Assessing Commuters' Perceptions of Road Safety Regulations and the Effectiveness of Enforcement Strategies in Benue State, Nigeria

Adeke Paul Terkumbur[1,2*], Mohamed Mostafa Hassan Mostafa[1], Dillip Kumar Das[1], Dandy Ejeh Omale[3]

[*]lead presenter: dasD@ukzn.ac.za

[1] Sustainable Transportation Research Group, University of KwaZulu-Natal, Durba, South Africa.
[2] Department of Civil Engineering, Joseph Sarwuan Tarka University, Makurdi, Nigeria.
[3] Federal Road Safety Commission, Abuja, Nigeria.

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Background

Recently, Nigeria, the most populous nation on the African continent, has experienced rapid urbanization and motorization, facing significant road safety challenges. Population growth and the resulting increase in travel demand have intensified road use, and road traffic crashes continue to pose serious public health and socio-economic problems. Road traffic injuries disproportionately affect developing countries due to factors such as inadequate infrastructure, weak regulatory enforcement, rapid motorization, and cultural attitudes toward traffic safety. The burden of road accidents extends beyond fatalities to include disabilities, long-term health complications, and substantial economic losses. Aside from road infrastructure deficiencies, commuters' behavioral factors and the enforcement of road safety regulations remain major contributors to road crashes. Nigeria's road safety records are becoming alarming, with some states ranking among the highest in road traffic crashes, thereby reflecting broader challenges in transportation infrastructure and regulatory frameworks.

Therefore, understanding road safety issues, with particular emphasis on an economically viable and rapidly growing state such as Benue, is essential for achieving sustainable development. This can support effective and sustainable transport planning, infrastructure design, and the formulation of road safety policies, thereby bridging existing gaps between regulatory awareness, compliance levels, and enforcement strategies in Benue State.

Research Aim, Objectives, and Questions

This study aims to assess commuters' perception and compliance with road safety regulations and examine the effectiveness of enforcement strategies in Benue State, Nigeria. Objectives of the study include;

1. To appraise the common causes of road traffic crashes in Benue State

2. To examine commuters' perception and compliance with road traffic regulations in Benue State.
3. To classify commuters' perceptions based on enforcement strategies using machine learning techniques.
4. To examine the correlation between commuters' perceptions and road safety regulations in Benue State.

The study answered the following questions;
1. Do commuters' perceptions and level of compliance with road safety regulations in Benue State align with global practices?
2. Do traffic regulations and enforcement strategies in Benue State conform to global standards?
3. What are the major factors influencing compliance with road traffic regulations in Benue State?
4. How effective are the enforcement strategies for road traffic regulations in Benue State?

Method

Data were obtained through structured questionnaires and analysed using descriptive and inferential statistics, and Machine learning techniques (Decision Tree, Random Forest, and KNN algorithms) to explore the relationship between commuters' perception of road traffic regulations and to measure the effectiveness of enforcement strategies.

Descriptive statistics – frequencies

Inferential statistics – correlation Analysis

Machine Learning – classifications of attributes

Results

The findings of this study revealed that road traffic crashes in Benue State are primarily influenced by interconnected behavioral, infrastructural, and institutional deficiencies. Despite 91.25% of the respondents recognising the importance of traffic regulations, through basic education, the level of compliance with safety regulations was low. The enforcement practices were widely perceived as inconsistent (32.75%), despite the awareness (30.25%), and road facilities (37.00%). The ML classifications showed that the RF model produced overfitted outcomes with perfect accuracy (100%), while the DT model exhibited weak predictive performance (below 50%). However, the KNN model demonstrated relatively moderate (above 50%) and more realistic classification due to its ability to handle small and imbalanced datasets, indicating that socio-demographic factors such as age, driving experience, and educational background significantly influence road safety perceptions and crash-related behaviors. Correlation analysis also revealed weak but meaningful relationships among variables, particularly between road safety strategies and commuters' perceptions, suggesting that improved safety interventions may positively influence public compliance and awareness.

Conclusion

Based on the findings, it was concluded that effective road safety strategies, strict enforcement of regulations, improved road infrastructure, and campaigns on road safety strategies would positively improve commuters' awareness and compliance with traffic regulations. These campaigns are expected to enlighten commuters and shape their perceptions of road safety rules and compliance with traffic regulations towards reducing the rate of traffic crash injuries and fatalities in Benue State.