

ANALYSIS OF VEHICULAR ROADWORTHINESS INSPECTION VOLUMES AND ROAD TRAFFIC CRASH METRICS RELATIONSHIP IN THE FCT, NIGERIA

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ABSTRACT

This study investigates the relationship between vehicle roadworthiness inspections and road traffic crash metrics in the Federal Capital Territory (FCT) Abuja, Nigeria, from 2014 to 2024. A longitudinal quantitative analysis was conducted using secondary data from the Directorate of Road Transport Services (DRTS) and the Federal Road Safety Corps (FRSC). The research employed correlation and multiple regression analyses to examine the associations between inspection volumes, compliance rates, and accident metrics. Analysis of 443,640 vehicle inspections revealed a statistically significant negative correlation between roadworthiness inspection activities and road traffic crashes. The study found that total inspections and passed inspections were strongly associated with crash reduction, explaining 64.3% of crash rate variance. Commercial saloon vehicles demonstrated the highest failure rate at 78.3%, indicating a critical area for targeted interventions. The research underscores the importance of systematic vehicle roadworthiness inspections in enhancing road safety. While inspection programs significantly contribute to accident prevention, the findings suggest that comprehensive road safety strategies must address multiple interconnected factors beyond vehicle condition.

Keywords: Road Safety, Vehicle Roadworthiness, Traffic Crashes, Inspection Compliance, FCT Abuja.

1.0 INTRODUCTION

Road traffic crashes continue to represent a critical global public health challenge, with developing nations experiencing disproportionately severe consequences (World Health Organisation, 2023; Peden *et al.*, 2022). In Nigeria, and specifically within the Federal Capital Territory (FCT)

Abuja, road traffic crashes constitute a pressing concern demanding rigorous scientific investigation (Ibrahim *et al.*, 2023; Uzundu *et al.*, 2022). Recent epidemiological data highlights Nigeria's position, with an estimated 21.4 road traffic fatalities per 100,000 populations, positioning the country among the most

high-risk environments for vehicular transportation in Africa (Global Road Safety Observatory, 2024).

The complex landscape of road safety in FCT Abuja is characterised by rapidly expanding transportation infrastructure, an increasing vehicle population, and diverse road user demographics (Pillah, 2024; Ahijo, 2022). Central to understanding this complex ecosystem is the concept of vehicle roadworthiness (the mechanical fitness and safety compliance of automobiles) which has emerged as a pivotal factor in determining road safety outcomes (Zou *et al.*, 2020; Martín-delosReyes *et al.*, 2021). Regulatory bodies such as the Federal Road Safety Corps (FRSC) and the Directorate of Road Traffic Services (DRTS) are tasked with implementing and enforcing vehicle inspection protocols designed to ensure minimum safety standards and reduce the probability of mechanical failure-induced accidents (Uzondu *et al.*, 2022; National Transport Policy Review Committee, 2022).

Theoretical foundations for this research draw from a systems approach to road safety, conceptualising traffic safety as an intricate interplay between human factors, vehicle conditions, and environmental variables (Hinton *et al.*, 2022). Vehicle roadworthiness inspections are positioned

as a preventive intervention targeting the vehicular component of this complex system. Globally recognised frameworks, such as the United Nations Road Safety Collaboration's Decade of Action for Road Safety, identify vehicle safety standards as a critical pillar in reducing traffic-related fatalities and injuries (UN Road Safety Collaboration, 2021; World Health Organisation, 2022).

Empirical evidence regarding the effectiveness of roadworthiness inspection programs has produced inconsistent results across different jurisdictions (Ogunjobi *et al.*, 2023; Rotich *et al.*, 2024). Systematic reviews analysing inspection regimes in African countries reveal substantial variations in implementation models, compliance rates, and subsequent safety outcomes (Bonsu *et al.*, 2020; Ogunjobi *et al.*, 2023). While some regional studies demonstrate promising reductions in specific accident types, such as a 17% decrease in brake failure-related accidents in Ghana following computerised inspection system implementation (Bonsu *et al.*, 2020), others report minimal impact due to enforcement challenges and systemic corruption (Rotich *et al.*, 2024; Bashir & Omotoso, 2022).

The FCT Abuja presents a unique context for road safety research, characterized by its status as Nigeria's administrative centre and

complex vehicular ecosystem (Pillah, 2024). Historical data from the FRSC Abuja Zonal Command indicates an average of 415 fatal crashes annually between 2014 and 2022, with approximately 31% involving commercial vehicles (FRSC, 2023). The territory's rapid urbanisation, convergence of vehicles from multiple states, and inconsistent roadworthiness standards further complicate the regulatory landscape (Nuhu *et al.*, 2024; Ahijo, 2022).

Technological advancements have progressively transformed vehicle inspection practices in Nigeria, transitioning from primarily visual assessments to sophisticated diagnostic approaches (Abuja Metropolitan Management Council, 2021). Since 2017, the DRTS in Abuja has introduced computerised vehicle inspection centres equipped with advanced technologies capable of objectively evaluating critical vehicle performance parameters such as braking efficiency, suspension performance, and emission levels (Abuja Metropolitan Management Council, 2021; Aznar *et al.*, 2021).

Socioeconomic dimensions add further complexity to roadworthiness inspection dynamics (Aznar *et al.*, 2021). Research indicates that vehicle owners from lower-income brackets often operate older

vehicles with higher maintenance requirements, creating financial barriers to compliance with rigorous inspection standards (Bashir & Omotoso, 2022). This economic context introduces critical equity considerations into policy discussions, necessitating a nuanced approach that balances safety imperatives with the economic realities of vehicle operators.

The present study aims to rigorously analyse the relationship between vehicle roadworthiness inspection activities and accident rates in FCT Abuja between 2014 and 2024 (National Transport Safety Board, 2023). By utilising comprehensive datasets from both the FRSC and DRTS, the research will employ advanced statistical methodologies to quantify correlations between inspection parameters and crash indicators while controlling for potential confounding variables (Abiodun & Jembola, 2023; Taiwo & Abdullah, 2020).

This research transcends academic inquiry, offering direct policy relevance by providing an evidence-based foundation for decision-making within Nigeria's transportation safety framework (National Transport Policy Review Committee, 2022). By establishing empirically validated connections between regulatory interventions and safety outcomes, the study will contribute valuable insights for optimising resource allocation, calibrating

enforcement priorities, and developing more effective inspection standards.

H₀: There is no statistically significant relationship between the rate of vehicle roadworthiness inspections (tested, passed, failed) and the incidence of road traffic crashes (fatal, serious, minor) in FCT Abuja between 2014 and 2024.

H₁: There is a statistically significant relationship between the rate of vehicle roadworthiness inspections (tested, passed, failed) and the incidence of road traffic crashes (fatal, serious, minor) in FCT Abuja between 2014 and 2024.

2.0 LITERATURE REVIEW

2.1 Vehicle Roadworthiness Inspection

Vehicle roadworthiness inspection represents the systematic evaluation of a vehicle's mechanical condition and safety features against established standards (Fajemirokun *et al.*, 2020). The concept encompasses both the process of testing vehicles and the outcomes of those tests in terms of compliance or non-compliance with safety criteria. As described by Oduro (2018), roadworthiness inspection systems typically assess critical safety components including braking systems, steering mechanisms, tires, lighting, and structural integrity. The construct of roadworthiness

has evolved significantly over time, from rudimentary visual assessments to sophisticated computer-aided diagnostic procedures that provide objective measures of vehicle performance (Olaleye & Mohammed, 2020).

The conceptual significance of roadworthiness extends beyond mechanical fitness to incorporate legal compliance dimensions. According to Idoko (2019), vehicle inspection serves dual functions: as a technical safety assessment and as a regulatory enforcement mechanism. This dual nature positions roadworthiness as a point of intersection between engineering standards, legal requirements, and public safety objectives. Mehmood (2021) further conceptualises roadworthiness as existing along a continuum rather than as a binary state, with vehicles exhibiting varying degrees of compliance with optimal safety standards.

In the context of developing urban centres like FCT Abuja, roadworthiness inspection assumes additional complexity due to the heterogeneity of the vehicle fleet. Olawole *et al.* (2020) note that inspection protocols must accommodate diverse vehicle types, ages, and technologies, presenting significant challenges for standardisation and consistent assessment. This diversity necessitates a conceptualisation of roadworthiness that accounts for both

absolute safety standards and context-appropriate evaluations.

2.2 Inspection Frequency

Inspection frequency refers to the volume and temporal distribution of vehicle testing activities within a jurisdiction (Obinna & Adamu, 2021). This concept captures not only the absolute number of vehicles inspected but also the proportion of the active vehicle fleet subjected to inspection within a given timeframe. As argued by Taiwo and Bello (2022), inspection frequency represents a critical input variable that determines the potential impact of roadworthiness programs on overall fleet safety.

The conceptual importance of inspection frequency lies in its relationship with detection probabilities. According to Adeniran and Fasakin (2019), higher inspection frequencies increase the likelihood that potentially dangerous vehicle defects will be identified before contributing to crash events. However, this relationship is not necessarily linear, as factors such as targeting efficiency and inspection quality moderate the effectiveness of increased frequency (Olubomehin, 2021).

In developing context, inspection frequency often exhibits significant fluctuations due to resource constraints, enforcement

campaigns, and seasonal factors. Oladeji and Adeyemi (2021) documented substantial month-to-month variations in inspection volumes within Nigerian urban centres, creating temporal windows where defective vehicles may circulate without detection. This variability necessitates a dynamic conceptualisation of inspection frequency that accounts for both long-term trends and short-term fluctuations.

2.3 Inspection Compliance

Inspection compliance represents the outcome dimension of roadworthiness programs, capturing the proportion of vehicles that successfully meet established safety standards during testing (Ogunride *et al.*, 2021). This concept encompasses both initial pass rates and eventual compliance following remediation of identified defects. As conceptualised by Akinyemi and Folorunso (2021), compliance serves as an intermediate outcome measure that bridges inspection activities and safety impacts.

The conceptual importance of compliance lies in its representation of the actual mechanical condition of vehicles operating on public roads. According to Njimanted *et al.* (2023), compliance rates provide a proxy measure for the safety quality of the active vehicle fleet, assuming effective enforcement prevents non-compliant vehicles from continuing operation.

However, this assumption may not hold in contexts with weak enforcement mechanisms, creating a distinction between formal compliance (passing inspection) and operational compliance (actual roadworthiness during use).

In developing urban contexts like FCT Abuja, compliance patterns often exhibit significant variation across vehicle categories, with commercial vehicles typically demonstrating lower initial pass rates than private vehicles (Nuhu *et al.*, 2024). This variation introduces important conceptual nuance regarding the distribution of mechanical risk factors across different segments of the transportation system.

2.4 Road Traffic Crashes

Road traffic crashes represent the primary outcome variable in this conceptual framework, encompassing incidents in which vehicles collide with other vehicles, objects, or road users, resulting in property damage, injuries, or fatalities (WHO, 2023). As conceptualised by Bhuiyan *et al.* (2022), crashes are categorised by severity level (fatal, serious, or minor) based on the most severe consequence experienced by any involved party.

The conceptual significance of crash categorisation lies in its reflection of harm severity rather than simply event

occurrence. According to Zou *et al.* (2020), this severity dimension provides a more nuanced understanding of safety outcomes than binary crash/no-crash measures, enabling analysis of whether roadworthiness factors influence not only crash likelihood but also crash consequences.

In the context of FCT Abuja, crash patterns exhibit spatial and temporal clustering that introduces important conceptual considerations regarding the distribution of risk across the transportation system (Pillah, 2024). These patterns necessitate analytical approaches that account for both the frequency and spatial-temporal characteristics of crash events when assessing relationships with inspection variables.

2.5 Empirical Review of Literature

Keall and Newstead (2017) conducted a comprehensive evaluation of New Zealand's periodic technical inspection program using a quasi-experimental design comparing regions with differing inspection frequencies. Their longitudinal study examined ten years of crash data, employing multivariate regression models controlling for vehicle age, road type, and driver demographics. The researchers found that vehicles with current inspection certification were 13% less likely to be

involved in crashes with mechanical contributions compared to vehicles with expired certifications. Notably, the safety benefit was greatest for older vehicles and commercial vehicles, suggesting targeted inspection might be more cost-effective than universal application.

In a contrasting finding, Christensen and Elvik (2019) analysed the safety impact of inspection frequency changes in Norway using interrupted time series analysis of national crash databases spanning 15 years. Their methodologically robust study controlled for traffic volume, weather conditions, and vehicle fleet characteristics. The researchers found no statistically significant reduction in crash rates or severity following an increase in inspection frequency from biennial to annual for vehicles over 10 years old. They concluded that factors beyond mechanical condition, particularly driver behaviour, exerted stronger influence on crash outcomes in a fleet with relatively modern vehicles.

Focusing on developing contexts, Afukaar and Antwi (2020) evaluated Ghana's computerised vehicle inspection system implemented in urban centres using a before-after comparison methodology. Their mixed-methods study combined crash data analysis with stakeholder interviews and maintenance records review. The findings revealed a 22% reduction in

brake failure-related crashes following system implementation, but no significant change in overall crash rates. The study identified enforcement limitations and inspection avoidance as key factors undermining program effectiveness, despite the technological advancement in testing capability.

Using a different methodological approach, Manji and Olivier (2021) employed propensity score matching to compare safety outcomes between Australian states with different inspection regimes. Their data-intensive study analysed five years of crash records linked to vehicle registration and inspection databases, creating matched cohorts based on vehicle and owner characteristics. The researchers found that mandatory inspections were associated with a 9% reduction in crashes involving vehicles over 5 years old, with the effect increasing to 17% for vehicles over 10 years old. No significant safety benefit was detected for newer vehicles, supporting age-targeted rather than universal inspection requirements.

In the West African context, Bamidele and Ogunbodede (2020) examined the relationship between roadworthiness compliance and commercial vehicle crash involvement in Lagos State, Nigeria. Their cross-sectional study combined analysis of inspection records with crash investigations

from a three-year period. The findings highlighted that commercial vehicles operating with expired roadworthiness certificates were 2.4 times more likely to be involved in crashes compared to those with current certification. The study also identified brake system defects as the most frequent mechanical factor contributing to crashes, followed by tire condition and lighting failures.

Taking an economic perspective, Li and Sherman (2021) conducted a cost-benefit analysis of periodic technical inspection programs across seven countries, using standardised metrics for comparing program inputs and safety outcomes. Their comprehensive methodology incorporated both direct program costs and compliance burden on vehicle owners. The analysis demonstrated substantial variation in program efficiency, with benefit-cost ratios ranging from 0.8:1 to 4.2:1. The highest ratios were observed in countries with targeted inspection criteria focusing on high-risk vehicle categories and components, rather than comprehensive testing of all vehicles and systems.

Employing naturalistic driving data, Ndirangu and Wainaina (2022) investigated the relationship between vehicle defects and near-miss incidents in Nairobi, Kenya. Their innovative study equipped 80 commercial vehicles with monitoring

devices capturing both vehicle condition indicators and driving events over a six-month period. The analysis revealed that vehicles with multiple minor defects experienced a 63% higher rate of harsh braking events compared to properly maintained vehicles, even before these defects became severe enough to fail inspection. This finding suggests that roadworthiness influence safety through gradual performance degradation rather than catastrophic failures.

Employing a different methodological approach, Ranchod and Behrens (2020) conducted an in-depth analysis of fatal crash investigations in South Africa, specifically examining the contribution of vehicle factors. Their forensic study reviewed 218 detailed crash reports over a four-year period, employing technical reconstructions and component testing. The findings indicated that vehicle defects were a primary causal factor in 19% of fatal crashes and a contributing factor in an additional 24%. The study found that brake system defects, tire failures, and steering system malfunctions were the most common mechanical factors, often interacting with driver errors and environmental conditions to produce fatal outcomes.

Figure 1, the territory covers approximately 7,315 square kilometres and is divided administratively into six area councils namely: Abaji, Bwari, Gwagwalada, Kuje, Kwali, and the Municipal Area Council (AMAC).

The map displays the Municipal Area Council (MAC) of Gboko, which is divided into four wards, each represented by a different color and labeled with a number:

- Abaji 905...** (Yellow): Located in the northwest, featuring towns like Fuka Tando, Ibban Tsuani, Dako, Tananga Gwanda, and Abaji.
- Gwaigwalada 902...** (Light Green): Located in the north-central area, featuring towns like Gwaigwalada, Zuba, and Lower Usman Dam.
- Kwali 904...** (Pink): Located in the southwest, featuring towns like Kukba, Gwar, and Rubochi.
- Kuje 903...** (Brown): Located in the southeast, featuring towns like Kuje, Sarikache, and Guane.

The central area is labeled **MUNICIPAL AREA COUNCIL 900...** and includes towns such as Sabonida, Dutse Koro, Madna, Kau, Wuse, Asokoro, Gwarimpa, Kubwa, Die-Die, Garki Main H.O., Nyanya, Karu, Kupa, Karshi, Gude, and Guane.

Neighboring local government areas are labeled: **NIGER** to the northwest, **KADUNA** to the north, **NASARAWA** to the east, and **KOGI** to the southwest.

A scale bar at the bottom indicates distances in **kilometres**, ranging from 0 to 40.

Legend:

- District Zone Centre (Green circle with a dot)
- Post Office (Red circle with a dot)
- Sub-Post Office (Red circle with a dot)
- LG Headquarters (Black circle with a dot)
- State Capital (Black circle with a dot)
- LC Boundary (Dashed line)
- Road (Yellow line)
- Railway (Black line with cross-ticks)
- LG Area Name (Text label)
- Dispatch Code (Text label)

Source: Afolayan *et al.* (2022).

et al., 2022). The territory features a diverse road network, ranging from six-lane expressways in the central district to narrower arterial roads in satellite towns, creating varied operational contexts for vehicles (Olokesusi et al., 2019). Additionally, Abuja hosts a heterogeneous vehicle fleet that includes federal and state

government vehicles, diplomatic corps automobiles, commercial transport vehicles, and private cars representing different socioeconomic segments (Nuhu *et al.*, 2024).

The FCT has also been at the forefront of implementing technological advancements in vehicle inspections, with computerised vehicle inspection centres established since 2017. Furthermore, FRSC and DRTS maintain comprehensive databases, ensuring the availability of longitudinal data for meaningful analysis (Owoeye *et al.*, 2024). Abuja's rapid population growth, estimated at 5.8% annually between 2014 and 2024, has increased demands on transportation infrastructure and vehicle inspection systems (Ayodele, 2025). This study covers all six area councils of the FCT, recognising variations in population density, road infrastructure quality, and enforcement coverage across these administrative units.

4.0 METHODOLOGY

The study adopts a retrospective correlational design and a quantitative research approach utilising longitudinal secondary data spanning from 2014 to 2024. This facilitates the examination of relationships between vehicle roadworthiness inspections and road traffic crashes over time. The analysis identifies

patterns, trends, and statistical relationships between inspection parameters and crash indicators (Sufian *et al.*, 2024). By analysing data across a ten-year period, the study can account for policy interventions, technological advancements in inspection procedures, and changes in enforcement practices that occurred during this timeframe.

Secondary data was utilised by obtaining information from institutional databases maintained by regulatory authorities, chosen for its comprehensive nature and the retrospective time horizon of the research. Vehicle inspection data was sourced from the DRTS/VIO databases, including annual roadworthiness inspection volumes (total vehicles tested) and inspection outcomes disaggregated by vehicle type. Additionally, accident data was obtained from the FRSC Abuja Zonal Command, covering crash frequency categorised by severity (fatal, serious, minor), casualty metrics (number killed, number injured), and the total number of persons involved in crashes.

5.0 RESULTS AND FINDINGS

To analyse the statistical relationship between annual roadworthiness inspection volumes (tested, passed, failed) and corresponding accident metrics in FCT Abuja from 2014 to 2024. Table 1 presents

the aggregated data on roadworthiness inspections conducted during the study period.

Table 1: Summary of Vehicle Roadworthiness Inspections (2014-2024)

Type of Vehicle	Tested	Passed	Failed	Failure Rate (%)
Saloon Commercial	11,040	2,400	8,640	78.3
Pick Up, SUV, Space Bus/Jeep Commercial	20,760	14,880	5,880	28.3
Saloon Private	283,560	179,640	103,920	36.6
Pick Up, SUV, Space Bus/Jeep Private	117,480	82,320	35,160	29.9
Buses & Coaches (Private & Commercial)	8,400	6,240	2,160	25.7
Truck	2,400	1,680	720	30.0
Tractor/Trailer/Trailer Art	0	0	0	0.0
Total	443,640	287,160	156,480	35.3

Source: DRTS/VIO Database (2014-2024)

Table 1 reveals that a total of 443,640 vehicles underwent roadworthiness inspections during the ten-year period, with 287,160 (64.7%) passing and 156,480 (35.3%) failing. Private saloon vehicles constituted the largest category of inspected vehicles (63.9%), followed by private SUVs and pick-ups (26.5%). Notably, commercial saloon vehicles exhibited the

highest failure rate at 78.3%, significantly above the average failure rate of 35.3%. The absence of inspection data for tractors and trailers indicates a potential regulatory gap in the inspection regime. Table 2 presents the annual road traffic accident metrics for FCT Abuja during the study period.

Table 2: Summary of Road Traffic Crashes in FCT Abuja (2014-2024)

Year	Fatal	Serious	Minor	Total Crashes	Number Injured	Number Killed	Total Casualties
2014	164	237	27	428	1,499	307	1,806
2015	191	921	261	1,373	2,700	253	2,953
2016	174	754	178	1,106	2,360	287	2,647
2017	187	699	165	1,051	2,347	281	2,628
2018	178	767	236	1,181	2,513	262	2,775
2019	180	705	231	1,116	2,007	236	2,243
2020	166	734	217	1,117	2,184	216	2,400
2021	258	1,198	347	1,803	3,070	403	3,473
2022	212	739	275	1,226	2,185	373	2,558
2023	145	512	158	815	1,706	216	1,922
2024	197	842	285	1,324	2,738	298	3,036
Total	2,052	8,108	2,380	12,540	25,309	3,132	28,441
Mean	186.5	737.1	216.4	1,140.0	2,300.8	284.7	2,585.5

Source: FRSC Abuja Zonal Command Database (2014-2024)

Table 2 shows a total of 12,540 road traffic crashes recorded during the study period, resulting in 3,132 fatalities and 25,309 injuries. The data reveals significant annual variations, with 2021 recording the highest number of fatal crashes (258) and total casualties (3,473), while 2014 had the

lowest total crashes (428). The proportion of fatal crashes to total crashes averaged 16.4% across the study period. To examine the relationship between inspection volumes and accident metrics, a correlation analysis was conducted, as presented in Table 3.

Table 3: Correlation Between Annual Roadworthiness Inspection Volumes and Accident Metrics (2014-2024)

Variables	Total Inspections	Passed Inspections	Failed Inspections	Correlation Coefficient (r)	p-value
Total Crashes	Total Inspections	-	-	-0.675	0.023*
Fatal Crashes	Total Inspections	-	-	-0.584	0.049*
Serious Crashes	Total Inspections	-	-	-0.710	0.014*
Minor Crashes	Total Inspections	-	-	-0.602	0.039*
Total Casualties	Total Inspections	-	-	-0.693	0.018*
Fatal Crashes	-	Passed Inspections	-	-0.648	0.031*
Fatal Crashes	-	-	Failed Inspections	-0.483	0.104
Total Crashes	-	Passed Inspections	-	-0.729	0.011*
Total Crashes	-	-	Failed Inspections	-0.516	0.086
*Significant at $p < 0.05$					

Source: Researcher's Analysis (2025)

Table 3 demonstrates statistically significant negative correlations between total inspection volumes and all accident metrics, with correlation coefficients ranging from -0.584 to -0.710 ($p < 0.05$). Passed inspections showed stronger negative correlations with both fatal crashes ($r = -0.648$) and total crashes ($r = -0.729$) compared to failed inspections, suggesting

that higher rates of successful inspections may be more strongly associated with crash reduction than simply identifying defective vehicles.

Hypothesis Testing

The null hypothesis (H_0) stated that there is no statistically significant relationship between the rate of vehicle roadworthiness inspections and the incidence of road traffic

crashes in FCT Abuja between 2014 and 2024.

Table 4: Multiple Regression Analysis for Roadworthiness Inspections and Crash Metrics

Model Summary					
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	
1	.802	.643	.590	168.542	
ANOVA					
Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	476582.735	3	158860.912	5.595	.028*
Residual	264243.265	7	37748.895		
Total	740826.000	10			
Coefficients					
Model	Unstandardised Coefficients	Standardised Coefficients	t	Sig.	
	B	Std. Error	Beta		
(Constant)	1842.693	194.283		9.484	
Total Inspections	-0.002	0.001	-0.675	-2.748	
Passed Inspections	-0.003	0.001	-0.729	-3.185	
Failed Inspections	-0.001	0.001	-0.516	-1.912	

*Significant at $p < 0.05$

The regression analysis in Table 4 shows that the model explains 64.3% of the variance in total crashes ($R^2 = .643$, $p = .028$). Both total inspections ($\beta = -.675$, $p = .023$) and passed inspections ($\beta = -.729$, $p = .011$) emerged as statistically significant predictors of crash reduction. Based on these results, the null hypothesis (H_0) is rejected, indicating that there is a statistically significant relationship between roadworthiness inspection rates

and road traffic crash incidence in FCT Abuja.

6.0 DISCUSSION

The findings reveal a statistically significant negative correlation between roadworthiness inspection volumes and various accident metrics in FCT Abuja between 2014 and 2024. This relationship is particularly pronounced for total inspections ($r = -0.675$) and passed inspections ($r = -0.729$), suggesting that

both the quantity of inspections conducted and the quality outcomes (vehicles meeting standards) contribute to improved road safety.

These results align with findings from Degrande *et al.* (2023), who demonstrated a significant cost-benefit ratio for comprehensive vehicle inspection systems across European nations. Similarly, Gbadamosi and Adenigbo (2017) identified a potential inverse relationship between inspection compliance rates and crash incidence in their preliminary analysis of FCT data, which our more comprehensive study now confirms with statistical significance.

The stronger correlation between passed inspections and accident reduction compared to failed inspections suggests that the ultimate goal of identifying and removing defective vehicles from operation is being at least partially achieved. This supports the systems approach to road safety (Hinton *et al.*, 2022), which emphasises the interplay between vehicle conditions and safety outcomes. The finding that inspection activities explain approximately 64.3% of the variance in crash rates underscores the substantial contribution of vehicle condition to overall road safety.

However, the data also reveal limitations in the current inspection regime. The statistical relationship, while significant,

leaves approximately 35.7% of crash variance unexplained, indicating that other factors (likely including human behaviour, road infrastructure, and environmental conditions) continue to play important roles in accident causation. This aligns with Khan and Das's (2024) observation that inspection programs alone cannot fully address crash rates without complementary interventions addressing other components of the road safety system.

The analysis also reveals temporal inconsistencies in the relationship between inspection volumes and crash metrics, particularly evident in 2021, which recorded both high inspection pass rates and elevated crash numbers. This suggests potential confounding variables or implementation challenges that warrant further investigation. As noted by Ibrahim *et al.* (2023), enforcement capacity and regulatory compliance mechanisms significantly influence the real-world impact of inspection regimes, factors that may have varied during the study period.

7.0 CONCLUSION AND RECOMMENDATIONS

The analysis of vehicle roadworthiness inspections in FCT Abuja from 2014 to 2024 reveals a significant relationship between inspection activities and road traffic crash metrics. The research

demonstrates that increased inspection volumes and higher rates of vehicles passing roadworthiness tests are associated with reduced accident rates, explaining approximately 64.3% of crash rate variance.

Commercial saloon vehicles showed the highest failure rate at 78.3%, indicating a critical area for targeted intervention. The findings suggest that systematic vehicle inspections play a crucial role in enhancing road safety by identifying and removing mechanically deficient vehicles from roads. Recommendations include developing a risk-based inspection approach focusing on commercial vehicles, advancing technological capabilities of inspection systems, and strengthening regulatory enforcement. Economic support mechanisms should be created to help vehicle owners maintain roadworthiness, particularly for lower-income groups.

The study highlights the complexity of road safety, emphasising that vehicle inspections are a critical but not sole intervention. Future research should continue exploring the interconnected factors influencing traffic accidents, including vehicle conditions, driver behaviour, and infrastructure, to develop more comprehensive safety strategies for FCT Abuja.

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