, none of these control practices was highly efficacious either, though most of them were better than rural practices. The designation of road sideways for fragile users was less and the least efficacious followed by restriction of DMC vehicles, also less efficacious. The rest were fairly efficacious led by regulation of vehicle speed and safe driving as the most active, followed by enforcing vehicle basic safety requirements, then penalty of vehicle traffic offenses, enforcing motorcycle basic safety requirements, and lastly penalty of motorcycle traffic offenses. Despite the advantage urban Kisumu seemed to enjoy over rural areas, urban traffic control was still not enough among regulatory practices investigated, echoing Femi (2013) findings about road traffic regulation in Nigeria's Municipalities.

The experience in Kisumu County, as a whole, reflects earlier findings of Kipkosgei's (2009) research about regulation of passenger service vehicle operations in Nairobi. That's why the current study was necessary to harmonise the locational differences and perhaps temporal changes. Similar to the present Kisumu County, Kipkosgei had found out that the new traffic regulations were generally good, but poor implementation and enforcement in Nairobi County hindered road safety promotion in the area, which was a district then.

Otherwise traffic regulation and control could have been better-off if a leaf was borrowed from China's experience reported by Hu et al. (2005). The report specifies that in China, government and other stakeholders at national and local levels had given due diligence to the implementation of the road traffic safety law enacted in May in 2004. The law provided the basis of paying due attention to the people and personal security. The significance of traffic control on road safety was defined by the efficacy levels of these control measures.

According to study results, operations against vehicles in DMCs were rare in most rural areas and fairly rare in many urban areas of Kisumu County. In rural Kisumu results indicate that a unit increase in restricting DMC vehicles led to a 0.018 increase in road safety. Such restrictions were the second least (0.018) to contribute to road safety of the seven traffic control factors of study. In so doing, they were the second least important factor and required of the traffic control activities to enhance road safety in that part of the county.

A unit increase in restriction of DMC vehicles in urban Kisumu, led to a 0.026 increase in road safety. It was also found out that of all the traffic control factors such restriction in urban areas of the county contributed third least (0.026) to road safety discrepancy and was thus the third least most important and required traffic factor to propel road safety towns. The results on rural and urban Kisumu both corroborate the findings of Modley and Allopi (2008), which indicated that vehicle defects contributed to road misfortune as along they were not restricted and/or inhibited by law enforcement.

Road sideways for fragile road users in rural areas of Kisumu County limited to only along a few parts of roads. If anything, they were short and not well designed. They were never provided on most part of the rural roads. In urban areas of the county, such sideways were

relatively well designed to a few roads and were lacking along many parts of the roads including Kisumu City. Similar discrepancies were also reported by Sharma (2015) about India as widely lacking walkways for the most vulnerable road users i.e. pedestrians and cyclists mainly in rural areas due to poor road designs.

Results show that a unit increase in road sideways for fragile users led to a 0.184 increase in road safety. The road sideways, contributed third most (0.184) to road safety plight of fragile users including pedestrians, children, the elderly and disabled. The walkways were according to results the third most important factor (0.239) required to address for purpose of fixing the road safety problem in rural areas of Kisumu County. In urban Kisumu, results indicate that a unit increase in road sideways for fragile users led to a 0.310 increase in road safety. It was also shown that such roadside walkways (0.310) contributed the most to the road safety needs of fragile users and were the most important traffic control factor (0.419) needed to be fixed to improve road safety in the county's urban areas. The effect of road sideways to road safety is also according to Sharma (2015) and Girma (2013) an issue of concern in India and most of African countries respectively. In India, the significance of such walkways led authorities to rethink improving road designs to reduce contact between pedestrians and cyclists perceived as the host and vehicles known as the agent (Sharma, 2015).

As another traffic control practice, enforcing of all vehicle basic safety requirements under review was reported to be not enough. The requirements investigated include seat belts, side indicators, driving mirrors, wind screen wipers, night vision lights, vehicle hooter and side mirrors. This traffic enforcement was only relatively effective in most of Kisumu County but particularly a bit more effective in urban areas than rural areas. Each individual vehicle safety requirement was enforced more in urban than rural areas.

According to reports, in each of rural and urban Kisumu, some safety requirements were enforced more than others; in rural Kisumu the most enforced was side mirrors, followed by side indicators, then driving mirrors, wind screen wipers, night vision lights, vehicle hooter and lastly seat belts. In urban areas, side indicators were the most enforced, followed by side mirrors, then seat belts, driving mirrors, night vision lights, wind screen wipers and

lastly vehicle hooter. Generally, enforcement of vehicle basic safety requirements of study was less relatively effective in most of rural Kisumu and fairly effective in much of urban Kisumu. Well, the low levels of enforcing vehicle basic safety in Kisumu corroborate what had previously been observed by Girma (2013) who reveals that this was a common practice in Africa due to lack of enough electronically detective traffic management systems; enforcement was largely dependent on manual controls, so susceptible to human behavioural dynamics.

Results show that a unit increase in enforcing vehicle basic safety requirements led to a 0.205 increase in road safety. However, this was however a wish as the level of enforcement was not enough that it contributed second most (0.205) to the road safety gap. In was also realised that enforcement of vehicle basic safety requirements was the second most important factor (0.278) required to close the road safety gap. About urban Kisumu, results show, a unit increase in enforcing vehicle basic safety requirements led to a 0.097 increase in road safety. In that context, the level enforcement (0.097) contributed third most to road safety needs in towns. It was also learnt that enforcing safety requirements under study was the fourth most important traffic factor (0.135) needed to improve road safety in such urban areas. The results about rural and urban Kisumu underscore the importance of vehicle basic safety enforcement, which was earlier credited by Mukabanah (2012) as a potent factor that can significantly dent road safety if not correctly and consistently executed institutionally.

In the case of motorcycles, reports indicate that in rural areas of Kisumu County, the basic safety requirements of study were not well enforced by traffic authorities. The requirements investigated in the study include motorcyclist reflector jacket, night vision lights, helmet, side mirrors, side indicators, and motorcycle hooter. In urban areas, traffic enforcement of similar motorcycle safety requirements was fairly effective. Reports also show that in each of the territories some safety requirements were enforced more consistently than others. In rural areas, the safety requirement most enforced was motorcyclist reflector jacket, followed by night vision lights, then helmets, side mirrors, side indicators and lastly motorcycle hooter.

In urban areas, reflector jacket was similarly the most enforced, then side mirrors, helmets, night vision lights, side indicators and finally motorcycle hooter likewise. According to study, enforcement of such requirements was largely less effectively in most of rural areas and less fairly effective in much of urban areas of Kisumu County. The varying enforcement levels on motorcycle basic safety between territories and between basic safety requirements are facts of diversity in Kisumu County. What should be undeniable though is that such enforcement was generally not enough in the county thereby corroborating earlier concerns in Raynor (2014) about the developing world. In his paper about Boda boda cyclists in Uganda, Raynor singled out enforcement of basic safety among such commercial motorcycles as a matter over the public expressed much fear. How this motorcycle basic safety enforcement affected road safety in Kisumu County also reflected the level of compliance with each of the motorcycle requirements aforementioned.

In rural Kisumu, resultants indicated that a unit increase in enforcing motorcycle basic safety requirements led to 0.017 increases in road safety. This was consistent with what deficiency in enforcement caused on road safety. The level of enforcement of such requirements however contributed the least (0.017) to the rural road safety problem. In fact, this enforcement was the least important factor (0.024) of all the seven factors of traffic control required to improve road safety in that territory of Kisumu County. In urban Kisumu, results indicated that a unit increase in enforcing motorcycle basic safety requirements led to 0.005 increase in road safety. It was also indicated that the level of this enforcement (0.005) contributed second least to road safety breach. Such enforcement was the least important traffic factor (0.007) required to address the breach. Enforcement of motorcycle basic safety may have pulled the least position among traffic control practices investigated, but its negative effect on road safety in many parts of Kisumu County was irrefutably significant as was formerly underlined in Raynor (2014). The increase in importance of the Boda boda sub sector in Uganda has made the negative impact of motorcycles involved insurmountable. This is due to massive expansion of the sector rendering enforcement strained.

Regulation of vehicle speed was another contentious traffic control practice in Kisumu County. Study reports revealed this regulation was less relative in rural areas and fairly

sufficient in urban areas of Kisumu County. Regulation was done by use of the following mechanisms: road bumps, speed guns, enforcing speed governors, and alcoblow. Specifically, in both rural and urban Kisumu, alcoblow was the least used by traffic authorities of the four vehicle speed and safety regulation mechanisms studied. This was followed by use of speed guns, enforcing speed governors and then road bumps. Only road bumps were highly relied in urban areas for vehicle speed and safety regulation. According to study findings, the four traffic regulation mechanisms were less relatively used in most rural Kisumu and more fairly used in much of urban Kisumu for control of vehicle speed. Whatever the consistency of mechanisms used, vehicle speed control in Kisumu County as a whole was never enough to warranty safe driving. This locally validates Macharia's (2017) inference that regulation of vehicle overspeeding in Kenya was not enough.

The effect of such regulation on road safety depended on the level of use of each of the mechanisms used. Study results show that a unit increase in regulation of vehicle speed and safe driving led to 0.219 increase in road safety. This regulation was the most important traffic control factor (0.286) required to address the rural road safety dilemma. In urban Kisumu, results indicate that a unit increase in regulation of vehicle speed and safe driving led to 0.140 increase in road safety. The regulation was urban the second most important traffic factor (0.181) as its laxity contributed second most (0.140) to the road safety deficiency compared to other traffic control practises investigated. Widely the most contributor of traffic control to road safety troubles in Kisumu County, well this realisation about vehicle speed regulation in the county corresponds to Mackey and Roodt's (2003) findings in a previous related research about South Africa.

Penalising vehicle traffic offences as a form of traffic control also varied between places in Kisumu County just like its effects on road safety. Reports show that although it was not entirely enough, more was done to discipline vehicle traffic offenders in urban areas than rural areas in Kisumu County. Offenses captured in this study include unlicensed driving, reckless driving, overloading, and improper vehicle parking. Each of the vehicle offenses of study was penalised more in urban than rural areas. This territorial disparity in Kisumu County with regard to curbing vehicle offenses, according to Zwerling et al. (2005)

attributed to one thing; norm of close inspection and accountability of government traffic managers in urban areas than rural areas.

It was particularly reported that in both rural and urban Kisumu, some vehicle offenses were penalised more than others. In rural Kisumu, only unlicensed driving was somewhat consistently penalised, otherwise traffic authorities were less strict on the rest with least penalised being improper vehicle parking, followed by overloading, then reckless driving. In urban Kisumu, unlicensed driving was the most consistently penalised followed by reckless driving, improper parking and then overloading. Traffic authorities were not strict enough on all these vehicle offenses though; all were only fairly consistently penalised! Generally, vehicle offense penalty was relatively consistent in urban areas and less consistent in rural areas. This aside, the habit of fighting against certain vehicle offenses than others was not limited to Kisumu County but rather had formerly been reported in Lagos, Nigeria by Olaogbebikan, *et al.* (2013). They for instance singled out some offenses that had apparently received lesser control as indiscriminate parking, loading and off-loading of goods and passengers on the road, and on-street trading (social) as well as over dependency on small occupancy vehicles. Yet, any offenses count as causative factors of road traffic mishaps, according to the Olaogbebikan's.

The significance of vehicle offense penalty depended on the consistency with which it was done for each of the offenses. Results on rural Kisumu show that a unit increase in consistency of penalty against vehicle offenses led to 0.054 increase in rural road safety and 0.094 increase for urban roads. It was also realised, such penalties was the fourth most contributor to road safety deficits in rural Kisumu (0.054) and urban Kisumu (0.094). The penalty of vehicle offenses therefore was the fourth most important factor required to fix the deficit in rural road safety (0.077) and urban road safety (0.139). Penalty of vehicle offenses was the fourth contributor of Kisumu County's road

The inconsistency of anti-vehicle offense penalty may not have been highest contributor to Kisumu road traffic tragedies but incidences of less tamed offenses were significantly a road safety hindrance like had been observed by Chiduo and Minja (2005) in Tanzania

despite her devotion to tackle the road safety problem; overloading was reported to be one major cause of undue damage to the roads.

As for motorcycle offenses, reports show that these were not sufficiently penalised in both urban and rural areas of Kisumu County. Though not enough, penalties against the offenses of study were more consistent in urban than rural. The offenses included reckless motorcycle driving, unlicensed driving and motorcycle overloading. Reports specify that in rural Kisumu, penalty of reckless motorcycle driving was the least consistent followed by unlicensed driving and then motorcycle overloading. In urban Kisumu it was the reverse. Important to note, not enough was done by traffic authorities in either of the territories in Kisumu County; generally in rural Kisumu, penalty against motorcycle traffic offenses was less compliant and in urban Kisumu, it was only fairly compliant with the law. According to earlier discussions, urban areas appealed to better traffic progresses than the rural locality, so were controls of motorcycle offenses in Kisumu County, but that was not the issue of most concern. Of much discontent here was inefficiencies, which compared to Raynor (2014) reports, were widely associated with anti-motorcycle offense operations in Uganda as much as the experience reported in Kisumu County. The significance of motorcycle offense penalty affected road safety depending on the consistency with which penalties were administered.

Statistical results show that a unit increase in consistency of penalty against motorcycle offenses led to 0.043 increases in road safety in such rural areas. Such penalty was revealed to have been the third least contributor (0.043) to the rural road safety gap and was therefore the third least important factor (0.066) that should have been improved for better road safety. For urban Kisumu, results show a unit increase in the compliancy of motorcycle offense penalty led to 0.005 increase in road safety in such urban areas of the county. It was revealed that consistency levels of such penalties contributed the least (0.005) to urban road safety woes. Motorcycle offense penalty was therefore the second least important (0.008) factor of the traffic control practices required to improve urban road safety. Combating motorcycle transgressions seemed not so bad compared to many of the traffic controls investigated. However the effect of its inconsistencies in rural and urban Kisumu

was equally significant to corroborate fears in Raynor (2014) about the laxity of traffic managers in regulating Boda boda cyclists in Uganda.

Summing up the significance of traffic control practices analysed, results show that at $r = 0.68^{**}$, their efficacy, altogether, had a positively strong influence on road safety in rural Kisumu. Similarly, the efficacy of traffic controls in urban Kisumu was positively and strongly significant on road safety at $r = 0.695^{**}$. For both territories of Kisumu County, the association of traffic control with road safety was significantly different from zero (0). Traffic control contributed significantly the role on the road safety levels experiences in the county contrary to the related null hypothesis. This is also reflected in previous research by Chiduo and Minja's (2005), which reports that traffic control program in Tanzania yielded significantly positive results only after government put emphasis on traffic law enforcement.

Compared to other traffic management factors investigated in this study, multivariate analysis results show that a unit increase in road traffic controls led to a 0.370 increase in road safety in rural areas and a 0.308 increase in urban areas of Kisumu County. This was because according to analysis, road traffic control correspondingly contributed most to road safety gaps in rural Kisumu (0.370) and urban Kisumu (0.308), respectively. It was therefore inferred that road traffic control was the most important factor required for better road safety in rural areas (0.433) and urban areas (0.375) in the county. Accordingly, the plight of road safety in both rural and urban areas of Kisumu County traffic control was attributed mostly on traffic control followed by driver support and lastly traffic information. The effects and concerns of road traffic information, driver support and traffic control can now vividly explain, basing on the Kisumu County experience, why WHO (2013) cited Kenya as part of countries most vulnerable to road fatality in Africa. No wonder, Kenya was reported to account for 64% of all road deaths on the continent (WHO, 2013).

The above road safety effects of traffic information, driver support and traffic control were spot-on reflections of the total culture theory according which traffic management was conceptualised and applied a function of reactionary and proactive policy strategies.

Theory postulates this perception through its three basic principles, namely 1) behavioural values, regarded as largely reactionary, 2) classical approach, considered as being largely reactionary and significantly proactive, and 3) the actively caring model that mainly advances pro-action (Cole, Stevens-Adams and Wenner, 2013; Dulaand and Geller, 2007; Guldenmund, 2010; Marsh, 2014; Rakowska, and Szubielska, 2013).

5.1.3 Contribution to knowledge

The study provides new knowledge that was never covered in previous research about road safety in Kisumu County (Amulla, 2018; Murimi, 2013; Nyachieo, 2015; Ndug'u, Ratemo, Mwai, 2015; Onyango, 2018). None of such research specifically investigated any of the effects of traffic information, driver support and traffic control on road safety.

The study also generated a proposed model dubbed, "McOpiyo Road Traffic Safety Model". The model derives from the findings of the study with which it was able to build on the related existing Target Hierarchy Model and Adopted Model.

More interestingly, the study introduces the importance of more computerized and intelligent vehicle safety gadgets into the local road safety literature. The safety gadgets, widely less known on the automobile market in Kisumu, included Intelligent Speed Adaption (ISA), Alcolocks, Fatigue Warning Systems (FWS), Adaptive Cruise Control Systems (ACCS), Electronic Stability Control (ESC), and Lane Keeping Assist (LKA).

5.2 Conclusions

Findings of the study not only consistently fulfil the research objectives but also led to significant lessons about the effects of traffic information, drier support and traffic control on road safety in Kisumu County. Findings on road safety, as a key social responsibility in public policy and administration, provide real knowledge on the road use realities in the county. That's why road safety was separately assessed in rural and urban Kisumu; this was never meant for comparative purposes though. Road safety was generally not enough in the county but varied according to the two territories. It was low in rural and relative in urban areas. It was fairly sufficient only in Kisumu City. Particularly, road fatality, which happened to be significant in the county, was higher in rural than urban Kisumu. It should

thus be noted that in a low income setting like Kisumu County, road safety very susceptible in rural areas and relatively vulnerable in urban areas.

Driven by the research objectives, this study demonstrates that such distinct territorial road safety discrepancies are attributable to and vary with the level of traffic management performance with regard to traffic information, driver support and traffic control. This was specifically mirrored in findings consistent with each of study objectives. The first of the objectives was about road traffic information investigated as one of the traffic management factors sought to explain the varying levels of road safety in Kisumu County. Traffic information was inadequate in most rural areas and relatively sufficient in urban areas of Kisumu County. Even in urban Kisumu, it was not enough though, and it should have been sufficient either way! Although there was and may always be distinct territorial traffic information at the advantage of urban areas, the sufficiency of such information is not territorially leveraged. Rather it seems achievable with more and due diligence to relevant road safety policy guidelines.

The level and territorial distinction of traffic information were realised upon examining traffic information factors perceived contentious in Kisumu County, namely road signages, school child road use education and traffic guidance. Increase in each of the three information factors specified led to a rise in the level of road safety in both rural and urban areas of Kisumu County but a lot more should have been done. Child road use sensitisation was the most required of traffic management, followed by road signages and then regular traffic guidance information for improved road safety. All these traffic information factors or strategies were significantly influential but it appears not all can be equally and resiliently provided for, especially in a developing country like Kenya and more so Kisumu County. It should also be noted that due to the road safety importance of all traffic information, child road use sensitisation, for example, was the most required than others because it was not equally sufficient.

In relation to the second research objective, the study indicates that driver support was less fairly sufficient in most rural areas and fairly sufficient in urban areas of Kisumu County. This was specifically noticed among the forms of support ascertained, namely driving

school training, supportive vehicle safety gadgets, motorcyclist training on road use, and road maintenance. Only driving schools adequately promoted road safety in the county as they were the only sufficiently provided driver support. Road maintenance was relatively consistent in urban and less consistent in rural areas of the county and so was its contribution to the road safety. Vehicle safety gadgets and motorcycle training were least promoters of road safety because they were less sufficient in both rural and urban Kisumu. Even with driver support some forms of driving assistance will be better in urban areas than rural areas. This is especially possible for driver support services that are not centrally provided. That's why for example driving schools in Kisumu County were equally effective in both rural and urban; they are only located in Kisumu City, moreover the only capital of the county.

Among vehicle safety gadgets, the market old gadgets including seat- belt locks, speed governors and anti-fatality air bag, though significantly not enough, were not as rare as the market recent gadgets. The rarest of recent gadgets was the fatigue warning system, followed by adaptive cruise control system, then alcolock, electronic stability control, lane keeping assist and intelligent speed adaptor. In driver support system, vehicle safety gadgets benefit the driver and promote safe driving mainly when readily available. The more electronic gadgets reported to be rare and new in the automobile market in Kenya and Kisumu County in particular, could therefore not have been as reliable as seat belt locks, speed governor and anti-fatality airbag which had been on market long enough.

Road safety in Kisumu County was significantly and partly not enough due to lack of such safety gadgets especially perceivably recent on Kenya's market. May be rarest of the gadgets would have been of great significance on driver and passenger safety if were fully adopted and well fitted in the vehicles. All in all, driver support was one of most underperformed traffic practices. It did not promote road safety in Kisumu County as much as traffic information. Its contribution to better road safety was far less to expectation. In the modern road safety world, vehicle safety cannot be fully meaningful to driver support and efficiency in the absence of such rare and hi-tech vehicle safety technology and in the event insufficient use of any safety gadgets including the old gadgets.

Relative to research three, findings show road traffic control was less efficacious in most rural areas and fairly efficacious in urban areas of Kisumu County. None of the practices of road traffic control in Kisumu county was highly efficacious though most of them in urban areas were better than in rural Kisumu. In both territories, designation of road sideways for fragile users, restriction of DMC vehicles and penalty of vehicle traffic offenses were the least efficacious. Penalising motorcycle traffic offenses and enforcing motorcycle basic safety requirements were also less efficacious in rural areas but were fairly efficacious in urban areas. In rural areas, only enforcement of vehicle basic safety requirements and regulation of vehicle speed and safe driving were fairly efficacious. These were also fairly efficacious in urban Kisumu beside penalty of vehicle traffic offenses and enforcing motorcycle basic safety requirements. In that case, urban areas also share more advantage than rural areas with regard to traffic control. While a few control activities will be equally the same in both territories, many others will be more effectively conducted in urban localities. These differences notwithstanding, in a developing world context traffic control remains less resilient and effective perhaps due to characteristically deterrent dynamics.

Each of the traffic control practices contributed to road safety depending on its efficiency and effectiveness. Less efficacious traffic control activities contributed less to road safety and vice versa. Particularly to note, all the traffic control practices were however not effective to significantly reduce road fatality be it in rural or urban Kisumu. They all required significant improvement to increase the level of road safety in the county. In a nutshell, traffic control was most underperformed of all the practices in Kisumu County. It was less effective compared to traffic information and driver support in that order. A lot was left to be desired as regards to its contribution to better road safety. If that was the case in the rest of Kenya or beyond, then traffic control was of most concern of all road traffic management. It is possible that it could be one of the institutional factors that have instead most induced persistent and serious road safety risks widely spread especially in most of the development world including Kenya.

Generally in Kisumu County, traffic information was significantly essential, however it was not as prominently required as driver support and traffic control for any of the

territories in the county. It was the least required because of being the most fairly sufficient of the traffic management practices studied. Traffic information, therefore, contributed the most to the relative road safety in the county compared to driver support and traffic control. In the traffic management system therefore, such traffic measures will be more required because they are not enough and not because they are more important after-all they are all vital for road safety promotion. No wonder, traffic control could be the most contentiously perceived in any road safety analyses in contexts similar to Kisumu County.

The road safety experiences and dynamics in Kisumu County regarding availability and efficacy of traffic information, driver support and traffic control, it should be acknowledged, could potentially happen anywhere in the rest of Kenya. This is on account of the fact that Kisumu County enjoys advantage in the road transport industry as the third largest city of Kenya, behind Nairobi Capital City and Mombasa City.

5.3 Recommendations

Recommendations were made based on findings of the study, and more particularly in a fashion consistent with the research objectives about road traffic information, driver support, traffic control and road safety in Kisumu County.

5.3.1 Traffic Information and Road Safety

Improved road signages. The National Government, through the Ministry of Transport, Infrastructure, Housing & Ubarn Development, State Departments for Transport and Infrastructure, as well as Kisumu County Government should increase on the quantity and quality of key road signages in Kisumu County. In case of budget constraints, only essential signages can be initially developed from among the following list: marked road lanes, parking sign posts, hump signs, zebra Crossings, speed reduction signs, route signs, road gradient/slope signs, and children crossing signs. More attention should be put on rural areas.

Enhance sensitisation of school children on road use. The NTSA, Traffic Police Department and Kisumu County Department of Roads and Transport should improve on the relevant strategies of school child traffic education. The electronic and print media should be regularly contracted for this purpose. School based road use education should be

consistently provided a cross schools particularly in urban areas, through teacher traffic training workshops and student traffic education seminars, among others.

Regular information on traffic use regulations. Relevant government agencies, such as the NTSA and County Transport and Roads Department should consistently avail road use regulations to all road users in Kisumu County, irrespective of location. Appropriate mass media such as TV and Radio as well as newspapers can be used regularly for this reason.

Consistent and clarity of road use warnings. Regular traffic management agencies such as Traffic Police and NTSA should ensure that warnings are consistently and promptly provided to road users about any spots of danger on the roads in the county. Such spots may include scenes of accidents, spots prone to road accidents and fatalities and spots usually used by robbers, especially for highway robbery.

5.3.2 Driver Support and Road Safety

Improved quality of driving schools. There is need to improve and maintain standards of driving schools in Kisumu County. This can be the initiative of school managers but should be enforced by relevant public authorities through strict registration of new schools and vigilant inspection. The NTSA licence new schools only on sound curriculum requirements and those standards are met. It should also ensure spirited school inspections in collaboration with the Traffic Police and the local Inspectorate of the County Transport Department.

Promote use of ultra-modern automatic driver support safety gadgets. The NTSA, County Transport Department and other public agencies should sensitise, encourage and support the private sector to deal in ultra-modern driver support safety gadgets. These, according to this study, were lacking mainly because most of them were hardly known to be used in the county, despite their ultimate practicality in relation to the county's road safety needs. The gadgets are automatic, user friendly and can provide the best alternative for the widely exiting driver safety gaps in Kisumu County.

Once again, they include automatic speed limit adaptor (technically referred to as Intelligent Speed Adaption), preventive drunk driving device (Alcolocks), fatigue or sleep

detective device (Sleep or Fatigue Warning Systems), automatic speed brake system keeping vehicles a distance apart (Adaptive Cruise Control Systems), automatic detective and brake device against vehicle breakdown or skidding (Electronic Stability Control) and automatic road lane deviation alerts (Lane Keeping Assist).

Kenya has a private sector led economy and, so is the transport industry, which largely relies on private dealership for automobile supplies. Whatever the supplies, private suppliers largely depend on imports. To promote sustainable use of such traffic safety gadgets, relevant public authorities aforementioned should first lobby the legislature and policymakers to ensure the gadgets are a mandatory requirement for automobile operators.

In addition, government, through Kenya Revenue Authority (KRA) and local revenue authorities, should extend tax holidays on such gadgets until they are well understood and consistently used by local vehicle operators. Besides, traffic authorities including Traffic Police should sensitise the public especially automobile traders about the marketability of the gadgets as well as vehicle operators and passengers about the immense safety importance of the same.

Consistency in the use of old and widely known driver safety gadgets. These are vehicle driving safety gadgets that have been available on market, legally required or enforced and widely used already in Kenya's road transport sector (NTSA, 2016). The gadgets include anti-fatality air bag, maximum speed governors and seat- belt locks. The NTSA, Traffic Police, County Government and private automobile dealers should work in unison to consistently sensitise and remind the public about the benefits of such safety gadgets. They also provide friendly and motivating conditions for use of the gadgets among vehicle operators and owners in Kisumu County. For example, there should be rewards set aside for gadget use consistency. Dealers can sell the gadgets on credit so that vehicle owners and operators could feel inspired to embrace the driver support gadgets whose use remains elusive in Kisumu despite being around for decades.

Adequate training of motorcycle riders. Traffic police, County government and NTSA should ensure that all riders of private and public motorcycles are sufficiently trained about safe and effective driving and road use. This should cover all private motorcyclists, and

commercial riders like Boda boda riders and Tricyclists in any part of Kisumu County, particularly rural areas. Authorities should conduct regular trials of motorcycle riding to track riders that could have not had proper initial training for retraining.

Consistent maintenance of roads. The State Department for Infrastructure and County Government of Kisumu should ensure that their mandated roads should be renovated whenever needs arise, respectively. For example, potholes should be urgently get rid of from National roads by the National Government, and County roads by the County Roads Department. Similar safety repairs should be made by the respective institutions as much as possible, where and when necessary.

5.3.3 Traffic Control and Road Safety

Phasing out vehicles in dangerous mechanical conditions (DMCs). There should be total ban of any un-roadworthy vehicles including the very old and recent but mechanically unfit vehicles. The NTSA and Traffic Police should carry out very regular clamp downs to route-out such banned mechanically dangerous vehicles from the roads of Kisumu County especially in rural areas where they could operate undetected.

Designate enough road sideways for fragile road users. The State Department of Infrastructure and County Roads Department should ensure that enough sideways are well designed on all the parts and spots of roads in Kisumu County used as walkways by vulnerable road users. These include pedestrians, school children, the elderly and people living with Disability.

Total enforcement of basic vehicle and motorcycle safety requirements. Traffic regulations enforcers such as the NTSA and Traffic Police Department should spontaneously and regularly crackdown on vehicles and motorcycles without basic safety requirements. All vehicles on the roads of Kisumu should have the following without fail: seat belts, side mirrors, side indicators, driving mirrors, wipers, night vision lights, and hooters. Motorcycle riders should also meet the following requirements, Side mirrors, Side indicators, Helmets, Reflector jacket, Night vision lights, and Hooters. All these vehicle and motorcycle safety gadgets should be in good condition.

Proper and effective regulation vehicle speed. The NTSA and Traffic Police should consistently use the speed controls to ensure safe speed and driving among vehicle drivers in Kisumu County. The following mechanisms should be widely and consistently used in every part of the county to curb vehicle over speeding: Vehicle speed regulator; Speed gun; Enforcing speed governors; Road bumps, and Alcoblow.

Consistency and transparency in the fight against vehicle and motorcycle traffic offences. The NTSA and Traffic Police should consistently and accordingly penalise any vehicle drivers and motorcyclists that commit any traffic offenses. The following Vehicle traffic offenses should vehemently and transparently be punished: overloading, improper parking, driving under the influence of alcohol, unlicensed driving, and reckless driving. For motorcycles, the following offenses should similarly be penalised: overloading, un licensed driving (riding); and reckless driving.

Fight against traffic management corruption. Kenya's Ethics and Anti-Corruption Commission (EACC) should work with the public and National Police Service to tame any corrupt tendencies orchestrated by traffic management officers and road users. The EACC should continously sensitise the public to report any acts of corruption and work in cohort with Police to apprehend the culprits who may be dishonest at work and can jeopardise traffic information provision and traffic control. The culprits can be anybody engaging in fraud, extortion and bribery among traffic managers, transport operators, passengers, Police at the roadblocks and any other road users.

5.3.4 Future research

Future research should be done on a range of issues so as to consistently address research gaps related to this study. Research in future should be done but not limited to the following:

Other factors influencing road safety. Research should be conducted on other physical and social factors affecting the level of road safety in Kisumu County.

A comparable study in other counties of Kenya or elsewhere in the world. Due to locational and contextual differences, a similar study can be carried out in any other county in Kenya or other parts of the world.

Conducting the same study over ten years to come. Due to likely changes in Kenya's road transport subsector, there will be a need to reassess the influence of traffic management on road safety.

Other transport subsectors can be studied. The transport industry in Kenya is made up of several other sectors beside the road subsector. These are different sectors and therefore, to cater for transport sectoral differences, similar studies can be conducted in other sectors such as the marine, sea, air and railway transport subsectors.

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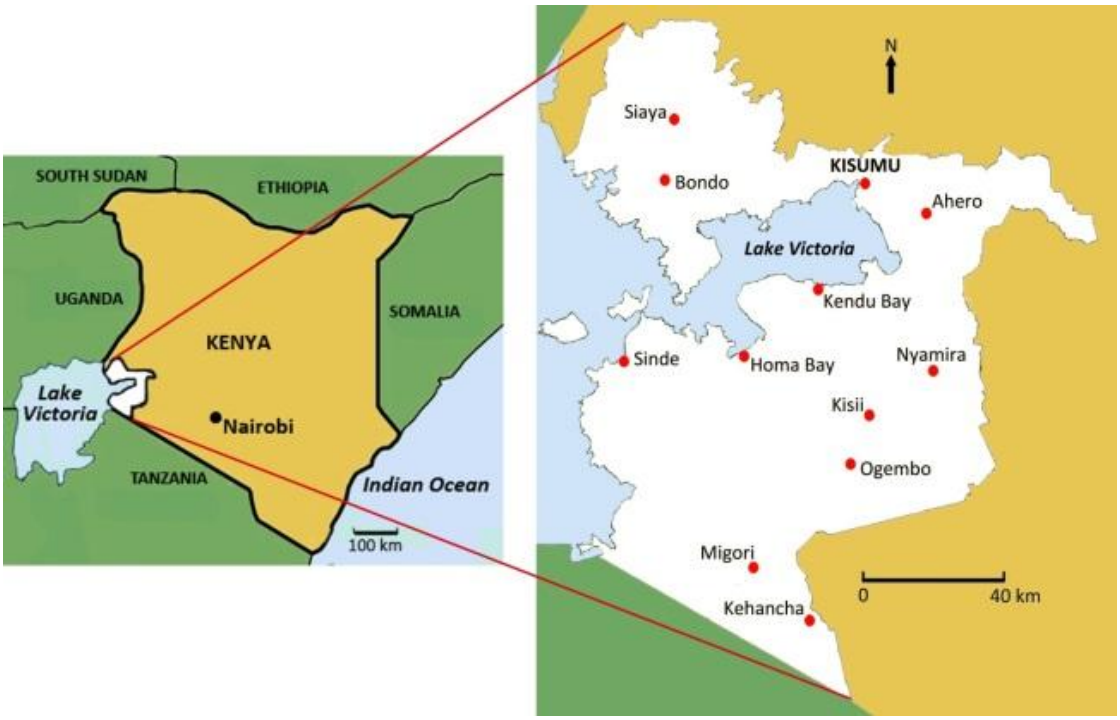
APPENDIX 1

KISUMU COUNTY, ITS LOCATION, CONSTITUENT WARDS AND THE SURROUNDING COUNTIES IN SOUTH WESTERN KENYA

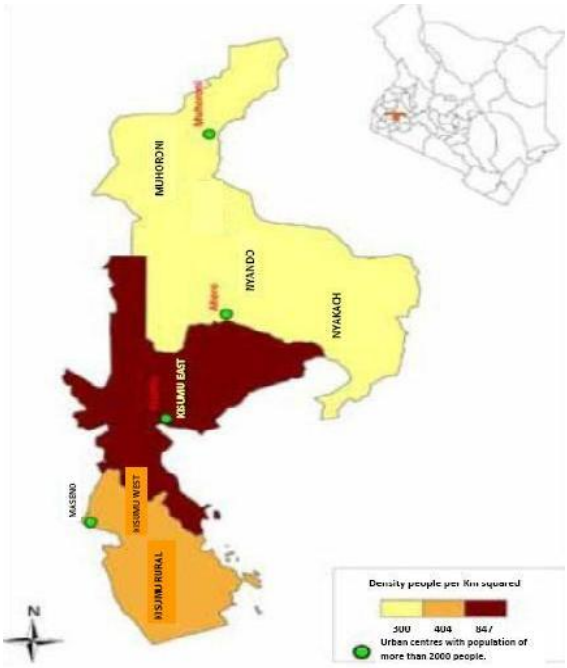


Source: Infotrack East Africa (2014)

Figure A1.1. Location of Kisumu County in South Western Kenya

Source: Infotrack East Africa (2014)

Figure A1.2. Sub counties in South-western Kenya



Source: Kenya Inter Agency Rapid Assessment (2014)

Figure A1.3. Kisumu County Wards

Source: KNBS (2011)

Figure A1.4. Kisumu County and the Surrounding Counties

APPENDIX 2

ROAD TRAFFIC ACTIVITY IN KISUMU COUNTY

Road Network	Road Use
+ Main roads serving the Kisumu city: *Kisumu-Ahero-Kericho, *Kisumu-Kakamega, *Kisumu-Bondo and *Kisumu Busia roads. + Many roads serving the city and the rest of the County and stretching to surrounding counties and regions have been or are being upgraded + Ahero-Nyamasria-Kisumu-Kisian- Maseno Road is the major road route in Kisumu County + 3 km section of this road passing through Kisumu City is widened to 2 lanes in each direction. + The road network distribution in Kisumu is significantly determined by among others: - Kisumu Port. This is a principal lake port formerly known as Port Florence on the Shores of Lake Victoria, the largest fresh water lake in Africa. - Kisumu International Airport (KIA), the fourth largest airport in Kenya - Kisumu Railway terminus. Kisumu is the western terminus of the Rift Valley Railway, linking the Indian Ocean and Lake Victoria.	H Roads in Kisumu County and the City in particular highly used than the rest of the counties in the region and the surrounding. H This is because the County hosts the Kisumu City, the third largest in Kenya After Nairobi and Mombasa. H Traffic levels on Kisumu Roads are steadily increasing also as a result of: - Kisumu port, which makes the county a transportation hub for people and goods en-route to the neighouring countries; Uganda, north western Tanzania, Burundi, Rwanda, Southern Sudan, Eastern DR Congo, Congo Brazzaville etc - Recently upgraded KIA to international standard. - Train service, which links Kisumu and Nairobi. H Other features promoting heavy traffic in Kisumu county include: - Ndere Island, a wildlife sanctuary located in the city, which houses buffaloes, lions, leopard, hyenas and impalas - Kisumu Market(Jubilee) including the old and new markets. "Old Kisumu" market area consists of rows of Stalls (Dukas) on Mumias Road. New market area is known as the "New Bazaar," and is located on Odera and Ogada Streets. H The Heavily travelled road is Ahero- Nyamasria-Kisumu-Kisian- Maseno H Bodaboda, bicycle taxis and tuktuks provide transport. Drivers often drive aggressively. Road risk is high. Helmets are not provided. H Matatus are commonly used for trips over 5 km. Matatus generally leave when full; may take a long time in more sparsely populated areas. H Buses provide transport between Kisumu, Nairobi, Nakuru and other main cities i.e. Jinja, Kampala in Uganda

Source: ASIRT (2014)

APPENDIX 3

THE SAMPLE SIZE SCALE TABLE

N	*S*	*N*	*S*	*N*	*S*
10	10	220	140	1200	291
15	14	230	144	1300	297
20	19	240	148	1400	302
25	24	250	152	1500	306
30	28	260	155	1600	310
35	32	270	159	1700	313
40	36	280	162	1800	317
45	40	290	165	1900	320
50	44	300	169	2000	322
55	48	320	175	2200	327
60	52	340	181	2400	331
65	56	360	186	2600	335
70	59	380	191	2800	338
75	63	400	196	3000	341
80	66	420	201	3500	346
85	70	440	205	4000	351
90	73	460	210	4500	354
95	76	480	214	5000	357
100	80	500	217	6000	361
110	86	550	226	7000	364
120	92	600	234	8000	367
130	97	650	242	9000	368
140	103	700	248	10000	370
150	108	750	254	15000	375
160	113	800	260	20000	377
170	118	850	265	30000	379
180	123	900	269	40000	380
190	127	950	274	50000	381
200	132	1000	278	75000	382
210	136	1100	285	1000000	384

Source: Krejeie and Morgan (1970)

Legend:

N is the S*tud Population Size*.

S is the *Sample Size*.

APPENDIX 4

INFORMED CONSENT

Dear Respondent

My name is Oloo Silas Mc'Opiyo. I am a student of Kampala International University, Uganda, doing a degree of Doctor of Philosophy in Public Administration and Management. I am currently working on my research thesis, titled "**Traffic Management and Road Safety in Kisumu County, South Western Kenya**". This research project is one of the final requirements for my degree award.

Therefore, I humbly request you to be part of my data collection process. Kindly accept to participate by filling the interview guide/ questionnaire attached or by attending and actively contributing in the Focus Group Discussion. I promise you total confidentiality and that any information you provide will be used only for academic purposes of this research.

Thank you very much in advance.

Yours faithfully

_____
Student Researcher

I agree to participate in this study research specified in the above request as, "**Traffic Management and Road Safety in Kisumu County, South Western Kenya**".

I have had the opportunity to ask questions about the study and I understood the request. All my questions regarding the risks and benefits involved have been answered to my satisfaction.

_____ _____

Participant Date

APPENDIX 5

INTERVIEW GUIDE

Dear Sir/ Madam, kindly provide the information required in this interview guide as frankly as you can. Please, respond to question items that sufficiently apply to you. Do not indicate your name.

Tick in the brackets and fill in the blank spaces provided for each question.

1 a) To what extent are road signs provided to guide road use in Kisumu County?

Great extent ( ) Relative extent ( ) Less extent ( ) None ( )

b) Please clarify.

.....

.....

2 a) Are school children sensitized about road use in Kisumu County?

Strongly Agree ( ) Agree ( ) Neutral ( ) Disagree ( ) Strongly Disagree ( )

b) Please clarify.

.....

.....

3 a) Are road users given information on traffic regulations for daily road use in Kisumu County.

Strongly Agree ( ) Agree ( ) Neutral ( ) Disagree ( ) Strongly Disagree ( )

b) Please clarify.

.....

.....

4 a) Are road users given warnings ahead of scenes of dangers on the roads in Kisumu County?

Strongly Agree ( ) Agree ( ) Neutral ( ) Disagree ( ) Strongly Disagree ( )

b) Please clarify.

.....

.....

5) Is the traffic information provided enough for reliable road use in rural and urban Kisumu County?

Strongly Agree ( ) Agree ( ) Neutral ( ) Disagree ( ) Strongly Disagree ( )

b) Please clarify.

.....

.....

6 a) Are drivers well supported on road use in Kisumu County?

Strongly Agree ( ) Agree ( ) Neutral ( ) Disagree ( ) Strongly Disagree ( )

b) Please clarify.

.....

.....

7 a) Is there consistent operation to stop the use of vehicles in dangerous mechanical conditions in Kisumu County.

Strongly Agree ( ) Agree ( ) Neutral ( ) Disagree ( ) Strongly Disagree ( )

b) Please clarify.

.....

.....

8 a) Do roads in Kisumu County have the designated sideways for the fragile road users

Strongly Agree ( ) Agree ( ) Neutral ( ) Disagree ( ) Strongly Disagree ( )

b) Please clarify.

.....

.....

9 a) Is there enough enforcement of basic vehicle safety requirements in Kisumu County?

Strongly Agree ( ) Agree ( ) Neutral ( ) Disagree ( ) Strongly Disagree ( )

b) Please clarify.

.....

.....

10 a) Are the basic motorcycle safety requirements adequately enforced in Kisumu County?

Strongly Agree ( ) Agree ( ) Neutral ( ) Disagree ( ) Strongly Disagree ( )

b) Please clarify.

.....

.....

11 a) Is vehicle speed on road well regulated in Kisumu County?

Strongly Agree ( ) Agree ( ) Neutral ( ) Disagree ( ) Strongly Disagree ( )

b) Please clarify.

.....

.....

12 a) Are vehicle traffic offences effectively controlled by traffic police in Kisumu County?

Strongly Agree ( ) Agree ( ) Neutral ( ) Disagree ( ) Strongly Disagree ( )

b) Please clarify.

.....

.....

13 a) Are motorcycle traffic offences effectively controlled by traffic police in Kisumu County?

Strongly Agree ( ) Agree ( ) Neutral ( ) Disagree ( ) Strongly Disagree ( )

b) Please clarify.

.....

.....

14) Is traffic control in Kisumu County effective enough for proper road use?

Strongly Agree ( ) Agree ( ) Neutral ( ) Disagree ( ) Strongly Disagree ( )

16 a) Are transport operators efficient enough on the roads in Kisumu County?

Strongly Agree ( ) Agree ( ) Neutral ( ) Disagree ( ) Strongly Disagree ( )

b) Please clarify.

.....

.....

17 a) Do road users in Kisumu County consistently observe traffic rules and regulations?

Strongly Agree ( ) Agree ( ) Neutral ( ) Disagree ( ) Strongly Disagree ( )

b) Please clarify.

.....

.....

19 a) Are regular road users safe enough from accidents in using the roads in Kisumu County?

Strongly Agree ( ) Agree ( ) Neutral ( ) Disagree ( ) Strongly Disagree ( )

b) Please clarify.

.....

.....

18 a) Are roads in Kisumu County conducive for high-risk road users?

Strongly Agree ( ) Agree ( ) Neutral ( ) Disagree ( ) Strongly Disagree ( )

b) Please clarify.

.....

.....

20 a) Does road use in Kisumu County pose serious security threats?

Strongly Agree ( ) Agree ( ) Neutral ( ) Disagree ( ) Strongly Disagree ( )

b) Please clarify.

.....

.....

21 a) Is there reduced road use fatality in rural and urban Kisumu County.

Strongly Agree ( ) Agree ( ) Neutral ( ) Disagree ( ) Strongly Disagree ( )

b) Please clarify.

.....

.....

APPENDIX 6

FOCUS GROUP DISCUSSION GUIDE

Kindly share your experiences and opinions on the road safety issues covered in this discussion guide as frankly as you can. Do not disclose your name.

1 To what extent are road signs provided to guide road use in Kisumu County? Please explain.

2 Are your school children sensitized about road use in Kisumu County? Please clarify.

3 Are you given information on traffic regulations for daily road use in Kisumu County? Please explain.

4 Are you given warnings ahead of scenes of dangers on the roads in Kisumu County? Please explain.

5 Is the traffic information provided enough for reliable road use in your community?

6 Are drivers well supported on road use in Kisumu County? Please show how?

7 Is there consistent operation to stop the use of vehicles in dangerous mechanical conditions in Kisumu County? Please explain?

8 Do roads in Kisumu County have the designated sideways for the fragile road users? Please explain.

9 Is there enough enforcement of basic vehicle safety requirements in Kisumu County? Please show how?

10 Are the basic motorcycle safety requirements adequately enforced in Kisumu County? Please explain.

11 Is vehicle speed on road well regulated in Kisumu County? Please explain.

12 Are vehicle traffic offences effectively controlled by traffic police in Kisumu County? Please explain.

13 Are motorcycle traffic offences effectively controlled by traffic police in Kisumu County? Please explain.

14 Is traffic control in Kisumu County effective enough for proper road use?

15 Are transport operators efficient enough on the roads in Kisumu County? Please explain.

16 Do road users in Kisumu County consistently observe traffic rules and regulations? Please explain.

17 Are roads in Kisumu County conducive for high-risk road users? Please explain.

18 Are road users safe enough from accidents in using the roads in Kisumu County? Please explain.

19 Is there reduced road use fatality in rural and urban Kisumu County? Please explain.

APPENDIX 7

RESEARCH QUESTIONNAIRE

Dear Sir/ Madam, kindly provide the information required in this questionnaire as frankly as you can. Please respond as faithfully as possible. Do not indicate your name.

Section 1: Background information

Tick in the brackets for your preferred answer to each of the questions in this section.

1. What is your gender

   Male [ ] Female [ ]

2. How old are you? (in years)

   15- 19 [ ] 20- 24 [ ] 25-29 [ ] 30- 34 [ ] 35-39 [ ] 40-44 [ ] 45-49 [ ] 50+ [ ]

3. What is your level of education?

   Certificate of Primary Education [ ] Certificate of Secondary Education [ ]

   Technical College Certificate [ ] Diploma [ ]

   Bachelors Degree [ ] Masters Degree [ ] Phd [ ]

4. How long have you stayed in this area? (Years)

   Less than a year [ ] 1- 2 [ ] 3-5 [ ] 6-9 [ ] 10- 12 [ ] 13-15 [ ] 16- 19 [ ] 20+ [ ]

5. How do you mostly use the roads of Kisumu County? (Cite one from the list below)

   As a car owner [ ] As a driver [ ] As a passenger [ ] As a regulator [ ]

   All of them [ ] None of them [ ]

6. a) Have you or a person close you been involved in any road accident?

   i) Yourself

   Yes ( ) No ()

   ii) Person close you

   Yes () No ()

   b) If yes, identify the most severe of the road accidents you have suffered in Kisumu County.

   i) Yourself

   Minor Injury Accident [ ] Serious Injury Accident [ ] Death Causing Accident [ ]

   ii) Person close you

   Minor Injury Accident [ ] Serious Injury Accident [ ] Death Causing Accident[ ]

For sections 2, 3, 4 & 5, some questions require separate responses about rural and urban Kisumu County as per your experience. Please give responses consistent with road use in the two areas.

* Kindly, use the **Codes** provided in the table cells for your response as specified in the **Response Legend** below.

5 = Strongly Agree **4** = Agree **3** = Neutral **2** = Disagree **1 =** Strongly Disagree

Section 2: Road Traffic Information

*[for questions 1& 2 below, *Tick* (√) on a *Response Code* for each of the County Areas]

1) The road signs in the table below are provided to guide road use in rural and urban Kisumu County.

Road signs	Rural Kisumu (√)	Urban Kisumu (√)
Well-marked road lanes	1, 2, 3, 4, 5	1, 2, 3, 4, 5
Parking sign posts	1, 2, 3, 4, 5	1, 2, 3, 4, 5
Hump signs	1, 2, 3, 4, 5	1, 2, 3, 4, 5
Zebra Closings	1, 2, 3, 4, 5	1, 2, 3, 4, 5
Speed reduction signs	1, 2, 3, 4, 5	1, 2, 3, 4, 5
Route signs	1, 2, 3, 4, 5	1, 2, 3, 4, 5
Road gradient/slope signs	1, 2, 3, 4, 5	1, 2, 3, 4, 5
Children crossing signs	1, 2, 3, 4, 5	1, 2, 3, 4, 5

2) The strategies below are used to sensitize school children on road use in Kisumu County.

Response	Rural Kisumu (√)	Urban Kisumu (√)
School based road use education	1, 2, 3, 4, 5	1, 2, 3, 4, 5
Electronic media	1, 2, 3, 4, 5	1, 2, 3, 4, 5
Print media	1, 2, 3, 4, 5	1, 2, 3, 4, 5

*[for questions 3, 4, & 5 below, *Tick* (√) in a *blank cell* against a *Response Code* for each of the County areas]

3) As a road user, you are regularly given guidelines for daily road use in Kisumu County.

Response	Rural Kisumu (√)	Urban Kisumu (√)
1		
2		
3		
4		
5		

4) Warnings are regularly given ahead of scenes of dangers on the roads in Kisumu County.

Response	Rural Kisumu (√)	Urban Kisumu (√)
1		
2		
3		
4		
5		

Section 3: Driver support practices

1) Driving schools in Kisumu County are good to train vehicle drivers for effective road use. [*Tick* (√) in one of the *Brackets*]

Strongly Agree [ ] Agree [ ] Neutral [ ] Disagree [ ] Strongly [ ]

2) Vehicles you have used in Kisumu County before were;

a) Fitted with the following safety gadgets

Rare and automatic vehicle safety gadgets	Tick (√) on any code that suits your experience
Automatic speed limit adaptor (Intelligent Speed Adaption)	1, 2, 3, 4, 5
Preventive drunk driving device (Alcolocks)	1, 2, 3, 4, 5
Fatigue or sleep detective device (Sleep or Fatique warning systems)	1, 2, 3, 4, 5
Automatic speed brake system to keep vehicles a distance apart (Adaptive Cruise Control Systems)	1, 2, 3, 4, 5
Automatic detective and brake device against vehicle breakdown – skidding (Electronic Stability Control)	1, 2, 3, 4, 5
Automatic road lane deviation alerts (Lane Keeping Assist)	1, 2, 3, 4, 5

b) Well fitted with the safety gadgets below.

Widely known vehicle safety gadgets	Tick (√) on any code that suits your experience
Seat- belt locks	1, 2, 3, 4, 5
Maximum speed governors	1, 2, 3, 4, 5
Anti-fatality Air bag	1, 2, 3, 4, 5

*[for questions 3, & 4 below, *Tick* (√) in a *blank cell* against a *Response Code* for each of the County areas]

3) Motorcycle riders in Kisumu County are well trained on how to use roads effectively.

Response	Rural Kisumu (√)	Urban Kisumu (√)
1		
2		
3		
4		
5		

4) Roads in Kisumu County are well maintained to help drivers avoid accidents due to potholes.

Response	Rural Kisumu (√)	Urban Kisumu (√)
1		
2		
3		
4		
5		

Section 4: Road Traffic Control

*[also for question 1 below, *Tick* (√) in a *blank cell* against a *Response Code* for each of the County areas]

1) There are field operations made to stop the use of vehicles in dangerous mechanical conditions in Kisumu County.

Response	Rural Kisumu (√)	Urban Kisumu (√)
1		
2		
3		
4		
5		

2) Roads in Kisumu County have the designated sideways for fragile road users i.e. pedestrians, school children, the Elderly and Disabled.

Response	Rural Kisumu (√)	Urban Kisumu (√)
1		
2		
3		
4		
5		

*[for questions 3, 4, 5, 6, & 7 below, *Tick* (√) on a *Response Code* for each of the County Areas]

3) Traffic control authorities effectively enforce the use of the following basic Vehicle safety requirements in Kisumu County

Vehicle safety	Rural Kisumu (√)	Urban Kisumu (√)
Seat belts	1, 2, 3, 4, 5	1, 2, 3, 4, 5
Side mirrors	1, 2, 3, 4, 5	1, 2, 3, 4, 5
Side indicators	1, 2, 3, 4, 5	1, 2, 3, 4, 5
Driving Mirrors	1, 2, 3, 4, 5	1, 2, 3, 4, 5
Wipers	1, 2, 3, 4, 5	1, 2, 3, 4, 5
Night vision lights	1, 2, 3, 4, 5	1, 2, 3, 4, 5
Hooter	1, 2, 3, 4, 5	1, 2, 3, 4, 5

4) Traffic control authorities enforce the use of the following Motorcycle basic safety requirements in Kisumu County

Motorbike safety	Rural Kisumu (√)	Urban Kisumu (√)
Side mirrors	1, 2, 3, 4, 5	1, 2, 3, 4, 5
Side indicators	1, 2, 3, 4, 5	1, 2, 3, 4, 5
Helmets	1, 2, 3, 4, 5	1, 2, 3, 4, 5
Reflector jacket	1, 2, 3, 4, 5	1, 2, 3, 4, 5
Night vision lights	1, 2, 3, 4, 5	1, 2, 3, 4, 5
Hooter	1, 2, 3, 4, 5	1, 2, 3, 4, 5

5) Traffic control authorities rely on the following mechanisms to regulate vehicle speed and safe driving on road in Kisumu County.

Vehicle speed regulator	Rural Kisumu (√)	Urban Kisumu (√)
Speed gun	1, 2, 3, 4, 5	1, 2, 3, 4, 5
Enforcing speed governors	1, 2, 3, 4, 5	1, 2, 3, 4, 5
Road bumps	1, 2, 3, 4, 5	1, 2, 3, 4, 5
Alcoblow	1, 2, 3, 4, 5	1, 2, 3, 4, 5

6) Vehicle traffic offences in the table below are penalised in Kisumu County.

Vehicle traffic offences	Rural Kisumu (√)	Urban Kisumu (√)
Overloading	1, 2, 3, 4, 5	1, 2, 3, 4, 5
Improper parking	1, 2, 3, 4, 5	1, 2, 3, 4, 5
Unlicensed driving	1, 2, 3, 4, 5	1, 2, 3, 4, 5
Reckless driving	1, 2, 3, 4, 5	1, 2, 3, 4, 5

7) The following Motorcycle traffic offences are penalised in Kisumu County.

Bike traffic offences	Rural Kisumu (√)	Urban Kisumu (√)
Overloading	1, 2, 3, 4, 5	1, 2, 3, 4, 5
Un licensed driving (riding)	1, 2, 3, 4, 5	1, 2, 3, 4, 5
Reckless driving	1, 2, 3, 4, 5	1, 2, 3, 4, 5

Section 5: Level of Road Traffic Safety

For questions 1, 2, 3, 4, 5, 6 & 7 below, *Tick* (√) on a *Response Code* for each of the County Areas]

1) The following transport operators are efficient on the roads in Kisumu County

Operators	Rural Kisumu (√)	Urban Kisumu (√)
1) Bicycle riders	1, 2, 3, 4, 5	1, 2, 3, 4, 5
2) Motorcycle riders	1, 2, 3, 4, 5	1, 2, 3, 4, 5
3) Vehicle drivers	1, 2, 3, 4, 5	1, 2, 3, 4, 5

2) Transport operators respect one another the road in Kisumu County

Inter-operator respect	Rural Kisumu (√)	Urban Kisumu (√)
Vehicle drivers respect Motorcycle riders	1, 2, 3, 4, 5	1, 2, 3, 4, 5
Motorcycle riders respect Vehicle drivers	1, 2, 3, 4, 5	1, 2, 3, 4, 5
Vehicle drivers respect Bicycle riders	1, 2, 3, 4, 5	1, 2, 3, 4, 5
Motorcycle riders respect Bicycle riders	1, 2, 3, 4, 5	1, 2, 3, 4, 5

3) Road users in Kisumu County observe traffic rules and regulations.

Road users	Rural Kisumu (√)	Urban Kisumu (√)
Pedestrians	1, 2, 3, 4, 5	1, 2, 3, 4, 5
Bicycle riders	1, 2, 3, 4, 5	1, 2, 3, 4, 5
Motorbike riders	1, 2, 3, 4, 5	1, 2, 3, 4, 5
Vehicle drivers	1, 2, 3, 4, 5	1, 2, 3, 4, 5
Passengers	1, 2, 3, 4, 5	1, 2, 3, 4, 5

4) The following regular road users are safe from accidents in using the roads in Kisumu County.

Road users	Rural Kisumu (√)	Urban Kisumu (√)
Motorbike riders	1, 2, 3, 4, 5	1, 2, 3, 4, 5

Road users	Rural Kisumu (√)	Urban Kisumu (√)
Vehicle drivers	1, 2, 3, 4, 5	1, 2, 3, 4, 5
Passengers	1, 2, 3, 4, 5	1, 2, 3, 4, 5

5) Road use in Kisumu County conducive for the following high-risk road users.

High risk road users	Rural Kisumu (√)	Urban Kisumu (√)
School children	1, 2, 3, 4, 5	1, 2, 3, 4, 5
The Elderly	1, 2, 3, 4, 5	1, 2, 3, 4, 5
Pedestrians	1, 2, 3, 4, 5	1, 2, 3, 4, 5
The Disabled	1, 2, 3, 4, 5	1, 2, 3, 4, 5

6) Road use in Kisumu County does not pose the following security threats

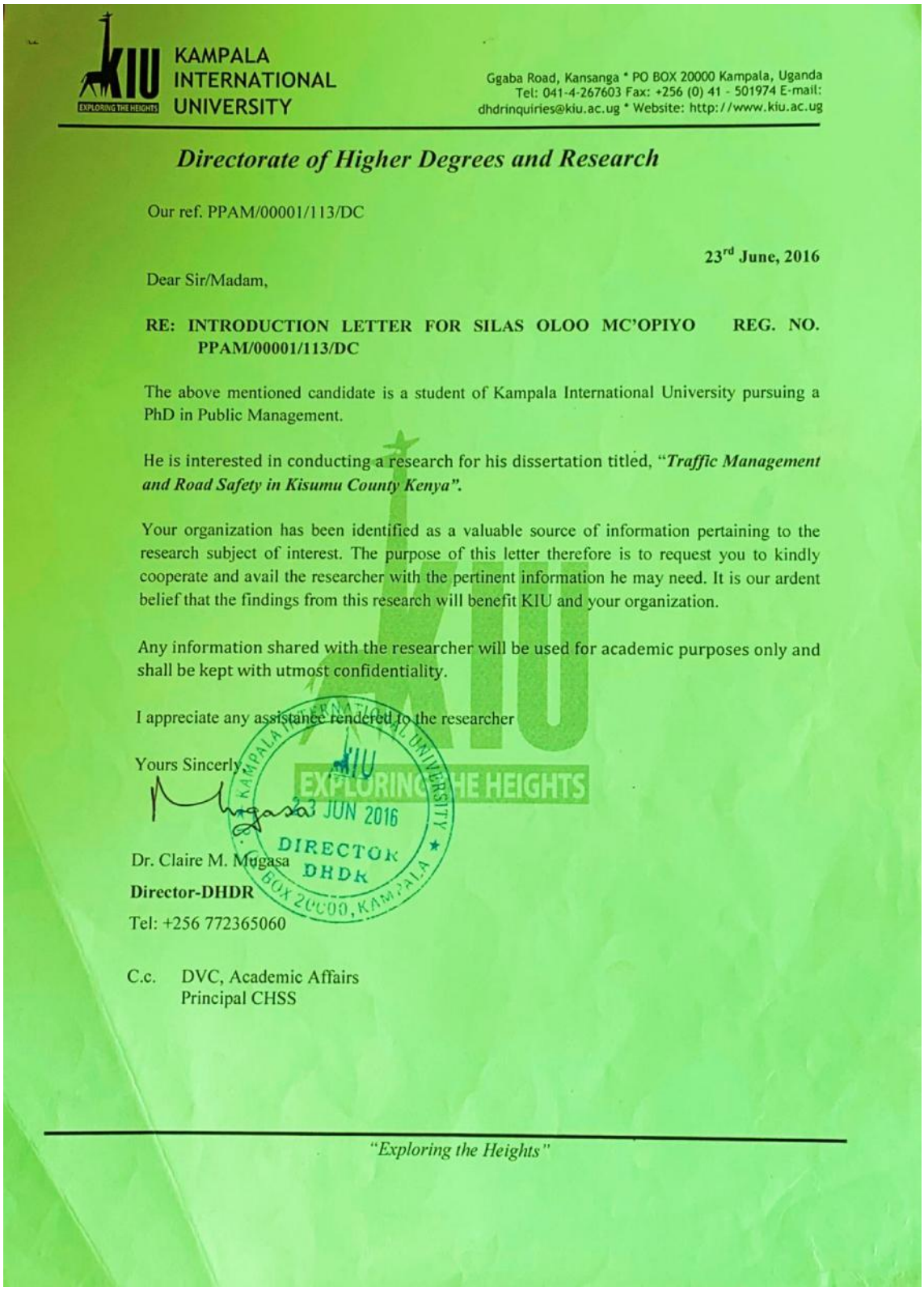
Security threats	Rural Kisumu (√)	Urban Kisumu (√)
High robbery	1, 2, 3, 4, 5	1, 2, 3, 4, 5
Carjacking	1, 2, 3, 4, 5	1, 2, 3, 4, 5
Parking thefts	1, 2, 3, 4, 5	1, 2, 3, 4, 5

7) There is reduced road use fatality in rural and urban Kisumu County. [Tick (√) on a *Response Code* for each of the County Areas]

Response	Rural Kisumu (√)	Urban Kisumu (√)
1		
2		
3		
4		
5		

APPENDIX 8

THE UNIVERSITY RESEARCH INTRODUCTION LETTER



KAMPALA INTERNATIONAL UNIVERSITY

EXPLORING THE HEIGHTS

Ggaba Road, Kansanga * PO BOX 20000 Kampala, Uganda
Tel: 041-4-267603 Fax: +256 (0) 41 - 501974 E-mail: dhdrinquiries@kiu.ac.ug * Website: http://www.kiu.ac.ug

Directorate of Higher Degrees and Research

Our ref. PPAM/00001/113/DC

23rd June, 2016

Dear Sir/Madam,

RE: INTRODUCTION LETTER FOR SILAS OLOO MC'OPIYO REG. NO. PPAM/00001/113/DC

The above mentioned candidate is a student of Kampala International University pursuing a PhD in Public Management.

He is interested in conducting a research for his dissertation titled, ***"Traffic Management and Road Safety in Kisumu County Kenya".***

Your organization has been identified as a valuable source of information pertaining to the research subject of interest. The purpose of this letter therefore is to request you to kindly cooperate and avail the researcher with the pertinent information he may need. It is our ardent belief that the findings from this research will benefit KIU and your organization.

Any information shared with the researcher will be used for academic purposes only and shall be kept with utmost confidentiality.

I appreciate any assistance rendered to the researcher

Yours Sincerly,

KIU
23 JUN 2016
DIRECTOR
DHDR
BOX 20000, KAMPALA

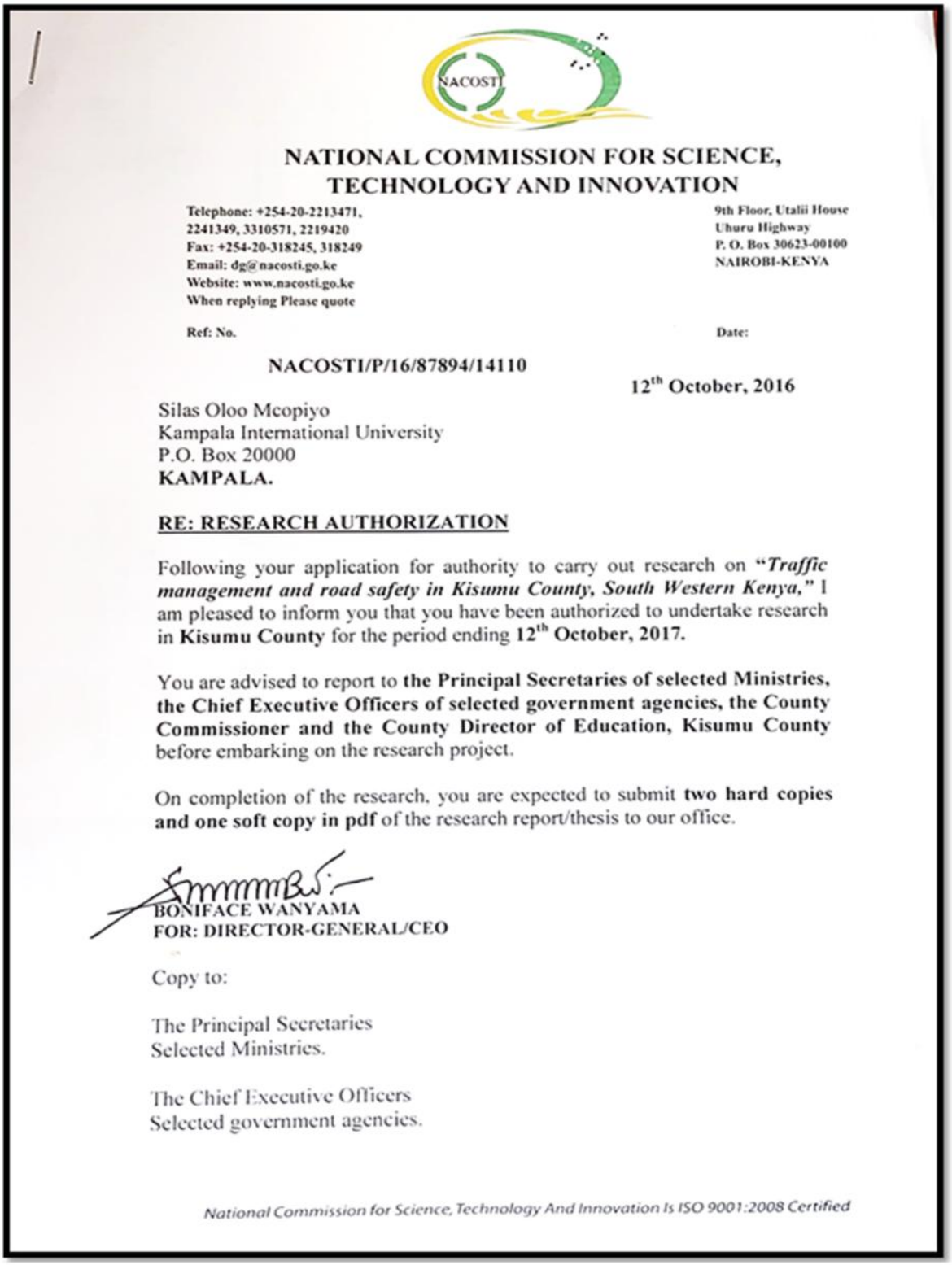
Dr. Claire M. Mugasa
Director-DHDR
Tel: +256 772365060

C.c. DVC, Academic Affairs
Principal CHSS

"Exploring the Heights"

APPENDIX 9

FIELD RESEARCH AUTHORISATION LETTER- NACOSTI



NACOSTI

NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY AND INNOVATION

Telephone: +254-20-2213471, 2241349, 3310571, 2219420
Fax: +254-20-318245, 318249
Email: dg@nacosti.go.ke
Website: www.nacosti.go.ke
When replying Please quote

9th Floor, Utalii House
Uhuru Highway
P. O. Box 30623-00100
NAIROBI-KENYA

Ref: No. **NACOSTI/P/16/87894/14110**

Date: **12th October, 2016**

Silas Oloo Mcopiyo
Kampala International University
P.O. Box 20000
KAMPALA.

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on ***"Traffic management and road safety in Kisumu County, South Western Kenya,"*** I am pleased to inform you that you have been authorized to undertake research in **Kisumu County** for the period ending **12th October, 2017.**

You are advised to report to **the Principal Secretaries of selected Ministries, the Chief Executive Officers of selected government agencies, the County Commissioner and the County Director of Education, Kisumu County** before embarking on the research project.

On completion of the research, you are expected to submit **two hard copies and one soft copy in pdf** of the research report/thesis to our office.

BONIFACE WANYAMA
FOR: DIRECTOR-GENERAL/CEO

Copy to:

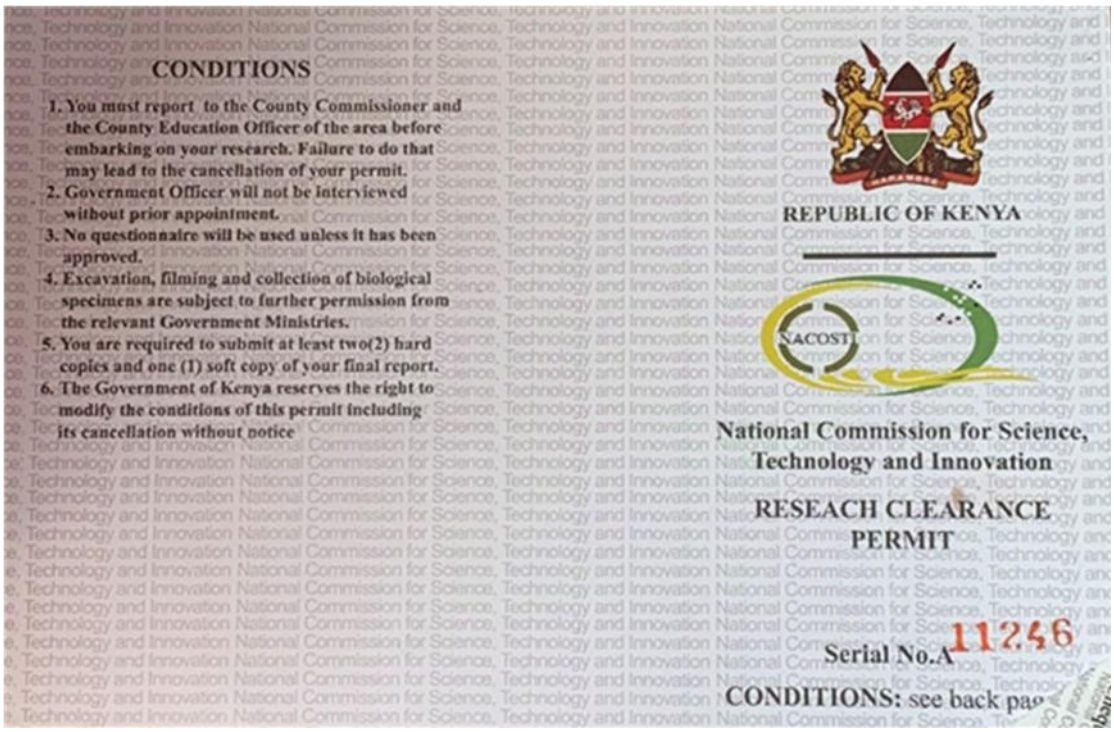
The Principal Secretaries
Selected Ministries.

The Chief Executive Officers
Selected government agencies.

National Commission for Science, Technology And Innovation Is ISO 9001:2008 Certified

APPENDIX 10

RESEARCH CLEARANCE PERMIT- NACOSTI



CONDITIONS

1. You must report to the County Commissioner and the County Education Officer of the area before embarking on your research. Failure to do that may lead to the cancellation of your permit.
2. Government Officer will not be interviewed without prior appointment.
3. No questionnaire will be used unless it has been approved.
4. Excavation, filming and collection of biological specimens are subject to further permission from the relevant Government Ministries.
5. You are required to submit at least two(2) hard copies and one (1) soft copy of your final report.
6. The Government of Kenya reserves the right to modify the conditions of this permit including its cancellation without notice

REPUBLIC OF KENYA

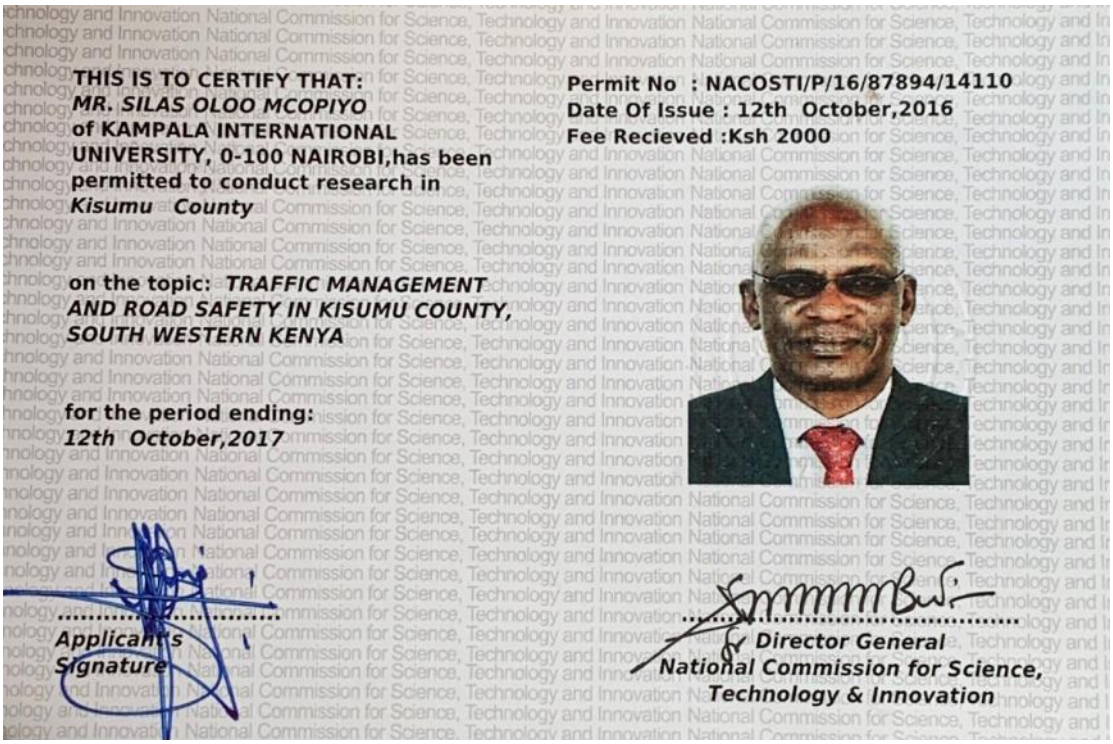
NACOSTI

National Commission for Science, Technology and Innovation

RESEACH CLEARANCE PERMIT

Serial No.A 11246

CONDITIONS: see back page



THIS IS TO CERTIFY THAT:
MR. SILAS OLOO MCOPIYO
of KAMPALA INTERNATIONAL UNIVERSITY, 0-100 NAIROBI,has been permitted to conduct research in
Kisumu County
on the topic: *TRAFFIC MANAGEMENT AND ROAD SAFETY IN KISUMU COUNTY, SOUTH WESTERN KENYA*
for the period ending:
12th October,2017

Permit No : NACOSTI/P/16/87894/14110
Date Of Issue : 12th October,2016
Fee Recieved :Ksh 2000

.....
Applicant's Signature

.....
Director General
National Commission for Science, Technology & Innovation