Current Trends of Vehicular Accidents in Nigeria.

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ABSTRACT

The present study attempts to analyze the data on the Road Vehicular Accidents (RVAs) from 1960 to 2006, compare the data for pre-Federal Road Safety Commission and post-Federal Road Safety Commission, and develop models for the prediction of number of reported cases of accidents, number of deaths attributable to RVAs as well as number of injuries.

Statistical analysis was done using SPSS 16.0 statistical package, the package was also used to develop the best of fit for the collected data by considering eleven models and the best selected. The study established that there reduction in the number of reported cases of accidents was statistically significant while those of deaths and injuries were not significant. Moreover, the values obtained using the models were not significantly different from the obtained data meaning that the models may be used to predict future cases of accidents, deaths and injuries.

(Keywords: road vehicular accidents, RVA, deaths, injuries, safety, reported cases, model)

INTRODUCTION

Road Vehicular Accidents (RVA) cause injuries, deaths and losses to properties in addition to damages to vehicles (Partheeban et al., 2008). They also stated that road vehicular accidents "are one of the most important problems being faced by modern societies". In fact, WHO (2004) estimated that 1.18 million people died from RVA in year 2002 and injuries from the same accidents accounted for 2.1 percent of all global deaths.

In the United States of America, RVAs are at the forefront of the cause of injury death (Subramanian, 2006). Mungnimit (2001) noted that 13,000 people died in RVA and hundreds of thousands are either injured or crippled annually in Thailand. Similarly, Bener and Crundal (2005) noted that RVAs are increasingly being regarded as a growing health concern in Bedoin Arabian Gulf Countries.

Out of the four main modes of transportation namely road, rail, air and marine, the one that puts people at the greatest risk of injury per kilometers travelled is road transportation (WHO, 2004). Moreover, RVAs are dominated by young adults who constitute the workforce of any nation (Posada et al, 2000).

Perhaps the human agonies and deaths coupled with damage to properties provoked the various studies on RVA. In the developing world just as in the developed countries, travelling by road is the major cause of accidental death (Hijar et al., 2000). A study carried out by Eke et al. (2000) in Nigeria found that RVAs was the leading cause of deaths in Port Harcourt (Niger Delta Area). Similarly, Balogun and Abereoje (1992) observed that RVAs has been a major cause of deaths in Nigeria.

However, the studies that had been carried out in Nigeria are either limited to a town (Eke et al., 2000) or to a state (Jegede, 1988). Some others (Afamdi, 1986 and Asogwa, 1992) though cover the whole country are limited to 10 year-data. To the authors' knowledge only the study of Nnadi and Ibe (2007) covered a period of 27 years.

The present study concerns itself with the trends of RVAs in Nigeria between 1960 and 2006. In

doing this, it compares the RVAs before the Federal Road Safety Commission (FRSC) was established in 1988 (1969-1987) and after its establishment (1988-2006). It also attempts to propose a model for predicting future RVAs which may guide policy makers including FRSC in policy formulations.

METHODS

The current study is based on data collected from FRSC (2009) total number of cases of reported accidents, on the spot fatal accidents, serious injuries, minor injuries as well as total fatal accidents (which include on the spot fatal accidents) and number of injuries reported (which may have excluded those who died later as a result of serious injuries sustained). Also, the data on the number of registered vehicles were obtained from the National Bureau of Statistics (2009).

Statistical analyses were conducted on the data obtained using SPSS 16.0 statistical package. 2-Tail paired samples T-test was conducted for the data between 1969 and 1987 (Period 1) with those between 1988 and 2006 (period 2) to establish whether there any reduction in RVAs between the two periods. The periods correspond to 19 years before the establishment of FRSC and 19 years after its establishment.

Also, the numbers of RVAs were correlated with number of registered vehicles for years 2000 to 2005 (available data).

Moreover, eleven models available in SPSS 16.0 statistical package namely Linear, Logarithmic, Inverse, Quadratic, Cubic, Compound, Power, S, Growth, Exponential, Logistic. The model with the highest R^2 selected as representing the best curve of fit for the data. The values obtained with the selected model were also statistically compared with the obtained data.

RESULTS AND DISCUSSION

Data on Reported Accidents: Figure 1 shows the trends of accidents from 1960 to 2006. The number of reported cases of accidents declined substantially in 1988 with the highest number of 40,881 recorded in 1976 and the minimum of 1754 recorded in 1989 just a year after the inauguration of Federal Road Safety Corps as shown in Table1.

The maximum number of deaths of 11,382 was recorded in 1982 while the minimum of 1083 was recorded in 1960. However, the maximum number of injuries of 30,023 was recorded in 1977 and the minimum of 5,759 recorded in 1992. The number of registered vehicles in from 2000 to 2005 is presented in Table 2.

Data on Registered Vehicles: The number of vehicles rose from 260,646 in year 2000 to 519,736 in year 2001 before declining to 232,814 in year 2005 (Table 2).

Statistical Analysis for Pre-FRSC and Post-FRSC: The statistical analysis done for data collected for period 1 (1969-1987) and period 2 (1988-2006) shows that the reported accident cases were significantly different between the two periods (t=7.651, p=0.000). In fact the difference in their means is 12,873.63 with a standard deviation of 7,334.63 signifying that there is a drop in the reported cases of accidents between the two periods (Table 3).

For reported deaths though there were no significant differences (t=-0.46, p=0.651), there were more reported deaths in period 2 (mean of 7469.47) than period 1 (mean of 7072.74). The reported injuries dropped in period 2 (mean of 18587.53) as compared to period 1 (mean of 21987.11) and the reduction was statistically significant (t=1.625, p=0.122). The findings are in agreement with the study of Nnadi and Ibe (2007) except that the means reported by them are at variance with the present study. They reported means of 31346.43 (cases), 8391.29 (deaths), 24450.14 (injuries) for period1 and 17524.29 (cases), 7506.50 (deaths), 20555.36 (injuries) for period 2. This may be the due to the fact that their study covered 1974 to 2001 while the present study covers 1960 to 2006, though for paired sample analysis, 1969 to 2006 was considered

Number of Registered Vehicles and Road Vehicular Accidents (RVAs):

The correlation between the number of registered vehicles and reported cases of accidents as well as vehicles and deaths were not significant at 0.05 level (p=0.148 and p=0.086, respectively).

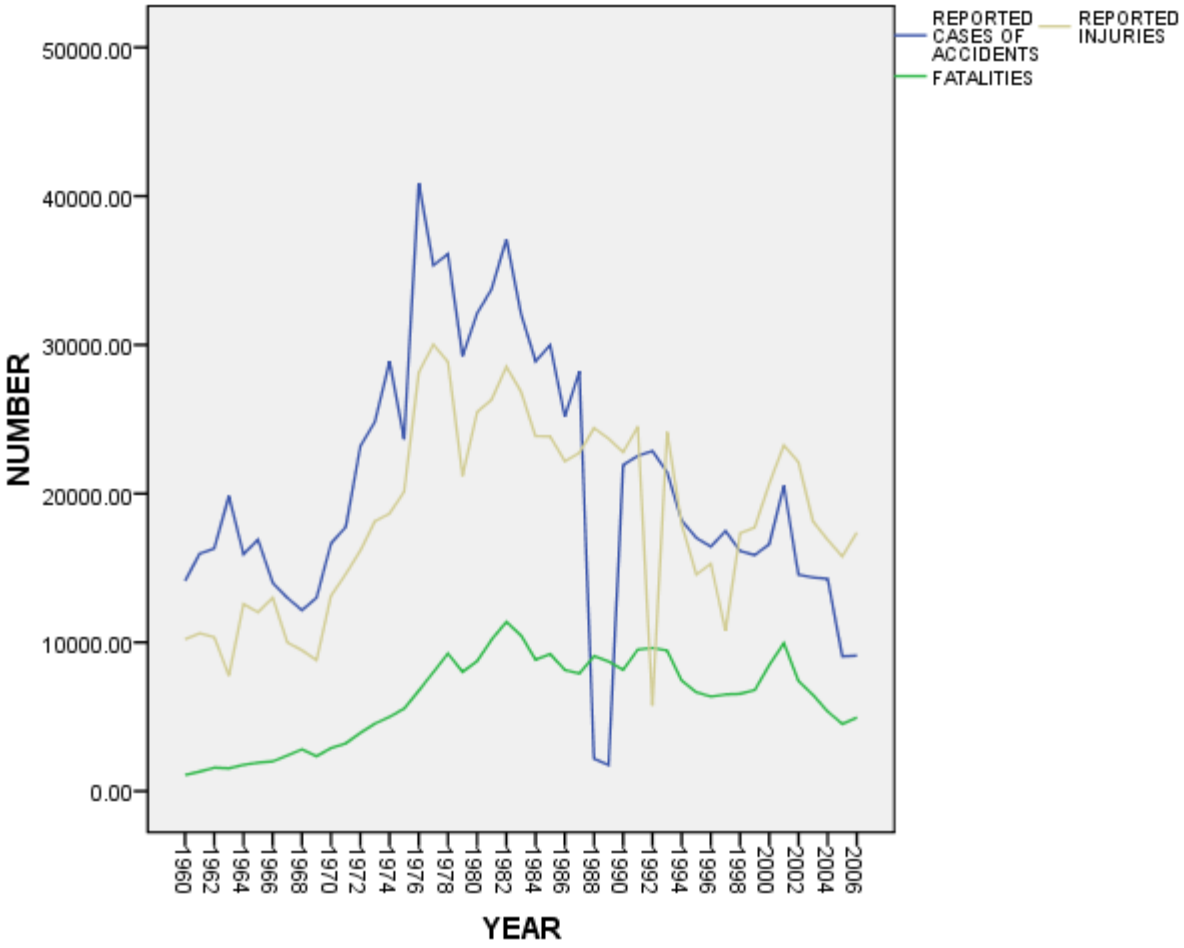

Figure 1: Trends of Road Vehicular Accidents from 1960-2006.

Table 1: Road Vehicular Accidents Data from 1960-2006.

	Number of deaths	Number of Injuries	Total Reported Cases
5th percentile	1545.8	9005	9077.6
50th percentile	6,647	18,116	17,745
95th percentile	10,125.2	28,423.8	35,885
Minimum	1,083	5,759	1,754
Maximum	11,382	30,023	40,881
Mean	6,227.72	18,445.51	20,587.62
Standard deviation	2,969.74	6,392.39	8,793.23
N	47	47	47

Source: Federal Road Safety Commission (2009)

Table 2: Number of Registered Vehicles from 2000-2005.

Year	Number of Vehicles
2000	260,646
2001	519,736
2002	454,592
2003	273,452
2004	227,583
2005	232,814

Source: National Bureau of Statistics (2009)

Table 3: Statistical Analysis for Period 1 (1969-1987) and Period 2 (1988-2006).

	Mean	Standard Deviation	T	Significant (1-tail paired)
Reported cases	12,873.63	7,334.63	7.651	0.0000
Reported deaths	-396.74	3,761.32	-0.46	0.651
Reported Injuries	3,399.58	9,120.7	1.625	0.122

Table 4: Paired Samples Correlation of Number of Registered Vehicles with RVAs.

	Correlation	Significant (2-tail)
Vehicles and reported cases	0.667	0.148
Vehicles and deaths	0.86	0.086
Vehicles and injuries	0.881	0.021

However, a significant correlation exists between the registered vehicles and reported injuries. This is highly surprising as earlier studies (Wakawa and Oyeyemi, 2003; James, 1991; Bolade and Ogunsanya, 1991) heavier traffic due to more vehicles led to higher rate of accidents.

Model Formulation for Predicting Number of Injuries: It is evident from Table 5 that the equation of best of fit for predicting the number of injuries is the cubic equation with the highest R^2 (0.499) with p=0.000. Therefore, the equation for predicting the number of injuries may be expressed as:

$$Y = 2889.21 + 1921.62B^1 - 56.70B^2 + 0.46B^3$$

where Y= Number of Injuries;
B= Number of years (1960=1……..2006=47)

Model Formulation for Predicting Deaths: Table 6 shows that for predicting the number of deaths in Road Vehicular Accidents, the cubic equation represents the best curve of fit for the data (R^2=0.822, p=0.000). The model for predicting the number of deaths may therefore be expressed as:

$$Y = -480.24 + 440.78B^1 + 1.53B^2 - 0.19B^3$$

where Y= Number of deaths
B= as described above.

Table 5: Model Summary and Parameter Estimates for Number of Injuries and Year of Accidents.

Equation	Model Summary					Parameter Estimates			
	R Square	F	df1	df2	Sig.	Constant	B^1	B^2	B^3
Linear	.106	5.340	1	45	.025	14805.202	151.949		
Logarithmic	.243	14.456	1	45	.000	8075.597	3564.623		
Inverse	.179	9.834	1	45	.003	20026.172	-16729.545		
Quadratic	.478	20.169	2	44	.000	5597.837	1277.016	-23.421	
Cubic	.499	14.255	3	43	.000	2889.213	1921.617	-56.704	.463
Compound	.137	7.123	1	45	.011	13343.274	1.011		
Power	.270	16.674	1	45	.000	8771.094	.232		
S	.191	10.595	1	45	.002	9.854	-1.064		
Growth	.137	7.123	1	45	.011	9.499	.011		
Exponential	.137	7.123	1	45	.011	13343.274	.011		
Logistic	.137	7.123	1	45	.011	7.494E-5	.989		

Dependent Variable: Number of Injuries, Y
The independent variable is Number Of Years (1960 corresponds to 1).

Table 6: Model Summary and Parameter Estimates for Reported Deaths and Year of Accidents.

Equation	Model Summary					Parameter Estimates			
	R Square	F	df1	df2	Sig.	Constant	B^1	B^2	B^3
Linear	.367	26.086	1	45	.000	3082.186	131.297		
Logarithmic	.547	54.253	1	45	.000	-995.680	2483.021		
Inverse	.326	21.729	1	45	.000	7217.210	-10472.614		
Quadratic	.807	91.776	2	44	.000	-1566.842	699.371	-11.826	
Cubic	.8i22	66.105	3	43	.000	-480.243	440.781	1.526	-.186
Compound	.487	42.738	1	45	.000	2393.000	1.034		
Power	.741	128.738	1	45	.000	841.406	.631		
S	.509	46.697	1	45	.000	8.842	-2.860		
Growth	.487	42.738	1	45	.000	7.780	.033		
Exponential	.487	42.738	1	45	.000	2393.000	.033		
Logistic	.487	42.738	1	45	.000	.000	.968		

Dependent Variable: Number of deaths, Y
The independent variable is Number of Years, B.

Model Formulation for Predicting Cases of Accidents: Table 7 shows the equations tested for best curve of fit. It is observed that the equation that represents the best curve of fit is also the cubic equation (R^2=0.407, p=0.000). This implies that the model for prediction of reported cases of accidents may be written as:

$$Y = 6650.05 + 2363.81B^1 - 80.61B^2 + 0.68B^3$$

where Y= Number of Cases of Accidents
B = As described above.

Statistical Comparison Between Obtained Data and Models: The values obtained using the models were tested statistically with the data collected and the results of the analysis (Table 8) shows that there were no significant differences between the values at 0.05 level of significance. This confirms that the models may be used to predict reported cases of accidents (t=-0.505, p=0.616), deaths (t=0.624, p=0.536), injuries (t=0.107, p=0.915). However, in numerical terms the models may marginally overestimate the cases of reported accidents (mean of model values was 21087.76 compared with 20587.62 for data) and marginally underestimate both the reported deaths (mean of 6113.02 for the model and 6227.72 for the data) and reported injuries (mean of 18374.90 for the model and 18445.51 for the data).

Table 7: Model Summary and Parameter Estimates for Reported Cases and Year of Accidents.

Equation	Model Summary					Parameters Estimates			
	R Square	F	df1	df2	Sig.	Constant	B^1	B^2	B^3
Linear	.026	1.194	1	45	.280	23059.913	-103.195		
Logarithmic	.003	.140	1	45	.710	18978.998	552.958		
Inverse	.027	1.250	1	45	.270	21431.546	-8932.052		
Quadratic	.384	13.705	2	44	.000	10638.758	1414.571	-31.596	
Cubic	.407	9.844	3	43	.000	6650.045	2363.810	-80.609	.681
Compound	.027	1.230	1	45	.273	21510.985	.993		
Power	.001	.035	1	45	.853	19152.807	-.019		
S	.005	.206	1	45	.652	9.829	-.250		
Growth	.027	1.230	1	45	.273	9.976	-.007		
Exponential	.027	1.230	1	45	.273	21510.985	-.007		
Logistic	.027	1.230	1	45	.273	4.649E-5	1.007		

Dependent Variable: Number of deaths, Y
The independent variable is Number of Years, B.

Table 8: Statistical Analysis for Values Obtained using the Model and Data Collected.

	Mean	Standard deviation	Standard Error Mean	T	Significant (2-tail)
Reported cases	-500.14	6,794.39	991.06	-0.505	0.616
Reported deaths	114.7	1,260.49	183.86	0.624	0.536
Reported injuries	70.61	4,526.99	660.33	0.107	0.915

CONCLUSIONS

The present study confirms that though there was significant reduction in the number of reported cases of accidents, there were no significant reduction of both deaths and injuries comparing the period between the inauguration of Federal Road Safety Commission and afterwards. Also, there was no increase in the number of accidents despite the increase in the number of vehicles on the road. Moreover, the models developed for predicting the reported cases of accidents, number of deaths and number of injuries was representatives of the data collected and can thus be used adequately for prediction.

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