

## Assessment of selected Roads with Speed Violations in the Federal Capital Territory (FCT) Abuja

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**Abstract:** *Speed has been identified as causing 50% of road traffic crashes globally, and road safety measures are now targeting speed reduction. This study aim to assess speed violations in the Federal Capital Territory (FCT). Speed data were collected with a radar gun and other details of the vehicles such as the direction of movement, vehicle category, peak or off-peak period, and days of the week associated with the sample vehicle were also recorded. A sample of 240 vehicles were selected from six roads linking FCT Abuja to the suburbs, Speed of 100kmph and above were considered as violations while 99kmph and below were considered acceptable. The data were analyzed using the Pearson Chi-Square test and One sample t-test analysis. The result shows significant speed violations along Kubwa expressway and Mabuchi-kado particularly with private vehicles, on weekdays, at peak periods, and both weekends and weekdays respectively. The study concludes that there is a high rate of speed violations and recommend that public enlightenment, enforcement of speed-limiting devices in both private and commercial vehicle with the installation of traffic calming, especially speed camera must be deployed on all highways.*

**Keywords:** Speed, Violation, Road Safety, Enforcement, FCT Abuja).

### Introduction

The very reason for the development of motor vehicles is to achieve quick turnaround time. But the safety implication of the quick turnaround time came to focus when Bridget Driscoll died in a crash in 1844. The car was traveling at 12kmph. It then became apparent that we need to 'kill the speed before it kills us'. Speed has been identified by the United Nations as causing 50% of Road Traffic Crashes (RTC) and fatalities in low and middle-income countries (UN, 2010). It increases the inability to maneuver, increases the stopping distance, and so on.

While a pedestrian has a 90% chance of survival if hit by a vehicle moving at 30 kmph, and a 50% chance of a vehicle moving at 45kmph, a pedestrian hardly has a chance of survival if hit by a vehicle moving at 80kmph (WHO, 2018). The Nigeria Highway Code (2013) corroborated this that vehicles moving at 40kmph can stop at 22m. A vehicle moving at 80kmph can only stop at 72m respectively. Hussain et al., (2019) found that for each 1km/hr increase in impact speed, there is an 11% increase in pedestrian fatality and a 7% increase in serious injury.

The Target 6 of the Global Road Safety Performance Target (2017) aims to half the number of vehicles moving above the posted speed limit by the year 2030. The Stockholm Declaration (GMCRS, 2020) intends to manage speed by enforcing 30kmph in built-up areas. Various strategies have been adopted to curtail speeding vehicles such as road classification, traffic calming, and dedication to speed zones on the road (fast, middle, and slow lanes) and the installation of speed cameras. Most of these measures have be found to be effective in speed

control. Hu & Cicchino (2024) found that the risk of fatal and serious crashes dropped between 11 percent and 20 percent on arterial roads in Seattle when the speed limit was lowered from 30mph to 25mph. in another survey by Reagan & Cicchino (2024) on the acceptability of measures to reduce speeding among drivers in US revealed that 60 percent of drivers wants a system that will warn drivers when they exceed the speed limit. Futher to the acceptability of the measures, 43 percent ticketing of drivers who exceed speed limit as a way of reducing speeding behavior among drivers (AAA Foundation for traffic safety, 2023)

The Federal Road Safety Corps has mandated vehicle owners (commercial from Jan 2017) to install speed limiters in their vehicles failure of which attracts a fine of ₦3,000 or 6 months imprisonment. The maximum speed expected from each category of vehicle has been written in the Nigeria Highway Code. A visit to major highways however confirms that the only condition compelling these vehicle categories to their prescribed speed limit is when the road is monitored by Road Safety Corps personnel. The driver's intent or state of mind, whether or not there is criminal etc. are irrelevant to the inquiry. Shawky, Sahnoun, and Al-Zaidy, (2017) reveal that the presence of a speed limit on the road can influence its violation at a 95% confidence level particularly on weekends and in rural areas

The concept of Speed violations has been studied using various methods. Cheng et al., (2019) and then Alnansa Alomasi, and Imam (2022) employed binary logistic regression method to study speed violations in Wujiang China and a decision tree to specify factors that influence



speed violations. Sutela and Aaltonen (2020) used Generalised additive methods to investigate whether and temporal characteristics of speed sanction rates in Finland while Javid and Al-Roushid (2019) used multivariate statistical Analysis to analyse questionnaire on speeding behavior in Oman and discover speed is common with young male. Kuskapan Codur, and Alalay (2021) used spatial analysis and machine learning algorithm to investigate violations among heavy-duty vehicles.

Most of these previous studies considered more than one independent variable in their studies. Considering the effect of the independent variable 'speed' over other more dependent variables 'peak/off-peak, categories of vehicles, and direction of vehicle movements respectively. The study has attempted to find out the categories of vehicles involved, crash implication of increase speed, when, and where it is more prevalent using one sample t-test as vehicles commute daily between the Federal Capital City (FCC) and the Satellite towns of Federal Capital Territory (FCT). Findings would lead to a more proactive strategy that could be adopted by the law enforcement agent in speed limit enforcement.

### Materials and Methods

The research utilizes Primary data for the study. The primary data was obtained with a field survey using a radar gun. The identified routes include Airport Road, Kubwa Express, Mabuchi-Kado/Life Camp Road, Gwarinpa Express, and Apo-AYA road respectively. All the roads have a maximum designed speed of 100kmph.

Since there is no existing Average Daily Traffic (ADT) count on the identified routes, a Pilot survey was carried out on each selected road to determine the Average Daily Traffic. This was done using the moving observer method. It involves a floating survey car moving at 100kmph within a stretch of 2km and the count of the number of vehicles that overtook the floating car. The survey reveals that an average of 60% of vehicles overtook the floating car while the floating car overtook 40% of the vehicles as shown below.

Table 1: Pilot study data

SN	Road	Speed		Total
		<100kmph	>10kmph	
1	Airport road	10	2	12
2	Kubwa express	15	3	18
3	Mabuch-Kado/life camp	10	1	11
4	Gwarinpa express	4	9	13
5	Apo-AYA	2	12	14
	Total	41	27	68

The ADT was also used to determine the probability of positive and negative responses needed for determining the sample size. The sample was determined using Topman sampling techniques developed by Cochran, (1963) thus;

$$N = \frac{Z^2 pq}{E^2} = \frac{1.96^2 (0.6 \times 0.4)}{(0.05)^2} = 1200 \text{ samples}$$

Where n=sample size

$$z=SD \text{ at } 95\%=1.96$$

p=probability of positive response

q=probability of negative response

e=5%, the limit of tolerable error

The main sample survey was based on Average Daily Traffic ADT (1200) obtained from the pilot traffic count. The survey assistants stood at the designated survey point on each selected roads to record the vehicle speed, categories (private/commercial), and the direction of traffic flow (in/out of FCC). A sample of 240 vehicles each was selected from the six (6) designated routes between the morning and afternoon peak hours of 8 am - 11 am and 4 pm-7 pm each day for two weeks.

Speed of vehicles moving at 50kmph, 60kmph, 70kmph, 80kmph, 100kmph 120kmph and 140kmph respectively were recorded. Vehicles moving at 100kmph, 120kmph, and 140kmph are regarded as over speeding (i.e. if 50% is the pass mark in an examination anyone that scores exactly 50 has passed hence vehicle at 100kmph is over speeding)

The analysis was done with Pearson Chi-Square to find the level of significance of the mean speed between the dependent variables while the One sample t-test available in Statistical Package for Social Sciences (SPSS) was used to compare speed values with the hypothesized mean of 100kmph to evaluate speed violations along different roads and at various times of the week, vehicle category etc. the research hypothesis Ho: Vehicles do not over speed along the identified roads was set and investigated.

### Results

Table 2 revealed that a total of 656 vehicles (55%) traveled at 100kmph and above while 544 traveled below 100kmph (45%) respectively. The highest cases of speed violations were recorded along Kubwa express road, Mabuchi Kado Life camp road, and Airport Road respectively. Furthermore, the Chi-square analysis shows no significant difference in the vehicle speed values on all the roads.

Table 2: Difference in mean speed on the selected roads

	Speed										Total	Pearson Chi-Square Df=24
	Below 100kmph					Above 100kmph						
	50	60	70	80	Sub-total	100	120	140	Sub-total			
Airport rd	14	17	15	34	80	97	48	15	160	240	= 286.803a	
Kubwa Express rd	4	10	22	35	71	87	65	17	169	240		
Mabuchi Kado rd	6	10	18	28	62	104	47	27	178	240		
Gwarinpa Express	24	36	56	46	162	48	20	10	78	240		
Apo AYA	51	29	72	17	169	29	27	15	71	240		
Total	99	102	183	160	544	365	207	84	656	240		Sig=0.00

Table 3 presents the mean speed between private and commercial vehicles. Private vehicles account for 64%



(422) of the speed violations while the remaining 36% involved commercial vehicles.

**Table 3: Difference in mean speed between Private and Commercial Vehicles**

	Speed										Pearson Chi-Square Df=6
	Below 100kmph					Above 100kmph					
	50	60	70	80	Sub-total	100	120	140	Sub-total	Total	
Private	41	41	82	84	248	218	132	72	422	670	66.144 <sup>a</sup>
Commercial	58	61	101	76	296	147	75	12	234	530	
Total	99	102	183	160	544	365	207	84	656	1200	Sig=0.00

Table 4 revealed that vehicles moving into FCT Abuja account for 52% (339) of speed violations while the remaining 48% took place while the vehicles were moving out of FCT Abuja.

**Table 4: Difference in mean speed between vehicles moving into and out of FCT**

	Speed										Pearson Chi-Square Df=6
	Below 100kmph					Above 100kmph					
	50	60	70	80	Sub-total	100	120	140	Sub-total	Total	
To FCT	44	58	90	88	280	191	99	49	339	619	7.113 <sup>a</sup>
From FCT	55	44	93	72	264	174	108	35	317	581	
Total	99	102	183	160	544	365	207	84	656	1200	Sig=0.311

Also, Table 5 shows a total of 55% (358) of the speed violations took place during the weekdays while the remaining 45% took place during the weekend.

**Table 5: Difference in mean speed on weekends and weekdays**

	Speed										Pearson Chi-Square Df=6
	Below 100kmph					Above 100kmph					
	50	60	70	80	Sub-total	100	120	140	Sub-total	Total	
Weekend	41	38	65	63	207	178	88	32	298	505	=11.964 <sup>a</sup>
Weekday	58	64	118	97	337	187	119	52	358	695	
Total	99	102	183	160	544	365	207	84	656	1200	Sig=0.063

Table 6 revealed that most of the speed violations took place during the peak period (53% or 350) while the remaining (47%) took place during the off-peak periods respectively.

**Table 6: Difference in mean speed during Peak and off-peak periods of movement**

	Speed										Pearson Chi-Square Df=6
	Below 100kmph					Above 100kmph					
	50	60	70	80	Sub-total	100	120	140	Sub-total	Total	
Peak	50	47	95	80	272	190	107	53	350	622	=5.915 <sup>a</sup>
Off-peak	49	55	88	80	272	175	100	31	306	578	=5.915 <sup>a</sup>
Total	99	102	183	160	544	365	207	84	656	1200	Sig=0.433

Table 7 presents the result of the Chi-square analysis and the hypothesis testing. However, the Chi-square reveals no significant vehicle speed values on all the roads, further investigation with a t-test at a 95% level of

confidence accepted the hypothesis (Ho) thereby confirming the presence of speed violations along Kubwa Express road, Mabuchi roads, and a limited extent along Airport road respectively. And for the Gwarinpa express and Apo-AYA roads, the confidence level is greater than zero, hence the Ho is rejected.

**Table 7: Speed violations along the roads**

Road	Mean	Mean different	T	df	Sig. (2-tailed)	95% Confidence Interval of the Difference		Decision
						Lower	Upper	
						Airport Rd	96.0417	
Kubwa Express Rd	100.0833	0.08333	0.059	239	0.953	-2.6816	2.8483	0.1667
Mabuchi Kado Rd	100.9167	0.91667	0.633	239	0.527	-1.9350	3.7683	1.8333
Gwarinpa Express	81.5000	-18.50000	-12.372	239	0.000	-21.4457	-15.5543	-37.0
Apo AYA	78.8750	-21.12500	-12.157	239	0.000	-24.5481	-17.7019	-42.25

The t-test analysis in Table 8 presents vehicle movement characteristics such as the direction of movement, peak or off-peak movement, vehicle categorization, etc. revealing that private vehicles violate speed regulations while moving into FCC at peak periods of weekends and weekdays respectively. Commercial vehicles do not have this is not common with commercial vehicles, they move below 100kmph at most times.

**Table 8: Vehicle movement characteristics and speed violations**

Vehicle category	Period	Direction of Movement	Traffic	N	Mean	Mean Difference	T	df	Sig. (2-tailed)	95% Int
										Lower
Private	Week end	To FCC	Peak	65	104.769	4.767	1.653	64	.103	-0.99
			Off peak	71	97.465	-2.535	-0.821	70	0.414	-8.8
	From FCC	Peak	60	102.43	2.43	0.991	106	0.324	-2.4	
		Off peak	79	91.932	-8.0682	-3.011	87	0.003	-13	
	Week day	To FCC	Peak	107	99.167	-0.833	-2.50	59	0.803	-7.4
			Off peak	88	92.405	-7.595	-3.098	78	0.003	-12
From FCC	Peak	95	93.369	-6.632	-2.401	94	0.018	-12		
	Off peak	105	93.238	-6.762	-2.632	104	0.010	-11		
Commer-cial	week end	To FCC	Peak	70	85.286	-14.714	-5.870	69	0.000	-19
			Off peak	57	85.965	-14.0351	-4.580	56	0.000	-20
	From FCC	Peak	60	81.7045	-18.296	-7.526	87	0.000	-23	
		Off peak	43	82.466	-17.534	-6.375	72	0.000	-23	
	week day	To FCC	Peak	88	84.167	-15.833	-4.779	59	0.000	-22
			Off peak	73	89.767	-10.233	-2.837	42	0.007	-17
From FCC	Peak	787	88.701	-11.299	-4.080	76	0.000	-16		
Off peak	62	85.000	-15.000	-4.674	61	0.000	-21			

### Discussion and Policy Implication

The above analysis utilizes a combination of mean, simple percentages, Chi test, and t-test analysis respectively. The mean and percentages available in the SPSS were used, to sum up the values while the Chi-square was used to determine the strength of relationships between the values. However, the t-test was used to further probe into the variables to find their actual effects. To do this, speeds of 100kmph and above were considered violations, while speeds of 99kmph and below were regarded as non-speed violations.



The finding shows that vehicles generally violate speed specification of a maximum of 100kmph along, Kubwa Express road, Mabuchi roads, and Airport roads respectively but do not generally violate speed regulations along Gwarimpa and Apo-AYA roads. However, these violations are more common with private vehicles, when coming into FCC during the peak hours of the working days. Speed violation is lesser among commercial vehicles when vehicles depart FCC, on weekends, and during off-peak hours respectively.

Against the background that awareness of speed monitoring can influence and then modify speed violations (Fuquan et al, 2020), this survey method utilized unobstructed means since none of the motorists studied were stopped during the investigation. Rather, their speeds were simply recorded with a radar gun, and vehicular movement characteristics such as the direction of movement, period of movement, etc were attached to the recording.

The result agrees with the findings of Obaidat et al, (2020) that speed violation is associated with an emergency, running late to work, traffic jams, road grade, terrain type, social culture, low-speed limit, and wrong and by extension Zamonor (2012) and Berner et al, (2019) which identified age with gender and improved driving skills respectively as witnessed along Kubwa expressway, Airport Road and Mabuch – Kado road respectively.

The result also agrees with Alomari et al (2021b) that when there is a difference between design speed and speed limits of more than 10kmph, there would be an increase in speed variance which leads to violations. The identified road with speed violations is primarily designed for about 120kmph while the speed limit in Nigeria is 100kmph for cars or to be precise 99kmph since a vehicle traveling at 100kmph is already violating speed regulations. The analogy for this is that if a pass mark in an examination is 50 marks, any candidate that scores exactly 50 marks has passed. It is noteworthy that speed violations are common among Private vehicles. This however disagrees with the findings of Ambo et al, (2020) which identified Commercial Busses as more involved in speed violations after subjecting the data to a multinomial logistic regression analysis.

It is therefore instructive that law enforcement agents pay more attention to Kubwa and Mabuchi-Kado express ways to curb the rising trend of speeding vehicles since this is a recipe for road traffic crashes. Particular interest should be placed on Private vehicles trying to make brisk business activities in the Federal Capital City.

### **Conclusion**

This research considered a speed of 100kmph the lower limit of speed violations. Consequently, important

factors predisposing the highways to road traffic crash as a result of speed violations were highlighted. Law enforcement agents are to take a cue from this going forward in an effort to reduce crashes. However, the following recommendations were made:

- i. Increase awareness of the inherent danger of speeding, among private and public transit drivers using all available means
- ii. Installation of speed cameras on inter cities roads with information signposts to warn motorists of over speeding
- iii. Road monitoring and surveillance by law enforcement agencies will act as a deterrent to road users who may be addicted to speeding.
- iv. Installation of traffic calming devices and other forgiving engineering structures to alter drivers speeding behavior.

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