

Research Paper



Effectiveness of road safety measures and socio-economic factors influencing accident reduction among motorists in North-East Nigeria

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ABSTRACT

Road traffic accidents remain a significant public health and developmental challenge in North-East Nigeria, exacerbated by post-conflict infrastructure degradation and socio-economic pressures. This study investigated the effectiveness of existing road safety measures and the socio-economic factors influencing accident reduction among motorists in the region. Adopting a descriptive survey design, data were collected from 508 stakeholders, using a structured questionnaire. Analysis revealed that safety measures such as seatbelt enforcement, traffic patrols, and hazard signage were moderately effective, while speed enforcement cameras and public awareness programs were largely ineffective. Socio-economic factors including government budgetary commitment to infrastructure, availability of affordable transport, and regional financial stability were found to moderately influence road safety outcomes. Effective strategies identified for improving road safety included enhanced public sensitization, stricter enforcement of traffic laws, infrastructural rehabilitation, and the adoption of technology-driven monitoring systems. The study underscores the critical interplay between technical interventions and socio-economic realities in achieving sustainable accident reduction among motorists.

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1. INTRODUCTION

Road traffic accidents (RTAs) constitute a critical global public health and developmental challenge, resulting in approximately 1.19 million fatalities annually, with over 90% occurring in low- and middle-income countries [1]. The rate of Road traffic fatality in Nigeria is still very negative, making the nation one of the worst in Africa as it has been estimated that the rate is at 21.4 deaths per 100,000 people [2]. The resultant economic and social costs are also great as they cost the country about 1-3% of Gross Domestic Product every year, and cause families and communities long-term psychological trauma [3].

The unique case of the North-East region of Nigeria is a part of the general national crisis. Socio-political instability and incessant insurgency in the last ten years have grossly undermined the transport infrastructure and the implementation of road regulations [4]. At the same time, socio-economic factors, including high poverty levels, low literacy, and a high reliance on informal commercial transport (e.g., outdated buses and motorcycles) are also the cause of a complicated risk environment [5]. Despite the fact that the national laws are required to impose the speed limits, the use of seat-belts, and the vehicle safety requirements, their realization and effectiveness in this area are unclear and under-investigated.

The current literature demonstrates a sharp gap between policy implementation and policy development in similar situations. It has been shown that the efficacy of statutory safety measures is mediated to a big extent by the capacity of local enforcement, driver education, and the perception of people [6]. Furthermore, post-2020 analyses suggest that socio-economic pressures, including livelihood strategies in conflict-affected zones, can lead to risk-taking behaviors such as overloading and speeding, thereby negating the intended benefits of safety interventions [7]. There is still a significant literature gap with regards to the interrelationship between socio-economic determinants and perceived actual efficacy of road safety interventions in the North-East Nigeria. Therefore, the current study attempted to analyze the effectiveness of road safety measures and socio-economic factors influencing the mitigation of accidents by motorists in North-East Nigeria.

1.1. Statement of the Problem

The North-East part of Nigeria, even with the national road safety policy and intervention measures in place, still records significantly higher rates of road-traffic accidents, which is why the effectiveness of the traditional measures remains extremely low. The root cause of this unending crisis is lack of fit: generic safety standards are implemented without proper modification to the actual post-conflict realities and the socio-economic stressors of poverty, underdeveloped infrastructure, high usage of informal transportation, and poor enforcement mechanisms, are present. It then follows that the need to understand the underlying mechanisms through which these localized determinants negatively affect policy effectiveness and adherence to rules among drivers is urgent; the current lack of an integrated, place-specific analysis model only contributes to the pattern of preventable deaths and economic costs.

1.2. Objective of the Study

1. Assess the effectiveness of existing safety measures for reducing accidents for motorists in North-East Nigeria.
2. Analyze the socio-economic factors contributing to road safety measures in North-East Nigeria.
3. Propose strategies for enhancing road safety measures among motorists in North-East Nigeria.

1.3. Research Questions

1. How effective are the existing safety measures for reducing accidents among motorists in North-East Nigeria?
2. What are the socio-economic factors contributing to road safety measures in North-East Nigeria?
3. What are strategies for enhancing road safety measures among motorists in North-East Nigeria?

1.4. Hypotheses

1. There is no significant difference in the mean response of FRSC, VIO, FERMA, and NURTW personnel on the effectiveness of the existing safety measures for reducing accidents among motorists in North-East Nigeria.
2. There is no significant difference in the mean response of FRSC, VIO, FERMA, and NURTW personnel on the socio-economic factors contributing to road safety measures in North-East Nigeria
3. There is no significant difference in the mean response of FRSC, VIO, FERMA, and NURTW personnel on the strategies for enhancing road safety measures among motorists in North-East Nigeria.

2. RELATED WORK

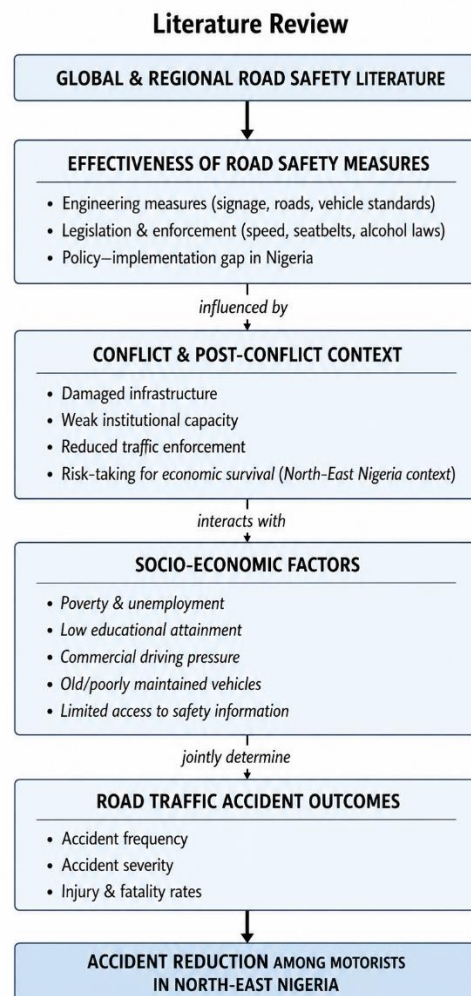


Figure 1. Literature Flowchart for the Study

The literature review will follow the description in Figure 1 shows the literature review process. The elements identified interact dynamically to shape motorist behaviour, which ultimately determines accident outcomes.

2.1. Effectiveness of Road Safety Measures

The efficacy of the road safety interventions when implemented properly has been consolidated in researches. Interventions, including better signage on the road, traffic calming features, and vehicle safety criteria have proven to lower the severity of crashes [8]. Similarly, speed regulation, alcohol-driving, seat-belt legislation, and enforcement are some of the supporting policies that the World Health Organization has [1]. However, their effectiveness is heavily reliant on the persistence of enforcement and social

conformity, which always tend to be inconsistent. In the Nigerian context, an analysis of the situation shows that there is a strong gap between policy making and action. Nwosu and Williams determined the insufficient enforcement systems, corruption, and institutional restraints as the main obstacles to the national efficiency of traffic laws [6]. By definition, therefore, the presence of safety measures as indicators of their effect is not enough particularly in jurisdictions that face the issue of governance challenges.

2.2. The Conflict and Post-Conflict Context

One of the emerging fields of study is related to mobility and safety in conflict areas. It is a proven fact that prolonged insecurity has a negative effect on the transportation infrastructure, pushes skilled manpower out of the country and pushes police officers away from traffic policing for other duties [4], [9].

In such settings, the institutional capacity to maintain road safety programs is so degraded that the programs are more likely to fail. Aliyu and Bello have recently presented a case study for North-East Nigeria that suggests that post-conflict recovery priorities tend to exclude aspects of road safety, and livelihood strategies in a fragmented economy can foster more risk-taking driving behaviours for economic survival [7]. This establishes an environment that is very different to the road safety environment, and where existing road safety models may not be immediately relevant without adaptation to local conditions of instability and recovery.

2.3. Socio-Economic Factors Influencing Road Safety

The association between the socio-economic status and risk of road traffic injury is well documented. Some of the variables that play an important role in determining vulnerability are poverty, education and job category [10]. There are risk factors that are common in poor socio-economic environments such as the high proportion of old vehicle fleets, endemic low levels of vehicle maintaining behaviour, and the economic imperative to achieve maximum trip frequency and ensure business operators are not caught up in high risk behaviours such as speeding and overload [5]. Analogous studies in developing countries have shown an apparent relationship between low socio-economic status and limited access to safety related information, reduction in the ability to internalize the indirect costs of regulatory compliance (i.e. time spent in vehicle inspections), and increasing risk exposures due to the nature of travel and type of vehicle used [11]. This relationship of factors creates a socio-ecological system, in which the economic need can take precedence over awareness of safety.

2.4. Identified Research Gap

The literature has a strong focus on road safety measures, socio-economic measures, and starts to throw light on the dynamics after conflict, but it does not adequately focus on the synthesis of these aspects. There are only a few studies that have looked into the dynamics between these domains from a quantitative and qualitative perspective and in the context of North-East Nigeria. The effective measures in road safety are shown in Figure 2.



Figure 2. Effective Road Safety Measures

3. MEATHODOLOGY

Research Design: Survey research design is the design of research that involves a structured design of questions (interviews or questionnaires) and the systematic collection and analysis of data from a representative sample of a population to achieve certain research aims [12], [13]. The design is suitable for studies that aim at finding information about the opinion, attitude and practices of the individuals towards a certain phenomenon. This design was selected because of its appropriateness to collect quantitative information on the effectiveness of road safety measures and socio-economic factors that affect reduction in the number of accidents among motorists. It allows the researcher to make inferences from the sample to the larger population, as well as to make sound policy decisions [14], [15].

Area of the Study: The study area was in the North-East geopolitical zone of Nigeria which covers an expansive area of 103,630 km² in Adamawa, Bauchi, Borno, Gombe, Taraba and Yobe States of the country, bounded by 4.92° North latitude and 6.26° east longitude. The area encloses a considerable land area in Nigeria, with a variety of geographical features such as savannah grassland, semi-arid area, mountain and river basin. The North-East region has a vast network of roads linking to the important commercial and agricultural centres and that makes it a strategic area. Despite these positive developments, the region has less than ideal road infrastructure, insecurity and some divergent socio-economic conditions which all impact road safety results.

Population of the Study: The population of the study was 788 which were key stakeholders in the Road Transport Management and Safety Enforcement in North-East Nigeria. These were chosen as some of the affected personnel and groups who are directly engaged in road safety regulation and enforcement, the maintenance of roads infrastructure and transport operations.

Sample and Sampling Technique: The number of respondents in the study was 508 with sample and Sampling Technique employed. The distribution of the sample was done as follows: FRSC- 166 respondents, VIO- 100 respondents, FERMA- 71 respondents, NURTW- 171 respondents. The sample size was calculated by Taro Yamane formula to ensure that the sample size is sufficient to represent the population.

The population was first stratified by organizational affiliation, (FRSC, VIO, FERMA, and NURTW) and then sampled. Senior officers, administrators and experienced operators were specifically chosen within each stratum based on their experience and knowledge in road safety and transport management.

Instrument for Data Collection: Data were collected using a structured questionnaire titled: "Road Safety Measures and Socio-Economic Factors Questionnaire (RSMSEQ)". The instrument 30 questionnaire items. Likert scale was adopted for the measuring the weight of the response options

Validation of the Instrument: The instrument was subjected to face validation by three experts: Two lecturers from the Department of Technology Education, Modibbo Adama University, Yola. One senior officer from the Federal Road Safety Corps (FRSC). Corrections and suggestions provided were incorporated into the final version of the instrument..

Reliability of the Instrument: A pilot study was conducted in Plateau State, using respondents from FRSC, VIO, FERMA, and NURTW who were not part of the study area. This was done to avoid bias and contamination of the main study. Cronbach Alpha was to determine internal consistency and 0.87reliability coefficient was obtained.

Method of Data Analysis: The statistical data obtained were analyzed using descriptive statistical tools, i.e. means and standard deviations to respond to the research questions set and Analysis of Variance (ANOVA) at the 0.05 level of significance to test the hypotheses formulated. The rules of interpreting mean scores were also based on the pre-equipped rating scales that outlined the level of effectiveness, impact, and agreement. The items with a mean of 3.50 and above were considered as indicative of positive responses and those with a mean of less than 3.50 considered negative responses. Hypotheses were tested such that a p-value ≤ 0.05 led to rejection of the null hypothesis, while a p-value > 0.05 led to acceptance. The methodology was executed as shown in Figure 3.

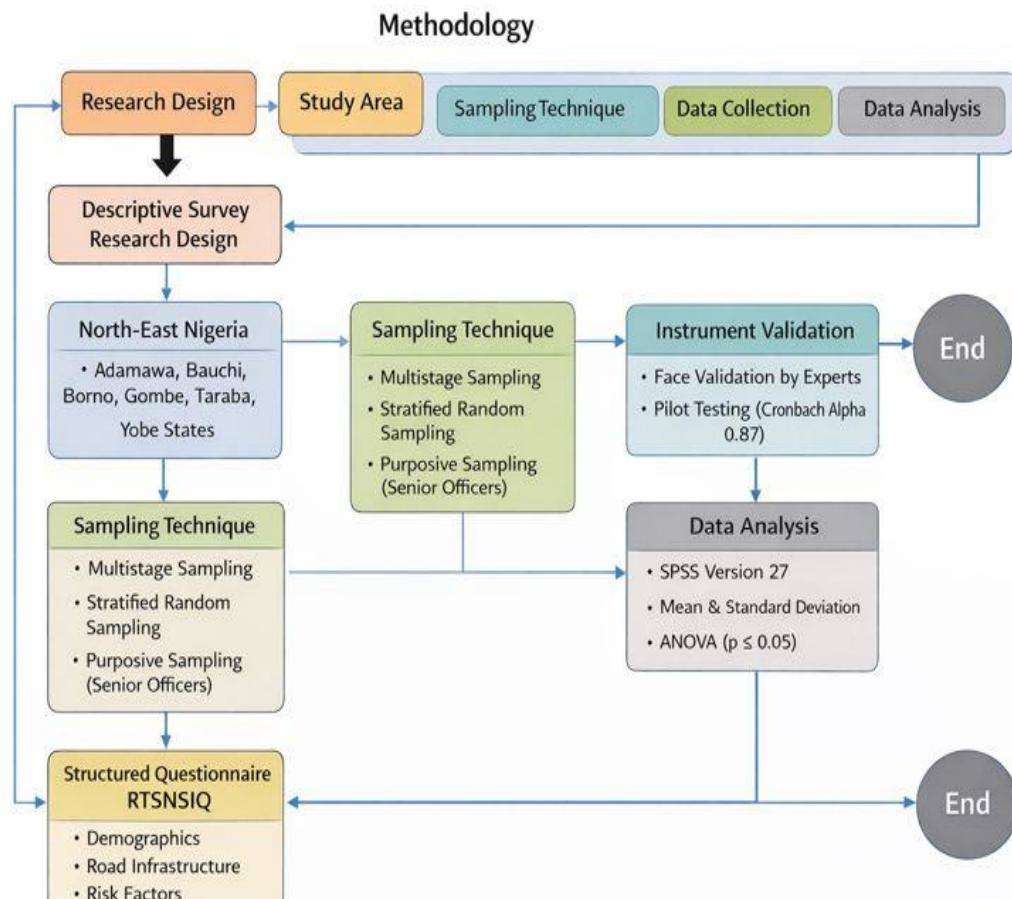


Figure 3. The Study Methodology

4. RESULTS AND DISCUSSION

4.1. Results

Research Question 1: How effective are the existing safety measures for reducing accidents among motorists in North-East Nigeria?

Table 1. Respondents' Mean and Standard Deviation on How Effective the Existing Safety Measures for Reducing Accidents among Motorists

S/N	Items	n = 166		n = 100		n = 71		n = 171		N = 508		Rmk
		$\bar{x}_{FR}$	SD_{FR}	$\bar{x}_V$	SD_V	$\bar{x}_{FM}$	SD_{FM}	$\bar{x}_{NU}$	SD_{NU}	$\bar{x}_g$	SD_g	
1	The signage indicating speed limits on highways in North-East Nigeria	3.02	0.13	3.03	0.17	3.04	0.20	3.02	0.13	3.02	0.15	ME
2	The visibility of road markings in North-East Nigeria	3.98	0.27	3.96	0.35	3.94	0.41	3.98	0.26	3.97	0.31	E
3	The enforcement of seatbelt usage among motorists in North-East Nigeria	4.07	0.25	4.11	0.31	4.15	0.36	4.06	0.25	4.09	0.28	E

4	The provision street lighting along major roads in North-East Nigeria	3.03	0.20	3.05	0.26	3.07	0.31	3.03	0.20	3.04	0.23	ME
5	The presence of traffic police patrols in North-East Nigeria	3.96	0.35	3.94	0.45	3.92	0.53	3.96	0.34	3.95	0.39	E
6	The effectiveness of traffic calming measures (Speed bump) in reducing accidents	3.92	0.47	3.87	0.60	3.82	0.70	3.92	0.46	3.90	0.53	E
7	The availability of pedestrian crossings in North-East Nigeria	2.95	0.31	2.92	0.39	2.89	0.46	2.95	0.30	2.94	0.35	ME
8	The effectiveness of road maintenance/repair programs in North-East Nigeria	2.99	0.28	2.95	0.41	2.99	0.43	2.99	0.28	2.98	0.33	ME
9	The implementation of driving regulations and laws in North-East Nigeria	3.01	0.21	2.97	0.33	3.01	0.32	3.01	0.20	3.00	0.25	ME
10	The effectiveness of public awareness campaigns on road safety in North-East Nigeria	2.02	0.24	2.04	0.32	2.06	0.37	2.02	0.24	2.03	0.28	SE
	Grand Mean									2.89	0.30	ME

KEY: E= Effective, ME = Moderately Effective, SE = Slightly Effective, NE = Not Effective, Rmk = Remark, $\bar{x}$ = Mean Response, SD = Standard Deviation

Table 1 indicates that while certain road safety measures are considered effective (mean ≥ 3.90), the majority of the measures were rated as moderately or slightly effective, with some measures like speed enforcement cameras deemed not effective. Overall, the grand mean of 2.89 suggests that the existing safety measures in North-East Nigeria are moderately effective in reducing accidents among motorists.

Research Question 2: What are the socio-economic factors contributing to road safety measures in North-East Nigeria?

Table 2. Mean Resonances on the Socio-Economic Factors Contributing to Road Safety Measures

S/N	Items	N = 508		Rmk
		$\bar{x}_g$	SD_g	
1	Road infrastructure development significantly influences road safety measures.	3.93	0.47	Agreed

2	Adequate enforcement of traffic laws contributes to improved road safety measures	3.98	0.22	Agreed
3	Economic stability positively impacts adherence to road safety regulations.	3.98	0.15	Agreed
4	Access to quality education correlates with better compliance with road safety measures.	3.73	0.85	Agreed
5	Availability of affordable public transportation options enhances road safety practices.	3.87	0.59	Agreed
6	Investment in road maintenance is crucial for ensuring road safety.	3.69	0.91	Agreed
7	Socioeconomic disparities affect access to road safety information and resources.	3.65	0.97	Agreed
8	Community awareness campaigns play a vital role in promoting road safety.	3.66	0.94	Agreed
9	Availability of emergency medical services influences road safety outcomes.	3.02	0.28	Disagreed
10	Socioeconomic status influences individuals' attitudes towards road safety	3.10	0.33	Disagreed
	Grand Mean	3.36	0.48	Disagreed

KEY: Rmk = Remark, $\bar{x}$ = Mean Response, SD = Standard Deviation

Table 2 show the analysis of socio-economic factors contributing to road safety measures in North-East Nigeria. With a grand mean of 3.36 and a standard deviation of 0.48, the findings suggest that although some socio-economic factors are seen as strongly contributing to road safety, the general perception is that socio-economic factors are only moderately effective in enhancing road safety measures in North-East Nigeria.

Research Question 3: What are the strategies for enhancing road safety measures among motorists in North-East Nigeria?

Table 3. Respondent-Derived Means and Standard Deviations of Strategies to Improve Road Safety Measures among Motorists.

S/N	Items	N = 508		Rmk
		$\bar{x}_g$	SD_g	
1	Frequent checking of traffic laws helps improve the road safety.	3.93	0.47	Agreed
2	Education of motorists on the significance of observing speed limits can be a good way of enhancing road safety among motorists.	3.98	0.29	Agreed
3	Introduction of more severe punishment on traffic offenders is essential towards ensuring that there is safer driving culture among motorists.	4.04	0.39	Agreed
4	Offering the defensive driving courses at accessible rates can assist the motorists in North-East Nigeria to acquire better road safety skills.	4.13	0.40	Agreed
5	To minimise accidents in motorists, it is important to improve road infrastructure	3.98	0.29	Agreed
6	The use of seat belts can be promoted by enforcing the law and conducting education to the population on the issue of road safety.	4.08	1.66	Agreed
7	The introduction of special resting places during lengthy travels can help curb the number of accidents caused by fatigue in motorists.	3.98	0.29	Agreed
8	The presence of police in highways will reduce the reckless behavior of motorists.	4.02	0.18	Agreed
9	The implementation of compulsory vehicle safety checks can be utilized to ensure that cars in the roads are at least safe.	3.98	0.29	Agreed

10	The use of local communities in identifying and responding to particular road safety issues can result in specific interventions.	3.57	1.05	Agreed
Average Mean		3.90	0.59	Agreed

KEY: Rmk = Remark, $\bar{x}$ = Mean Response, SD = Standard Deviation

The result presented in Table 3 offers empirical data pertaining to the appraisals of strategies that can be used to enhance road safety among motorists in North-East Nigeria. The respondents also showed a strong agreement regarding all items with a grand mean response of 3.90 (SD = 0.59).

Hypothesis 1: There is no significant difference in the mean response of FRSC, VIO, FERMA, and NURTW personnel on the effectiveness of the existing safety measures for reducing accidents among motorists in North-East Nigeria.

Table 4. ANOVA on the Effective the Existing Safety Measures for Reducing Accidents among Motorists

	Sum of Squares	df	Mean Square	F	Sig.	Remark
Between Groups	0.016	3	0.005	0.249	0.862	Accepted
Within Groups	10.861	504	0.022			
Total	10.877	507				

Table 4 shows the ANOVA results for Hypothesis 1. The table indicate that the between-groups sum of squares is 0.016 with 3 degrees of freedom, while the within-groups sum of squares is 10.861 with 504 degrees of freedom. The computed F-value is 0.249, and the corresponding p-value is 0.862. Since the p-value is greater than the α -value of 0.05, the null hypothesis is accepted.

Hypothesis 2: There is no significant difference in the mean response of FRSC, VIO, FERMA, and NURTW personnel on the socio-economic factors contributing to road safety measures in North-East Nigeria.

Table 5. ANOVA on the Socio-Economic Factors Contributing to Road Safety Measures

	Sum of Squares	df	Mean Square	F	Sig.	Remark
Between Groups	0.084	3	0.028	1.281	0.280	Accepted
Within Groups	11.081	504	0.022			
Total	11.165	507				

Table 5 shows the ANOVA results for Hypothesis 2. The results show that the between-groups sum of squares is 0.084 with 3 degrees of freedom, while the within-groups sum of squares is 11.081 with 504 degrees of freedom. The computed F-value is 1.281, and the corresponding p-value is 0.280. Since the p-value is greater than the 0.05 significance level, the null hypothesis is accepted.

Hypothesis 3: There is no significant difference in the mean response of FRSC, VIO, FERMA, and NURTW personnel on the strategies for enhancing road safety measures among motorists in North-East Nigeria.

Table 6. ANOVA on the Strategies for Enhancing Road Safety Measures among Motorists in North-East Nigeria

	Sum of Squares	df	Mean Square	F	Sig.	Remark
Between Groups	1.465	3	0.488	3.956	0.008	Rejected
Within Groups	62.217	504	0.123			
Total	63.682	507				

The result of the ANOVA in Table 6 tests Hypothesis 3, which states that there is no significant difference in the mean response of FRSC, VIO, FERMA, and NURTW personnel on the strategies for enhancing road safety measures among motorists in North-East Nigeria. The analysis yielded an F-value of

3.956 with a significance (p-value) of 0.008, which is less than the 0.05 threshold. Consequently, the null hypothesis is rejected.

Table 7. Scheffe's Post Hoc Test

(I) Respondents	(J) Respondents	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
FRSC	VIO	.07283	.04448	.444	-.0519	.1976
	FERMA	.14551*	.04982	.037	.0058	.2853
	NURTW	-.00343	.03828	1.000	-.1108	.1040
VIO	FRSC	-.07283	.04448	.444	-.1976	.0519
	FERMA	.07268	.05453	.620	-.0803	.2256
	NURTW	-.07626	.04423	.397	-.2003	.0478
FERMA	FRSC	-.14551*	.04982	.037	-.2853	-.0058
	VIO	-.07268	.05453	.620	-.2256	.0803
	NURTW	-.14893*	.04960	.030	-.2881	-.0098
NURTW	FRSC	.00343	.03828	1.000	-.1040	.1108
	VIO	.07626	.04423	.397	-.0478	.2003
	FERMA	.14893*	.04960	.030	.0098	.2881
*. The mean difference is significant at the 0.05 level.						

The Scheffe's Post Hoc Test in [Table 7](#) provides a detailed comparison of the mean responses of FRSC, VIO, FERMA, and NURTW personnel regarding strategies for enhancing road safety among motorists in North-East Nigeria. Therefore, the key reason that can be attributed to the observed large difference in the ANOVA [Table 6](#) is the difference in the responses of FERMA personnel in comparison to that of FRSC and NURTW personnel.

4.2. Discussion of Findings

The findings of the study revealed that the effectiveness of existing safety measures for reducing accidents among motorists in North-East Nigeria is generally perceived as moderately effective. This aligns with previous studies [\[16\]](#), [\[17\]](#), which reported that although safety measures such as speed bumps, warning signs, and periodic public enlightenment campaigns have been introduced, they have not been consistently maintained or enforced. These studies further emphasized that the lack of follow-up monitoring and weak public compliance significantly reduces the overall effectiveness of road safety interventions. Similarly, it has been reported in [\[18\]](#), [\[19\]](#) that enforcement agencies such as the Federal Road Safety Corps (FRSC) and other traffic regulatory bodies often face operational constraints, including inadequate personnel, logistics, and funding, which limit their capacity to fully implement road safety laws. These studies show that most of the safety efforts are mostly focused in urban areas and that the rural and intercity routes are more exposed to traffic accidents. Further, [\[20\]](#) and [\[21\]](#) found that while there are vehicle inspection units and driver licensing regulations in place, they are ineffective due to systemic problems and corruption where drivers can obtain a license without proper testing and vehicles can be cleared without proper mechanical checks, thereby raising the risk of accidents. In addition, it has been found in [\[22\]](#), [\[23\]](#) that road safety education programme is lacking in continuity and depth, and even when it is done together with schools and transport unions, this is not always the case. The programs are frequently reactive instead of proactive, and not part of a long-term road safety strategy, which results in the programs only having a short-term effect on behavior of motorists.

The study also highlighted socio-economic factors that pose influence on road safety measures in North-East Nigeria, which include the budget allocated to the maintenance of roads, availability of affordable alternative transport and overall financial stability in the North-East region. This is similar to the results obtained in [\[24\]](#) and [\[25\]](#) which showed that investment in road rehabilitation and maintenance can greatly help to minimize traffic-related incidents. It was also noted in [\[25\]](#) that the cost and availability

of the transportation system impacts on the choice of how people travel, with good quality public transport options decreasing usage of the unsafe options of poorly maintained private transport and overloaded commercial transport. Further, there is evidence in [22] that areas with more effective mobility system and infrastructure tend to have fewer traffic accidents. Studies in [23] also point to the fact that though poverty and unemployment are important socio-economic issues, they are not the key factors in determining the outcome of road safety, but rather the institutional funding and effective allocation of resources are more influential in the design of road safety prevention strategies.

Lastly, the results indicated that some of the key interventions that could enhance road safety among motorists in North-East Nigeria are: enhanced public awareness campaigns, improved law enforcement, rehabilitation of roads, enforcement of seatbelt use, greater law enforcement visibility, regular vehicle inspections, and the implementation of intelligent transport systems like surveillance technology and automated enforcement devices. The results are consistent with those of [20] who emphasized the need for the continuous public awareness-raising regarding the prevention of risky driving behavior particularly in the rural populations with less consciousness of safety. Likewise, statistics in [21] pointed out that if legislation is enforced and the penalties are steep, for example fines, license suspension and imprisonment, it can help curb traffic violations. Additional assistance is available in [25] where it is emphasised how the upgrading of infrastructure and enhancing vehicle inspection systems can help to reduce crash incidence. Also, the results in [22] reinforce the use of technological solutions like traffic monitoring and automatic enforcement systems that increase transparency, fight against corruption and increase the general efficiency of road traffic management systems.

5. CONCLUSION

The study clearly indicates that the determination of road safety in North-East Nigeria is one of the complex interaction between the technical interventions and socioeconomic factors. While available safety measures provide a fundamental structure, a lack of systematic enforcement, monitoring, and resource distribution of the safety measures in responsible agencies fundamentally frustrates their moderate effectiveness. Importantly, the results indicate that the determinants of risk exposure and compliance levels are not peripheral, and that it is specific socioeconomic factors – notably government infrastructure spending, transportation affordability and regulation, and overall financial stability of the community – that are the central elements. Hence, the need to move beyond policies is required to realize sustainable accident reduction.

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Author Contributions Statement

Name of Author	C	M	So	Va	Fo	I	R	D	O	E	Vi	Su	P	Fu
Stephen Zira Kumazhege	✓	✓		✓	✓	✓		✓	✓	✓		✓		
Haruna Gwana Bawa		✓				✓			✓	✓	✓		✓	
Michael Ubale Cyril	✓			✓			✓	✓		✓			✓	
Eric Borba Enoch					✓	✓			✓		✓	✓		✓

C : Conceptualization

M : Methodology

So : Software

Va : Validation

I : Investigation

R : Resources

D : Data Curation

O : Writing - Original Draft

Vi : Visualization

Su : Supervision

P : Project administration

Fu : Funding acquisition

Fo : Formal analysis

E : Writing - Review & Editing

Conflict of Interest Statement

There is no conflict of interest in the authors for the publication of this study.

Informed Consent

All the participants gave informed consent before participating in the study. Participants were assured of anonymity and confidentiality and the aim of the study was clearly explained to them.

Ethical Approval

Ethical clearance was obtained from the relevant institutional ethics committee and the study was conducted as per the accepted ethical guidelines as per social science research.

Data Availability

The data supporting the findings of this study are available from the corresponding author upon reasonable request.

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