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DRIVER SUPPORT AND ROAD SAFETY IN KISUMU COUNTY, SOUTH WESTERN KENYA

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Abstract: **Road safety in Kenya has since the mid-2010s caused more lingering questions following increasingly persistent road carnage in central and western regions. In response, this study set out to assess the consistency of driver support practices and their effect on road safety in the south western sub region, particularly Kisumu County. An exploratory and descriptive correlational research design was adopted for the study based on the quantitative and qualitative approach. A study population of 1919 people was coherently identified and grouped in categories that were adopted as sampling frames to select a study sample of 365 participants for field survey. The study found that the level of road safety in rural areas was low and relatively high in urban areas of Kisumu County. Road fatality was only less fairly reduced on rural roads and more relatively decreased on urban roads. This was congruently attributed to inconsistencies in maintenance of roads, training of motorcyclists including the infamous *Bodas and Tuk-tuk*, as well as enforcement gaps of vehicle safety gadgets that varied between rural and urban Kisumu. Road maintenance was irregular in most of rural Kisumu and relatively regular in urban Kisumu, respectively. Motorcyclist training was less consistent in most of both rural and urban areas of the county; only riders had formal road use training. Use of vehicle safety gadgets was very rare in most rural and fairly consistent in urban Kisumu. In conclusion, the level of road safety in Kisumu County had a very significant bearing on the consistency of all the three driver support practices investigated. The county had a lot more to do with such practices most especially training of *Bodaboda* and *Tuk-tuk* riders to boost road safety that has for long been below par. It was recommended that Kenya's State Departments for Transport and Infrastructure, Kisumu County Government, the private sector and all other road users in the county should collectively help sustain driver support as required by Kenya's road safety policy. All stakeholders can do that by going about their road use responsibilities in a rational and best practice fashion.**

Keywords: **Road maintenance, motorcyclist training, vehicle safety gadgets, transport operator, marginal road users, road fatality, seatbelt, maximum speed governor, anti-fatality airbag.**

1. INTRODUCTION

1.1 Background to the study

Although driver support on the road is as old as the first formal road safety policies of the 17thcentury, modern support systems including automated vehicle safety devices have progressively evolved since early 20th century (Bellis, 2015; Truls, Terje and Rune, 2012). Road safety policies were pioneered by the British in 1663 to transform road transport (Wellings, 2002).Contemporary vehicle supporting systems started in Western Europe, United States and Japan with the introduction since 1930s and 1950s of what is currently perceived as old gadgets such as the padded dashboard, seat belt locks, maximum speed governors and anti- fatality airbag (Girma, 2013). Automated driver support technology comprising intelligent vehicle safety devices evolved much later in the United States, Germany and Japan in the advent of advanced computerisation since mid-2000s (European Union, 2006; Shunichi, 2006).

In Africa, such vehicle safety systems have progressively been embraced largely on an import basis except the traditionally infrastructural driver support. Earlier safety gadgets, like seatbelts and speed governors, were widely

enforced on the continent from early 2000s due to surging road fatality (Tanya, 2017; Vanderschuren and Irvine, 2002). Automatic intelligent vehicle safety technology is very young in Africa and has since 2010 been embraced in a few countries led by South Africa and Egypt (Khan and Sinclair, 2016). In Kenya, such sophisticated vehicle technology has lately been adopted but is afforded by a few high-end urbane mainly in Nairobi County (Aoya, 2017). This innovation revitalises driver support as a key function of traffic management, which since government devolution became a shared responsibility between the national and county governments including Kisumu County (Othieno, 2011). Kenya's current devolution system was catapulted by the recent constitution promulgated in 2010 (Ministry of Roads, 2012). However, both driver support and its role on road safety remain almost a mystery particularly in distant Kisumu County that has hardly attracted attention in a relevant scholarly research.

Underpinned by the total Safety Culture Theory (Geller, 1994), the study set out to fill the knowledge gap by assessing the ramifications of driver support. The theory was largely developed by E. S. Geller in 1994 and has been successively revised. As a result, it incorporates behavioural values, classical principles and the actively caring model (Geller, 1994; Guldenmund, 2010; Rakowska, and Szubielska, 2013). The actively caring model was the most appealing for current research as it backs proactive steps such as driver support to offset road safety threats (Cole, Stevens-Adams and Wenner, 2013; Marsh, 2014). In this study, driver support was defined as a function of practices and automobile fitted systems adopted to ensure driver efficiency and road use safety (NTSA[1], 2016). The practices include driving training, driver guidance and road maintenance, while automobile fitted systems include automated intelligent and non-intelligent supportive devices (FTA[2], 2010). Road safety is defined as a function of perceived desired road use effects of road traffic management (FTA, 2010).

Despite Kenya's constitutionally resonated road safety policy, in Kisumu County road safety is still a delusion particularly in rural areas. The policy was according to the 2010 constitution, designed to shove road safety inducing practices such as driver support, which under devolution dispensation, would have been more closely reinforced to desired success (Othieno, 2011). Kenya now comprises 47 devolved county governments of which Kisumu County is a party. As a county, Kisumu is widely known to be a nucleus transport systems in Kenya's South-western region and beyond. It links Kenya to Uganda, North-western Tanzania, Burundi, Rwanda, Southern Sudan, and Eastern Democratic Republic of Congo (ASIRT[3], 2014). However, this could be reason enough for the road safety dilemma widely reported in the county. Kisumu, as a local government enjoys a rich nationally supported institutional framework that should have been useful for close and reliable administration of the road safety policy (Infotrack East Africa, 2014; Othieno, 2011). Surprisingly, recent reports on road safety in Kisumu County (NTSA, 2018) suggest a discrepancy in road safety thrusts such as driver support. The county's road fatality in recent years has been daunting; between 2013 and 2018, the county suffered 808 fatal accidents and 974 victims; 434 serious accidents and 783 victims, as well as 141 slight accidents and 893 victims. In five years period, 1383 accidents and 2650 victims were recorded altogether. (NTSA, 2018).

Besides, during that traffic period, Kisumu County led the rest of the counties in South Western Kenya with almost 50% of road fatalities (Aoya, 2017; NTSA, 2018). Other counties include Siaya County, Homa Bay County, Kisii County, Migori County and Nyamira County (KCG[4], 2013; MDP[5], 2013). DRSEAI[6]attributed road fatality in Kisumu County to wrong road use that would have significantly been improved with right driver support. There was previous scholarly research on road safety in Kenya (Manyara, 2014; Kipkosgei, 2009; Manyara, 2014; Othieno, 2011), but little or none was about driver support. Road use experiences and dynamics in Kisumu County were a mystery either with no clear explanations, hence the need for this study.

1.2 Statement of the problem

Road safety hitches in Kisumu County have been persistent partly because of poor road use by the driver. According to recent reports, the county leads the rest of South-western Kenya in road fatality despite a seemingly sound road safety policy that came into force following the promulgation of the much celebrated 2010 national Constitution (Aoya, 2017;

[1]National Transport and Safety Authority
[2]Finnish Transport Agency
[3]Association for Safe International Road Travel
[4] Kisumu County Government
[5] Ministry of Devolution and planning
[6]Directorate of Road Safety Enforcement and Investigation

NTSA, 2018). This is attributed to poor driver support among other traffic management gaps especially in rural areas, which the policy was supposed to correct by enhancing road use efficiency and safety through a sound institutional framework (Ministry of Roads, 2012; NTSA, 2016). Nonetheless, road safety remains a major public administration problem (NTSA, 2018). In recent years, motor vehicles have been 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 reported to be caused by cyclists particularly motorcycles. Lately, the road safety risk in the county has been high with an annual road fatality rate of 31.3 per 100 000. This compares unfavourably with national fatality estimates which stood at 28.2 per 100 000 (ASIRT, 2014; NTSA, 2018; WHO, 2016).

According to DRSEAI (NTSA, 2018), driver support discrepancies were to blame because of 10 drivers for all motorized vehicles, 7 often drove vulnerably, three quarters of 10 motorcyclists and more than three quarters of 10 bicyclists hardly adhered to best road use (ASIRT, 2014; Regional Traffic Police Service, 2015). Bhargavi and Kannaiya (2011) had also attributed wrong road use to poor road traffic management practices of which, according to FTA (2010), driver support is significant. The implications of this specific traffic management function was however a mystery due to lack of attention in most previous road safety scholarly analysis (Asingo and Mitullah, 2007; Chitere and Kibua, 2006; Kipkosgei, 2009; Manyara, 2014; Othieno, 2011; Wasike, 2001). Besides, such analysis was not about Kisumu County which presents a unique context. It was thus important for this study to address the knowledge gap about the county.

1.3 Purpose of the study

The purpose of the study was to explore the effect of driver support on road safety in Kisumu County, South western Kenya.

1.4 Specific objectives of the study

The study addressed the following specific objectives to accomplish the purpose of the study.

1. To assess the effect of road maintenance on road safety in Kisumu County.
2. To examine the influence of training motorcyclists on road safety in Kisumu County.
3. To ascertain how vehicle safety gadgets widely enforced in Kenya affect road safety in Kisumu County.

1.5 Research hypotheses

1. Road maintenance does not significantly affect road safety in Kisumu County.
2. Training of motorcyclists does not significantly influence road safety in Kisumu County.
3. Vehicle safety gadgets widely enforced in Kenya do not significantly affect road safety in Kisumu County.

2. LITERATURE REVIEW

2.1 Theoretical framework: Total safety culture theory

Total Safety Culture Theory (TSCT) was adopted as the theoretical framework used to guide this study. According to Dulaand Geller (2007), total safety is a responsibility, which all stakeholders of an entity should collectively be concerned about and show that in routine commitments. Advanced by E. S. Geller, TSCT was progressively revised and as a result, three theoretical insights were developed, namely behavioural approach, classic approach and actively caring' model (Dulaand Geller, 2007; Geller, 1994; Guldenmund, 2010; Rakowska, and Szubielska, 2013). As a result, the theory successively assumed 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 suggests that safety culture recommends reactive actions to problems and chances encountered in an organisation or institutional set up (Geller, 1994). The subsequent classical approach perceives safety culture theory as a proposition of shared beliefs, perception and values among stakeholders in relation to the safety (Westrum, 2004).

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 (Geller, 1994, Rakowska, & Szubielska, 2013). Besides perceiving safety culture as a proactive approach actively care models underscores that such a culture is characterised by communication based on

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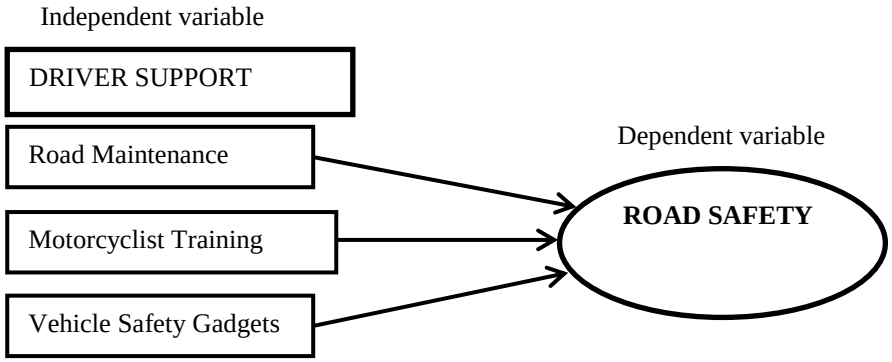
mutual trust, perception of the importance of security, belief in the efficiency of used safety measurements (Cole *et al*, 2013; Guldenmund, 2010; Marsh, 2014). The total safety culture theory underpinned this study because it was useful for depicting driver support as a proactive measure potentially significant for road safety promotion.

2.2 Conceptual framework



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

Figure 1. Conceptual framework about the effect of driver support on road safety

2.3 Related literature: Driver Support and road safety

2.3.1 Road Maintenance and road safety

WHO's (2016)[7] analysis of Africa's road safety specifies that while the region possessed only 2% of the world's vehicles, it contributed 16% to the global deaths. Nigeria and South Africa had the highest fatality rates (33.7 and 31.9 deaths per 100 000 people per year, respectively). It was reported that more than one in four deaths in the African Region occurred on Nigeria's roads. Kenya was part of the seven countries that accounted for 64% of all road deaths in the region. Other countries included Nigeria, Democratic Republic of Congo (DRC), Ethiopia, South Africa, Tanzania, and Uganda. WHO (2013) partly attributed this regional traffic quagmire to poor driver support including poor roads. The country road traffic fatality positions are undeniable but regional differentials were not sufficiently accounted for with regard to the quality of roads. There was therefore need for the current study to fill the conceptual gaps with the possibility of discrepancies in road maintenance in 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 road safety not only in the country, but also the surrounding great lakes region. The study discusses two case studies: one, 50-kmThika Super Highway— a high-class, high-traffic-volume road and two, the Northern Corridor transnational road; This 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 on the Nairobi - Thika Highway (a trunk road) have attracted many investors along the highway strip 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[8], 2015) on the Northern Corridor Road cited in Gichaga (2016) shows that drivers were the major contributors of accidents, with a component ratio of 49.4%. The report also indicates that 24% of the accidents along the Northern Corridor were fatal causing a major concern. For this reason, the Evaluation recommended improvements in the geometric design and maintenance of the road as one of the major steps to guarantee safety on the road (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.

[7] WHO stands for World Health Organisation
[8]International Association of Traffic and Safety Sciences

2.3.2 Training of motorcyclists and road safety

According to Chitere's (2014) research, most of Kenya's driving schools were reported to be significantly commendable as regards the quality of training. The study was about the implications of training, testing and licensing of drivers 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 within and on the outskirts of Nairobi City. Although majority (61.5%) of the drivers were reported to have poorly complied with traffic regulations, those who had attended professional driving schools were sufficiently compliant. Although Chitere's study held a lot of clout for driver support research, it was not about motorcyclists and Kisumu County, where *Bodaboda*[9] and *Tuk-tuk*[10] motorcyclists are the most dominant and vulnerable to poor road use.

A study on *Bodaboda* motorcycle safety in Kenya (Moraa, 2016) linked knowledge and practice among operators, the riders particularly in Kisumu City. The study involved sample of 370 respondents from *Bodaboda* riders for descriptive research survey. The results indicate that, majority (66.5%) had low level of motorcycle safety knowledge due to 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. *Bodaboda* riders engaged in unsafe riding practices and this compromised their safety and those of their passengers. 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 Vehicle safety gadgets and road safety

The Africa Development Bank (ADB) made an assessment on progresses and challenges of road safety management systems in seventeen countries including Kenya (Girma, 2013). According to the assessment survey, road crash was enormous in Africa resulting into 1000 of deaths, tens of thousands of injuries and huge amounts of economic losses every day. Road crash was reported to be the fourth leading cause of deaths of people aged 5 - 44 years; over 75% of the casualties were of productive age of 16 - 65 years, and vulnerable road users constituted over 65% of the deaths. According to the assessment, the losses suffered in Africa have been disproportionate to the level of motorization and road network density, compared with other regions. It noted that unless appropriate comprehensive and effective actions are taken timely, specific regional causes of road crash would increase unbearable impacts.

One of the key factors reported to have exacerbated road traffic fatality was poor driver support. Among the driving support deficiency reported was neglect of automobile safety features. These among others include vehicle safety gadgets that have at least for the last two decades, been on Africa's automobile market such as the seatbelts, speed governors, anti-fatality air bags, 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 agencies despite the existence of related legislation. Over 94% of the countries of study have vehicle safety legislations, but only half of them were keen on the use such safety devices. The assessment above 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, research was conducted by Khan and Sinclair (2016) to examine the importance of safety features to new car buyers. The research survey involved 176 recent car purchasers and 32 car dealership sales persons 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 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 and not Kenya whose territories present distinct traffic contexts and dynamics including Kisumu County.

[9]*Bodaboda* is a term locally and widely adopted in Kenya to refer to a two wheeled public transport motorcycle or its rider.
[10]*Tuk*-tuk is a local name in Kenya for a three wheeled motorcycle or tri-motorcycle used for public transport

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2.4 Summary

The theoretical review underscored the usefulness of the total safety culture theory as the underpinning theoretical framework of this study. The theory integrates binding theoretical insights relative to driver and safety, most important of which was the proactive perspective. Review of related literature was themed in a fashion consistent with specific research objectives. In much of previous related literature, the most common research gap was contextual; there was hardly a relevant study about Kisumu County regarding road safety dynamics. Almost nothing had ever been done on driver support. Other research gaps detected included the content, scope, approach and temporal research gaps. The approach gap was significant because most of research was statistical thus presenting less qualitative detail. The content research gap was prevalent as there was no study directly linking any of the parameters of driver support under review to road safety. In light of the literature review, the current was deemed original and essentially timely.

3. METHODOLOGY

This study adopted an exploratory and descriptive correlational research design based on the quantitative approach. According to Van der Mescht (2014), the exploratory facet of the design was useful for ascertaining unfamiliar experiences and instances in Kisumu County with regard to driver support. Descriptive design facet was adopted to answer questions of *what*, *where*, *who*, *when* and *how* (Creswell, 2007; Murphy, 2013) about each of the variables of driver support and road safety in the county. According to Zoëga (2008), correlational facet was used to determine co-variance research driver support and roads safety variables. The study assumed a quantitative approach to enhance logic and comprehensive analysis (Harwell, 2010; Neuman, 2003). The study population targeted for research comprised several subgroups, each of which was represented by a category of the study sample adding to 365 subjects.The sample was determined using the Sloven's formula (Adanza, 2006; Altares, 2003) as well as Krejcie and Morgan's (1970) sample scale. Purposive sampling and stratified random sampling strategies were adopted to select the sample as summarised Table 1.

Table 1: Summary of the sampling procedure

Sampling	Description	Population	Sample	Instrument
Purposive sampling	Lead Field Traffic Police Officers	102	18	
Stratified random sampling	Members of the CEC	12	02	
	Members of County Assembly	45	08	Structured Questionnaire (248 Copies)
	Members of Operator Associations	48	08	
	Members of Civil Society	14	02	
	Transport Business Operators	150	26	
	Grass root Community Leaders	1050	184	
Total		1421	248	

Source: Adapted by Researcher from records of field survey institutions (2016)

The questionnaire, based on a 5-Likert Scale, was used as the instrument for collection of primary data. Responses to the 5-Likert questions or items were scaled as 5 = Strongly Agree, 4 = Agree, 3 = Neutral, 2 = Disagree, and1 = Strongly Disagree. At least 248 copies of structured questionnaire were administered among respondents as specified in Table 1. This was done with due diligence to respondents' informed consent and confidentiality. The collected raw data was presented, analysed and interpreted using descriptive and inferential statistics based on the Scientific Package for Social Scientists (SPSS), version 16. The main descriptive statistical tools (packages) used included the arithmetic mean ($\bar{x}$), and standard deviation(S). Frequency distribution was also used also used in some respects. The inferential statistical tools adopted included Pearson's correlation coefficient and standard multiple regression.

For accurate interpretation of variable descriptions and covariance, interpretive scales were adopted for each of the analysis tools. The variables included road safety, road maintenance, motorcyclist training, and vehicle safety gadgets. The "scale" for the arithmetic mean ($\bar{x}$) was adapted in such a way that 1 = 'Very low', 2 = 'Low', 3 = 'Moderate', 4 = 'High', 5 = 'Very High' (Kostoulas, 2013). While scaling of the standard deviation included ≥ 1.5 = more spread from the mean and <1.5 = closely clustered or less spread around the mean (Bland & Altman, 1996). For Pearson's correlation coefficient, the adapted scale included ≤ 0.35= weak correlation; 0.36- 0.67= moderate correlation, 0.68- 0.89 = strong correlations and ≥ 0.9 = very strong correlations (Asuero, Sayago, &Gonz´alez, 2006; Taylor, 1990).

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4. FINDINGS

At rate of 94%, the study findings were recorded from 233 respondents of the initially targeted sample of 248 subjects. This was very sufficient to address the research problem because, according to Fincham (2008), a minimum response rate of 70% is recommendable in social science research. In this section, findings were presented, analysed and interpreted in a fashion consistent with the research objectives. For this reason, the dependent variable was described, and its association with the independent variables was analysed hypothesis by hypothesis relative to the same research objectives, respectively. However, this was preceded by respondents' background information, whose purpose was to verify their response potential and authenticity of the findings (Kaya, 2013; Wyse, 2012).

4.1 Background information

On the background of respondents (n = 233), findings include the following details on specific profile variables. Of the respondents, 58% were male and 42% were female; majority 67.2% of middle age ranging 35- 58 years (Stern, 2016), 28.8% were youths, and only 0.9% were aged 15-19 years; 9.0% of the respondents had KCPE[11], 39.5% were holders of KCSE[12], 9.9% held CEC[13], 24% had Diplomas, 13.7% were holders of bachelors' degrees, and the rest 3.9% were had masters' degrees. About their period of stay in Kisumu County, 20.6% of the respondents had operated there for not more 9 years, about 30% had stayed there for 10-19 years, and the majority 48.5% had lived in the county for over 20 years.

In addition, the findings also show that among respondents, 61.4% were mostly passengers, 12.4% were drivers, 11.2% were car owners, and 7.7% were road traffic regulators while the rest 7.3% had used all these forms of road use, and45.4% had personally been involved in an accident, while 89.3% had witnessed a very accident victim. According to findings on the severity of road accidents, 75.4% of the respondents ever personally involved (n= 106) suffered minor injuries, while 24.6% others suffered serious injuries. Of the respondents (n = 208) that had ever witnessed very close accident victims, 47.6% reported minor injury, 30.9% reported serious injury, while the rest 21.5% indicated that their kin had died as a result. With such background characteristics, all respondents were relied for consistent information on road safety analysis in Kisumu County.

4.2 Description of the dependent variable: Level of Road safety

Seven indictors were used as constructs adopted to assess the level of Road safety in Kisumu County, namely transport operator efficiency and interpersonal respect, observance of traffic rules and regulations, safety of regular road users, road favourability of high-risk road users, security on the roads and reduction in road use fatality. Road safety in Kisumu County was separately described in terms of Rural Kisumu and Urban Kisumu because the two territories present distinct contexts with different experiences of road use (Pateman, 2011), respectively. Concisely, Rural Kisumu (RK) represents rural areas while Urban Kisumu (UK) represents urban areas of Kisumu County. Table 2 presents descriptive statistics on the constructs adopted.

Table 2: Descriptive statistics on the level of road safety in Kisumu County

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

Source: Field research (2018)

[11] Kenya Certificate of primary education
[12] Kenya Certificate of Secondary Education
[13] College Education Certificates

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Statistics in Table 2 show, the rate of reduction in road use fatality ('Rdcrfatl') was largely less moderate in rural Kisumu ($\bar{x}$ = 2.57; S = 1.23) and mostly moderate ($\bar{x}$ = 2.78; S = 1.18) in urban Kisumu. This means, road fatality had less relatively reduced on rural roads and a bit highly relatively reduced in Kisumu County. In either territories of the county, reduction in fatality was not enough though. This explains the discrepancy in the levels of all the other six constructs of road safety of which only efficiency of transport operators (Reftops) was moderate in both rural Kisumu ($\bar{x}$ = 2.63; S = 1.17) and urban Kisumu ($\bar{x}$ = 2.73; S = 1.12). It was lesser in the former though by an efficiency difference of $\bar{x}$ = 0.10.

The rest of road safety indicators specified in the table were less sufficient in rural Kisumu; even compliance with traffic rules ('Rdfrscomp') was largely rated at only $\bar{x}$= 2.50; S = 1.01, and roads favourability to marginal users (Frhrrusrs) was rated at just $\bar{x}$ = 2.44; S = 1.13, despite the two road use needs being critical. For urban Kisumu, similar road safety measures were not highly rated either, they were just moderate and in fact, safety of regular road users ('Saftrrusacds') was low, widely rated at just $\bar{x}$ = 2.46; S = 1.10. It was therefore not surprising, the grand average indices indicate that the level of road safety in rural Kisumu was by and large low ($\bar{x}$ = 2.46; S=0.87), while in urban Kisumu, it was largely only moderate ($\bar{x}$ = 2.63; S= 0.80). Generally, the level of road safety in Kisumu County was not sufficient with dreary rates of reductions in traffic fatalities.

For both rural and urban Kisumu the grand average road safety indices were normally distributed (0.22 and 0.35, respectively). This implies that the indices could be confidently subjected to correlation coefficient (bivariate) and multiple linear regression (multivariate) analyses (Sweet and Grace-Martin, 2003) to verify the research hypotheses.

4.3 Verification of the hypotheses

Road maintenance, training of motorcyclists, and vehicle safety gadgets were investigated as the research parameters used to measure driver support. The findings generated as result were used to verify null research hypotheses and essentially address the corresponding research objectives. Findings on each of the parameters were also separately presented for rural and urban Kisumu, due to reasons unique to either territories, or the urban advantage, common in most of developing countries (Booth, Hanmer and Lovell, 2000)

4.3.1 Hypothesis One: Road maintenance and road safety

Hypothesis one assumed that road maintenance did not significantly affect road safety in Kisumu County. With the level road safety already known, the quality of road maintenance was described before verification of the hypothesis through correlational and regression analyses. Descriptive statistics on road maintenance were summarised Table 3.

Table 3: Descriptive statistics about road maintenance in Kisumu County

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)

According to statistics in Table 3, over three quarters (79.4%) of the respondents (n =233) 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. Relative to more accurate descriptive statistics adopted, responses about rural Kisumu generated a low arithmetic mean ($\bar{x}$ = 2.00) and small standard deviation (S = 1.16). Similar perceptions on urban Kisumu registered a less moderate mean ($\bar{x}$ = 2.52) and small standard deviation (S = 1.18). 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.

Having described the quality of road maintenance in the county, the null hypothesis one was now bivariately verified using Pearson's correlation co-efficient as presented in Table 4.

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Table 4: Bivariate Pearson's correlation coefficients on the influence of traffic signage son road safety in Kisumu County

			Level of Road Safety
Quality of road maintenance	Rural Kisumu	Pearson Correlation (*r*)	.370**
		Sig. (*p*) (2-tailed)	.000
		N	233
	Urban Kisumu	Pearson Correlation	.461**
		Sig. (2-tailed)	.000
		N	233

**Correlation is significant at the 0.01 level (2-tailed).

Source: Field research (2018)

According to the rule thumb adopted from Asuero *et al.* (2006), $r = 0.370^{**}$ means that road maintenance in rural Kisumu positively and less moderately affected road safety. At $r = 0.461^{**}$ similar road care in urban Kisumu also had a positive and moderate effect on road safety. At $p < 0.001$, the influence of road maintenance on road safety in either rural or urban Kisumu County was significantly different from zero (0). Therefore, Null Hypothesis (*Ho*) One was rejected. There was a linearly significant association (H_A) between road maintenance and road safety in rural and urban Kisumu, respectively. The more rural and urban roads were well maintained; the more road safety would improve, and vice versa.

4.3.2 Hypothesis Two: Training of motorcyclists and road safety

Hypothesis Two presumed that Training of motorcyclists does not significantly influence road safety in Kisumu County. To ensure informed verification of the hypothesis, the consistency of motorcyclist training was described before correlational and regression inferential analyses. Descriptive statistics on the consistency of motorcyclist training were summarised in Table 5

Table 5: Descriptive statistics about road use training of Motorcycle riders in Kisumu County

Item	Response Category	Frequency (percent); n= 233				Mean		Standard Deviation	
		RK		UK		RK	UK	RK	UK
Motorcycle 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 (n = 233) in Table 5 shows that over three quarters (76.8%) of the respondents felt that motorcyclists 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 motorcycle riders. According to related descriptive statistics in the same table, 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 meant that motorcycle riders were not well trained on road use in most rural and many urban areas of Kisumu County.

Following that description, the extent to which training of motorcyclists influenced road safety was also committed to Pearson's correlation co-efficient analysis. The results are presented in Table 6.

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Table 6: Pearson's correlation coefficients about influence of training of motorcyclists on road safety in Kisumu County

			Level of Road Safety
Motorcycle riders well trained on road use	Rural Kisumu	Pearson Correlation	.437**
		Sig. (2-tailed)	.000
		N	233
	Urban Kisumu	Pearson Correlation	.509**
		Sig. (2-tailed)	.000
		N	233

**Correlation is significant at the 0.01 level (2-tailed).

Source: Field research (2018)

The results in Table 6 indicate that at $r = 0.437^{**}$ training of motorcycle riders in rural Kisumu had a positive and moderate influence of the level of road safety. Statistic $r = 0.509^{**}$ suggest that similar training road sue training in urban Kisumu also positively and moderately affected road safety. In the two territories the influence of motorcyclist training was significantly different from zero (0), at $p < 0.001$, respectively implying that there was a linearly significant association (H_A) between such training and road safety. As a result, Null Hypothesis (*Ho*) Two was rejected. It was thus concluded that the more motorcycle riders were well training the more road safety improved in both rural and urban areas of Kisumu County and vice versa.

4.3.3 Hypothesis Three: Vehicle safety gadgets and road safety

The null hypothesis in question was that Vehicle safety gadgets widely enforced in Kenya do not significantly affect road safety in Kisumu County. The statistics generated to describe whether such gadgets fitted in vehicles operating in rural and urban Kisumu were summarised in Table 7. The gadgets investigated include seat belts, speed governors and airbag.

Table 7: Descriptive statistics about consistency of road use guidelines in Kisumu County

Vehicle safety gadgets	N	Mean	Standard Deviation
1) Seat- belt locks	233	2.7	1.44
2) Maximum speed governors	233	2.9	1.23
3) Anti-fatality Air bag	233	2.5	1.32
Grand Indices ('vehsftgts')	233	2.7	1.33

Source: Field Research (2018)

According to the statistics in the above table, all the three safety gadgets were moderately fitted in most of vehicles in the county led by seat belt lock, then maximum speed governors and anti- fatality airbags, in that order. Accordingly, the grand average indices ('vehsftgts') generated a moderate arithmetic mean ($\bar{x} = 27$) and less spread standard deviation ($S = 1.33$). This suggests that such gadgets were moderately enforced or fitted among vehicles in most of Kisumu County.

The effect of the safety gadgets was also subject to Pearson's correlation analysis as indicated in Table 8.

Table 8: Pearson's correlation of the vehicle safety gadgets and road safety in Kisumu County

			Level of Road Safety
Vehicle safety gadgets fitted	Rural Kisumu	Pearson Correlation	.522**
		Sig. (2-tailed)	.000
		N	233

**Correlation is significant at the 0.01 level (2-tailed).

Source: Field research (2018)

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The statistics in Table 8 indicate that at $r = 0.522^{**}$, vehicle safety gadgets positively and moderately affected the level on road safety in Kisumu County. The effect of such safety gadgets was at $p < 0.001$ significantly different from zero (0). Null hypothesis Three was therefore rejected. There was a linearly significant connection (H_A) between the use of vehicle safety gadgets and level of road safety in rural and urban areas of Kisumu County. This infers, the more the safety gadgets were enforced and/ or used, the more levels of road safety increased. The reverse was true.

4.3.4 Multivariate analysis: road maintenance, motorcyclist training, vehicle safety gadgets and road safety

To determine how driver support and each of its parameter predicted road safety levels in rural and urban Kisumu multiple regression analysis was adopted. The parameters included road maintenance, motorcyclist training, and vehicle safety gadgets. The results were summarised in Table 9 and 10.

Table 9: Model Summary

Model	Territory	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	RK	.599[a]	.358	.350	.70081
	UK	.663[a]	.439	.432	.60641

a. Predictors: (Constant), Roads well maintained to help drivers avoid accidents, Motorcycle riders well trained about road use, Vehicle safety gadgets consistently fitted.

Source: Field research (2018)

Results in Table 9 show that driver support predicted 35.8% (R^2= 0.358) of road safety in rural Kisumu and 43.9% (R^2= 439) in urban Kisumu respectively.

Table 10: Regression statistics on driver support and road safety in rural and urban Kisumu

Mode l	Territory	Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
(Constant)	RK	1.020	.139		7.340	.000
	UK	1.085	.129		8.414	.000
Roads well maintained	RK	.132	.044	.175	2.971	.003
	UK	.211	.036	.307	5.829	.000
Motorcyclists well trained	RK	.173	.043	.241	4.009	.000
	UK	.175	.035	.285	5.040	.000
Vehicle safety gadgets fitted	RK	.309	.047	.375	6.565	.000
	UK	.235	.042	.309	5.617	.000

Dependent Variable: Level of Road Safety in Rural Kisumu

Source: Field research (2018)

Statistics in Table 10, basing on the regression equation adopted ($Y= \beta o+ \beta_1X_1+ \beta_2X_2+ \beta_3X_3+ \varepsilon$), indicate the following predictions for rural and urban Kisumu, respectively. In rural Kisumu, a unit increase in road maintenance predicted 0.132; motorcyclist training, 0.173, and fitting in vehicle safety gadgets, 0.309 increase in road safety, respectively. Beta statistics show that enforcing vehicle safety gadgets was the most required (0.375), followed by motorcyclist training (0.241), and then road maintenance (0.175) to significantly support drivers to avoid road accidents. In urban Kisumu, a unit increase in road maintenance predicted 0.211; training of motorcyclists, 0.175, and vehicle safety gadgets, 0.235 increase in road safety, respectively. According to Beta statistics, vehicle safety gadgets was the most required (0.309), followed by road maintenance (0.307), and then motorcyclist training (.285) to significantly support drivers to circumvent road accidents. The predictions of road safety for all the three driver support parameters were very significant at < 0.005 in both rural and urban Kisumu.

5. DISCUSSION OF FINDINGS

Discussion of study findings about driver support and road safety was made hypothesis by hypothesis, consistently with the research objectives. Hypothesis one assumed that road maintenance could not significantly affect road safety in

Kisumu County, but this was not true. The effect was very significant. This was verified, first by describing and second, by correlating as well as regressing the level of road safety and road consistency of road maintenance in rural and urban Kisumu. The description show that road safety was low in rural Kisumu and relative in urban Kisumu. In both territories in can be argued that road safety was not enough though. This was contrary to best practice enshrined in Kenya's road safety policy (Ministry of Transport, 2012) and recommended by the NTSA (2018). For the road maintenance, not much was consistently done in rural Kisumu. In urban Kisumu similar maintenance was moderately consistent. Despite such territorial differences, more still there were inconsistencies through Kisumu County. Road maintenance discrepancies reported in any part of Kisumu County contrasts best practice reflected in Gichaga (2016), who underscored the need to keep roads free from infrastructural breaches that can induce traffic risks. Eventual verification of the hypothesis suggested that the level of road safety in rural and urban Kisumu was commensurate with the consistency of road maintenance. In rural Kisumu, road maintenance contributed little while in urban Kisumu, it contributed fairly to road safety. The effect was however equally very significant in the two territories. This was consistent with Gichaga (2016) research, which had reported that consistent renovation of roads significantly reduced rates of accidents and vice-versa.

Contrary to Hypothesis Two, reports in this study indicate that training of motorcycle riders significantly influenced the level of road safety in Kisumu County. According to findings, such riders in most of Kisumu County, both in rural and urban areas were not well trained. They could have informally been trained. A few attained formal and consistent training on proper road use. This corroborates experiences reported by Moraa (2016) about the rest of Kenya. With the level of road safety reported as being insufficient, the study discovered that traffic quagmire faced in both rural and urban Kisumu was partly attributed to untrained or poorly trained motorcyclists including Bodabodas and Tuk-tuk. This is why verification of the hypothesis through correlation and regression analysis that show that the roads gaps were significantly associated with such training needs. This was agreement with Girma (2013) who had observed that road safety had a great bearing of such practices of driver support.

Hypothesis three was not valid because there was a very significant association between the following vehicle safety gadgets and road safety in rural and urban areas of Kisumu County; seat belt locks, maximum speed governors and anti-fatality airbag. This was consistent with the confidence Vanderschuren& Irvine (2002) had demonstrated in vehicle safety. In rural Kisumu, where the level of road safety was reported to be low, enforcement and/ use of such gadgets was also rare. In urban Kisumu, road safety, rated as moderate, also corresponded with the extent to which similar safety gadgets were embraced. Vehicles plying on urban roads were better than the rural bound, but still vehicles' safety was not enough in either cases. This confirms the discontent in Girmas's (2013) research, in which such incompliances were reported in much of Africa due to vehicle owners' apathy. It was also regrettable and contrary to recommendations in previous research (Kazunori and Takeshi, n.d;Trul*set al.* 2012) which underscored the benefits of vehicle safety. More enforcement of the safety gadgets would have significantly propelled road safety Kisumu County, as earlier suggested by Khan & Sinclair (2016).

6. CONCLUSION

With driver support hardly respected, it is not surprising that road safety in much of Kisumu County was underwhelming especially in rural areas. If there was due repute of Kenya's road safety policy, drivers would have been proactively supported to avoid preventable road use threats in the county. In this study, road maintenance, training of motorcyclists on proper road use and enforcement of vehicle safety gadgets were proven very significant. That is why driver induced traffic dangers were not a coincidence on most rural roads and many urban roads in the county. Due to inconsistencies reportedly associated with the three driver support practices investigated, safety of road users could be guaranteed. Absence of best practice regarding maintenance of roads, training motorcyclists and enforcing or use of seat belts, maximum speed governors and anti-fatality airbags poses profound harm on road safety anywhere in Kenya and beyond.

7. RECOMMENDATIONS

The following recommendations were made bearing in mind the specific objectives of the study and in particular driver support gaps observed in Kisumu County.

7.1 Consistent and proper maintenance of roads: The State Department for Infrastructure and County Government of Kisumu should ensure that their mandated roads are renovated whenever needs arise, respectively.

7.2 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. Authorities should conduct regular trials of motorcycle riding and operations to track and crackdown on riders that did not get formal or proper training.

7.3 Consistency in the use of the three driver safety gadgets of study: 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 NTSA, Traffic Police, County Government and private automobile dealers should work in unison to consistently sensitise about and enforce utilisation of the vehicle safety gadgets.

7.4 Future research

Future research should be done on other traffic management practices influencing road safety; as comparable studies in other counties of Kenya or elsewhere in the world; as similar studies to cater for such as the maritime, air and railway transport.

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