# ROAD TRAFFIC ACCIDENTS IN WARRI AND ENVIRONS: A TREND ANALYSIS

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## *Abstract*

*Road traffic accidents (RTAs) rank 9th as the leading cause of daeth globally. Nigeria is among the worst cases. This study examined road traffic accidents in Warri and environs from 1990-2009. The data generated were analysed using time-series and one-way analysis of variance (ANOVA). Findings showed that the road traffic accident cases totalled 3,475 within the period of study, had a fluctuating pattern and increased in 2009. There was an upward trend in the study area as evidenced by a calculated value of 3.728, which is greater than the critical table value of 1.734 at $p < 0.05$. The model forecasted a 66.68 % increase by 2015, if the current trend is unabated. With a calculated F value of 13, which is greater than the critical table value of 3.16 at $p < 0.05$, there was spatial variability in road traffic accident trends in different parts of Warri and environs. Based on the findings recommendations were proffered.*

## Introduction

With 1.17 million deaths, road traffic accidents (RTAs) have been ranked the 9th leading cause of mortality globally. They account for about 70% of deaths in developing countries, including Nigeria (World Health Organisation, 1998).

Population explosion and increasing motorization are responsible for increasing rate of fatal road traffic accidents worldwide (Atubi, 2008). Increased motorization may be characterised briefly as the "automotive revolution", that is, the motorizing of urban population, especially in the developing countries.

The reported cases of fatal road traffic accidents (FRTAs) in Nigeria increased from 12,212 cases in 1995 to 13,913 in 1996 and to 15,418 in 2004. This shows an increase of 13.9% from 1995 to 1996 (Central Bank of Nigeria, CBN, 1997). FRTA figures across Nigeria rose sharply in 1992, resulting in 22,992 deaths (CBN, 1994). According to the National Bureau of Statistics (NBS, 2008), between 2003 and 2007, a total of 225,891 RTA cases were reported by the Nigeria Police Force, out of which 29,490 were fatal, 39,065 were serious cases, 23,380 were minor cases.

Dramatic increases in the proportion and absolute number of traffic fatalitics have been witnessed in a number of developing countries, while they decreased by more than 20% in industrialised nations (Ross et al, 1991). Over the past 30 years, a fivefold increase in traffic-related fatalities was observed in both Nigeria (Atubi, 2010a, 2009; Oluwasanmi, 1993; Ezenwa, 1986) and Kenya (National Road safety Council of Kenya, 1992). African and Asian countries, with relatively low vehicle densities, are experiencing substantially higher fatality rates per 10,000 vehicles than the industrialised

European and North American States (WHO, 1984; Jacobs and Sayer, 1983).

Traffic crashes also impact on the economy of developing countries at an estimated cost of 1.2% of a country's GNP per annum, as a result of morbidity, mortality and property-related costs (Downing et al, 1991; Jadan, 1989a and 1990; WHO, 1989; Jacobs and Sayer, 1983; Fouracre and Jacobs, 1976). Causes of motor vehicle crashes are multifactorial and involve the interaction of a number of pre-crash factors that include people, vehicles and the road environment (Stansfield et al, 1992; Robertson, 1992; AMA, 1983; Haddon, 1980).

Human error is estimated to account for between 64 % and 95 % of all causes of traffic crashes in developing countries. A high prevalence of old vehicles, overload of persons and luggages, lack of safety belts and helmet use, poor road design and maintenance and the traffic mix on roads are other factors that contribute to the high rate of fatalities in less developed countries (Atubi, 2009). Ajedi (1980) and Atubi (2010b) reported that the poor interconnections of existing Nigerian roads and poor maintenance of these roads were responsible for the chaotic urban transportation, which in turn, leads to accidents and irreparable losses in human lives and physical resources. Other researchers concentrated on other factors of road safety (Golias et al, 1997; Agunloye, 1989; Perrow, 1984).

In Nigeria, the RTA situation over the last three decades has been particularly disturbing. In 1976, there were 53,897 road traffic accidents resulting in 7,717 deaths. Although in 1981, the number reduced to 5,114 accidents, the

fatality increased to 10,236, giving an average of 96 accidents and 28 deaths for every day of that year (Ogunsanya, 1990). The situation in subsequent years has not been any better. The number of people killed in road accidents between 1990 and 2005 rose from 28,253 to 37,873 and the fatality rate remains consistently high (Atubi, 2009).

## Study area

Warri is located between latitude $5^{o}30'$ and $5^{o}35'$N and longitude $5^{o}29'$E and $5^{o}48'$E. Warri is situated within the Niger Delta region of Nigeria. It is bounded to the north by Okpe and Sapele Local Government Areas (LGAs), to the South by Warri South West LGA and the Atlantic ocean, to the east by Ughelli South and to the west by the Warri North LGA (Figure 1). Warri metropolis is made up of Warri south, Udu and Uvwie LGAs.

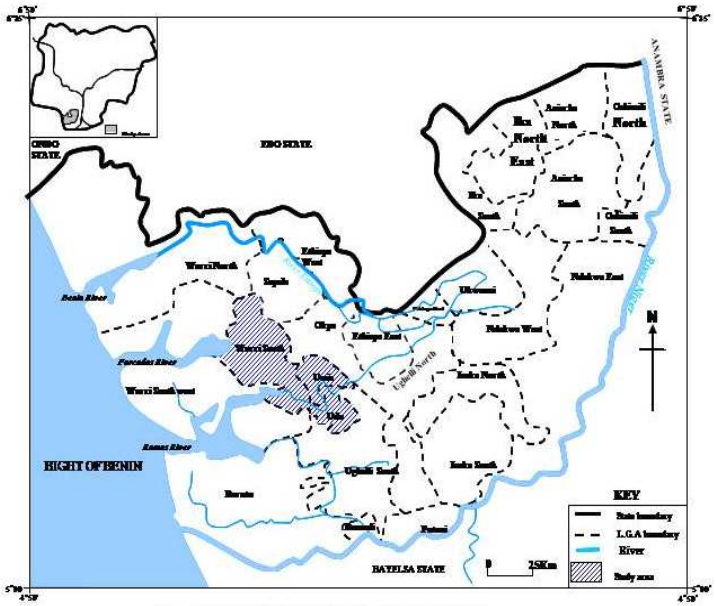


**Figure 1: Map of Delta State Showing Study Area**

# Methodology

The data used in this study were derived from secondary source. The secondary data include records on RTAs in Warri and environs for a period of twenty (20) years (1990-2009) from the Delta State Office of the Federal Road Safety Commission (FRSC) and the Nigeria Police Force, Warri and complemented with information from research reports and articles and national statistical abstracts and newspapers. The data were presented in tables and analysed with the aid of percentages, time-series and one-way ANOVA. Simple descriptive analysis of the distributions and cross tabulation of

variables were carried out. The data on accident cases were analysed with time-series by using auto-regressive integrated moving averages (ARIMA) models. The moving averages were specifically applied in this study because of the basic assumption that trend must be linear or approximately linear (Atubi, 2009; Okeke, 1996; Hammond and McCullagh, 1974).

# Results/Findings and Discussion

Table 5.1 shows the distribution of major black spots in Warri and environs. There were a lot of pot holes and a few black spots on almost all the roads in the study area, despite the billions of naira that the government of Delta State has reportedly spent on road repairs and maintenance. This casts a slur on the sincerity of the government on the one part and on the road construction contractors on the other part. This insincerity has contributed in no small measure to the peculiar nature and rate of RTA in Warri and environs.

**Table 5.1:** ***Distribution of major black spots in Warri and environs***

| Roads | No. of black spots | Major black spots areas |
|---|---|---|
| NPA | 1 | Before NPA gate |
| Ajaminmogha | Nil | Nil |
| Ugboroke | Nil | Nil |
| Okere | 1 | By Robert road junction |
| Eboh | Nil | Nil |
| Deco | 1 | Before Gbagi's plaza |
| Enerhen | Nil | Nil |
| Airport road | 1 | U-turn by old airport |
| Ugborikoko | Nil | Nil |
| Udu | 1 | Around Udu bridge |
| Mcdermott | Nil | Nil |

*Source:* Fieldwork, 2010

One major contributor to the incessant spoilage of the roads is the nature of land use in the study area. Being a highly urbanised centre with 17.76 $km^2$ (35.2 % of the total land area) of residential landuse, 6.87 $km^2$ (19.8 %) of industrial landuse and 4.27 $km^2$ (11.9 %) of commercial landuse, thus high volume of traffic and subsequently pressures on the existing roads (Figure 2). The study also revealed that the study area has about five (5) major black spots where road traffic accidents occur regularly.

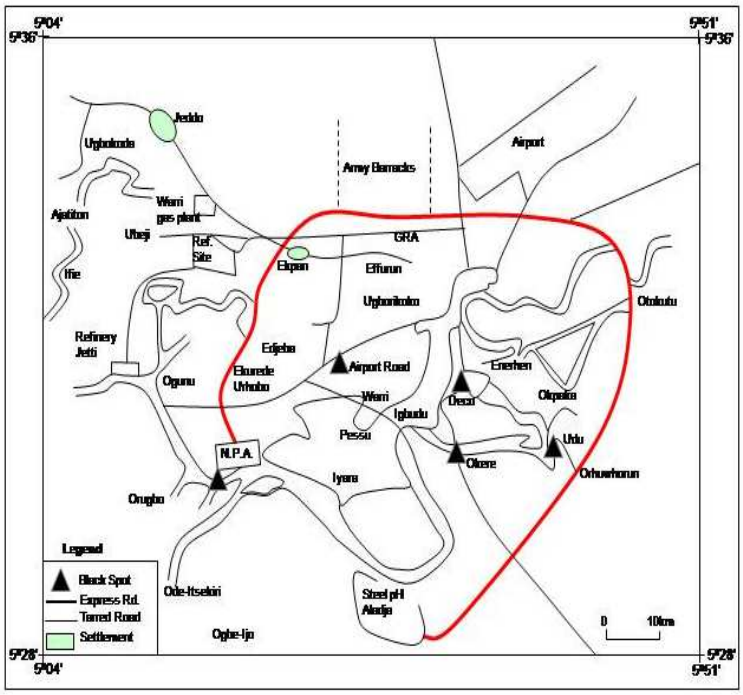


**Figure 2: Map of Warri and environs showing accident spots**

**Table 5.2:** ***Road traffic accident distribution***

| Zones | Place of occurrence | Daily traffic | Accident cases | % of RTA |
|---|---|---|---|---|
| Warri | Ogunu road to Okere road | 1276 | 3 | 4.8 |
| | Okumagba avenue road | 1168 | 7 | 11.1 |
| | Edjeba road to Apala road | 1054 | 2 | 3.2 |
| | NPA road | 1071 | 5 | 7.9 |
| | Makiava road to Warri main market road | 1014 | 9 | 14.3 |
| Uvwie | Airport road to Enerhen road | 1854 | 13 | 20.6 |
| | Refinery road | 1730 | 6 | 9.5 |
| | Ekpan to Jakpa road | 1124 | 3 | 4.8 |
| | PTI road | 1601 | 8 | 12.7 |
| Udu | Udu road | 1152 | 5 | 7.9 |
| | DSC road | 1011 | 2 | 3.2 |

*Source:* Nigeria Police (A and B division) Road Traffic Accident Statistics, Warri (2010)
** adapted from Atubi and Onokala (2005d).

From Table 5.2, daily traffic pass along Uvwie area was 6,307, while the daily traffic pass along Warri and Udu were 5,583 and 2,163 respectively. About 20.6 % of accidents occured in the Enerhen road axis of Airport road, while 3.2 % of accidents occured in the Apala road and DSC road axis of Edjeba road. The accident rate in Warri and environs increased correspondingly with the daily volume of traffic within Warri and environs (Figure 3). These findings are in line with the work of Atubi and Onokala (2005), which stated that the increased rate of fatal road traffic accident in Warri and environs had been attributed to population explosion and increased daily traffic.

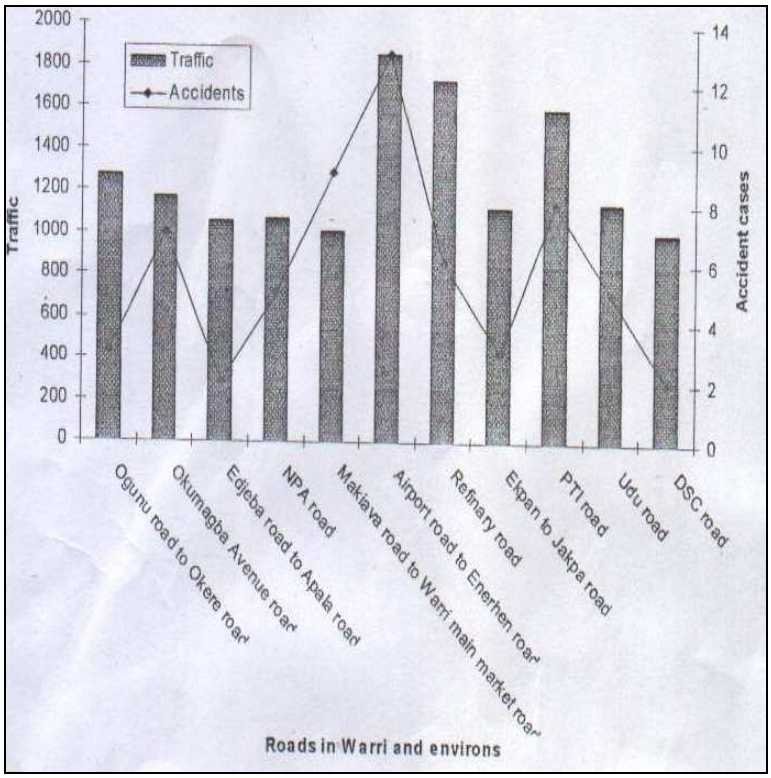


**Figure .3:** Accident distribution in Warri and environs

**Table 5.3:** ***Total number of reported RTA in the study area from 1990-2009***

| Years | Months | | | | | | | | | | | | Mean Amount (x)= 174 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | J | F | M | A | M | J | J | A | S | O | N | D | Total |
| 1990 | 9 | 15 | 25 | 39 | 21 | 17 | 21 | 14 | 23 | 22 | 18 | 15 | 239 |
| 1991 | 10 | 21 | 11 | 14 | 14 | 21 | 28 | 17 | 13 | 15 | 12 | 27 | 203 |
| 1992 | 20 | 15 | 17 | 29 | 10 | 17 | 18 | 9 | 21 | 14 | 15 | 14 | 199 |
| 1993 | 16 | 17 | 15 | 17 | 21 | 23 | 15 | 19 | 23 | 25 | 15 | 25 | 231 |
| 1994 | 18 | 20 | 22 | 12 | 9 | 13 | 6 | 11 | 48 | 25 | 16 | 18 | 218 |
| 1995 | 24 | 21 | 33 | 15 | 0 | 11 | 7 | 7 | 19 | 6 | 9 | 23 | 175 |
| 1996 | 40 | 39 | 39 | 31 | 31 | 31 | 22 | 22 | 27 | 18 | 16 | 16 | 332 |
| 1997 | 22 | 29 | 33 | 36 | 34 | 25 | 25 | 29 | 36 | 34 | 26 | 30 | 359 |
| 1998 | 45 | 29 | 10 | 15 | 16 | 15 | 13 | 4 | 17 | 32 | 8 | 17 | 221 |
| 1999 | 12 | 17 | 28 | 21 | 17 | 17 | 14 | 14 | 24 | 23 | 18 | 22 | 227 |
| 2000 | 16 | 11 | 12 | 27 | 16 | 25 | 17 | 22 | 21 | 9 | 5 | 14 | 195 |
| 2001 | 9 | 10 | 9 | 13 | 10 | 11 | 8 | 14 | 11 | 8 | 15 | 6 | 124 |
| 2002 | 9 | 10 | 13 | 10 | 7 | 6 | 10 | 11 | 14 | 14 | 10 | 16 | 130 |
| 2003 | 8 | 12 | 7 | 5 | 4 | 6 | 6 | 5 | 5 | 5 | 1 | 7 | 71 |
| 2004 | 5 | 3 | 6 | 4 | 6 | 4 | 0 | 5 | 6 | 4 | 1 | 6 | 50 |
| 2005 | 6 | 8 | 12 | 7 | 6 | 0 | 15 | 4 | 10 | 21 | 9 | 8 | 106 |
| 2006 | 28 | 10 | 6 | 12 | 15 | 8 | 10 | 21 | 5 | 6 | 4 | 17 | 142 |
| 2007 | 15 | 7 | 4 | 7 | 9 | 6 | 8 | 5 | 11 | 12 | 13 | 13 | 110 |
| 2008 | 10 | 5 | 9 | 0 | 5 | 6 | 4 | 9 | 10 | 6 | 8 | 9 | 81 |
| 2009 | 5 | 11 | 4 | 5 | 4 | 8 | 3 | 5 | 5 | 4 | 5 | 4 | 63 |
| | 327 | 310 | 315 | 319 | 255 | 270 | 250 | 247 | 349 | 303 | 224 | 307 | 3476 |

*Source:* Nigeria Police Force (A and B Division) Road Traffic Accident Statistics, Warri

Table 5.3 indicates that the actual number of traffic accidents for the period under review was 3,475. The highest number of

road traffic accident cases was in 1997 with a total of 359 cases, while the lowest number of cases, which is 50, was recorded in the year 2004. The year 2000, 2001, 2002, 2003, 2005, 2006, 2007, 2008 and 2009 had annual total RTA cases of 195, 124, 130, 71, 106, 142, 110, 81 and 63, while the years 1990, 1991, 1992, 1993, 1994, 1995, 1996, 1998 and 1999 had annual total of 239, 203, 1999, 231, 218, 175, 332, 221 and 227 RTA cases respectively. These first ten years of the period under review accounted for 2,404 (69.2%) of the traffic accident cases within the period, while the last ten years accounted for 1,071 (30.8%) of the road traffic accident cases during the period.

The monthly traffic accident data of Warri and environs for the period under review is the basic information upon which analysis of trends and patterns were based and the frequency of reported road traffic accidents were also considered (Table 5.4). There were a total of 3,475 reported road traffic accidents within the period with annual mean traffic accident value of 174 cases and a mean monthly RTA value of 15 cases. The deviations of the accident figures from the mean (x) are presented in Table 5.4 and Figure 4.

**Table 5.4:** ***Deviations of reported cases of RTA figures from the mean***

| Year | Annual total (x) | Annual mean (x) | Deviation from the means (x-x) |
|---|---|---|---|
| 1990 | 239 | 174 | 65 |
| 1991 | 203 | 174 | 29 |
| 1992 | 199 | 174 | 25 |
| 1993 | 231 | 174 | 57 |
| 1994 | 218 | 174 | 44 |
| 1995 | 175 | 174 | 1 |
| 1996 | 332 | 174 | 158 |
| 1997 | 359 | 174 | 185 |
| 1998 | 221 | 174 | 47 |
| 1999 | 227 | 174 | 53 |
| 2000 | 195 | 174 | 21 |
| 2001 | 124 | 174 | -50 |
| 2002 | 130 | 174 | -44 |
| 2003 | 71 | 174 | -103 |
| 2004 | 50 | 174 | -124 |
| 2005 | 106 | 174 | -68 |
| 2006 | 142 | 174 | -32 |
| 2007 | 110 | 174 | -64 |
| 2008 | 81 | 174 | -93 |
| 2009 | 63 | 174 | -111 |

*Source:* Fieldwork, 2010

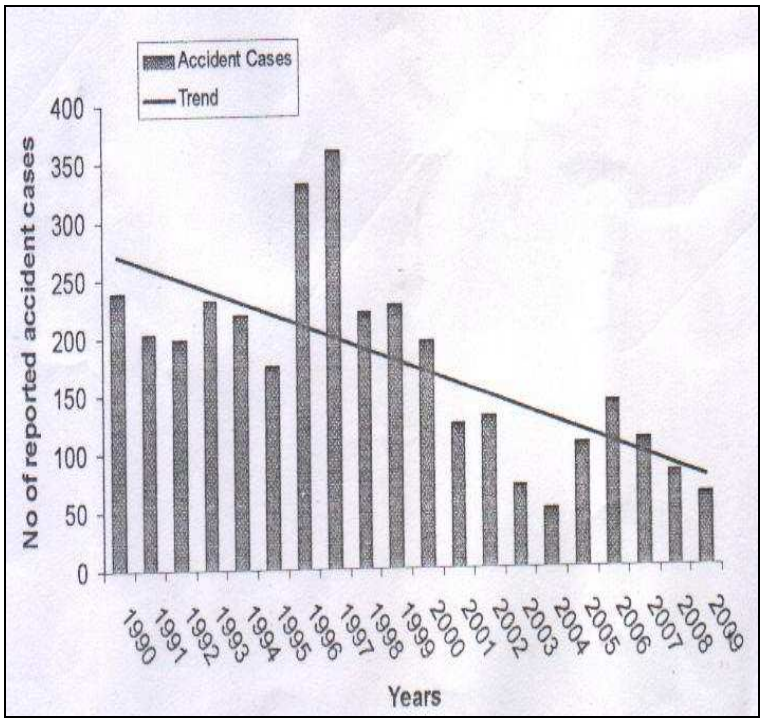


**Figure 5.4:** ***Trend in road traffic accidents in Warri and environs from 1999-2009***

Road traffic accident cases were more in 1997, during which 359 road traffic accidents cases were reported. Since 1999, when 227 traffic accidents were reported, these was more of intermittent decrease up to 2009, during which only 63 traffic accident cases were reported. From the year 2001, the RTA cases were below the mean (x) (less than 174). Figure 5.4 shows a progressive decrease from the mean (x) up to the year

2009. This implies that from 1997 there has been an unstable decrease in RTA in Warri and environs. This could have arisen from improvement in road rehabilitation effort of the government, road safety practice of drivers and increased monitoring of speed by Federal Road Safety Corps marshals. When the Third Republic took effect in 1999, the civilian administration embarked on massive road rehabilitation through the agency called Federal Road Maintenance Agency (FERMA). The observed decreas in RTA cases, which were below the mean (x) from 2001-2009 may also be attributed to the increased use of information and communication technology (ICT) facilities by the population. The available ICT services, such as e-mail, e-banking and the use of mobile phones had reduced travels on the major roads. RTA rarely occurs when the population travels less frequently.

**Table 5.5:** ***Exponential smoothing model parameters***

| Model | Estimate | SE | t | Sign. |
|---|---|---|---|---|
| RTA-Model-1 No Alpha (level) transformation | .842 | .226 | 3.728 | .001 |

From Table 5.5, the calculated t (3.728) was greater than the critical table (1.734) at $p < 0.05$. Thus, the model was significant. Therefore, there is an upward trend in road traffic accident in Warri and environs. This result implies that RTA in Warri and environs needs to be checked seriously by all relevant stakeholders, using a holistic approach in order to step down the carnage and eventual loss of lives and properties.

**Table 5.6:** ***Forecast***

| Model | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|
| RTA-Model-1 Forecast | 66.68 | 66.68 | 66.68 | 66.68 | 66.68 | 66.68 |
| UCL | 188.99 | 226.55 | 256.83 | 282.91 | 306.17 | 327.36 |
| LCL | -55.64 | -93.20 | -123.48 | -149.56 | -172.82 | -194.01 |

For each model, forecasts start after the last non-missing in the range of the requested estimated period, and end at the last period for which non-missing values of all the predictors are available or at the end date of the requested forecast period, which ever is earlier. From Table 5.6, the model further forecasted that road traffic accident trend is on the increase and will certainly increase to about 66.68% cases in 2015, if the trend of accident remains unabated. This means that there will be more loss of lives and properties, which will affect the socio-economic status of the study area.

**Table 5.7:** ANOVA on variability of road traffic accidents

| Square of variation | Sum of squares | Df | Mean sum of square | F | P |
|---|---|---|---|---|---|
| Between group | 27913.8 | 2 | 13956.9 | 13 | 0.00 |
| Within group | 60707.3 | 57 | 1065 | | |

From Table 5.7, the calculated F value of 13 is greater than the critical table value of 3.16 at $p < 0.05$. Thus, the model is significant. Therefore, there is a significant variability in the trends of road traffic accidents in the different areas of Warri and environs. The implication of this is that the areas marked in Figure 2 as accident black spots in the study area should be monitored and proactive steps should be taken to reduce drastically the current trend of RTA.

## Policy implications and Recommendations

The high RTA rates and high forecasted increase by 2015 by over 66 % in Warri and its environs in Delta State have far-reaching implications on road traffic planning and management sector of the economy, as well as traffic monitoring and road rehabilitation in the country. When similar studies are conducted in other parts of Nigeria, it can form the basis for generating regional or national empirical models based on the peculiar RTA factors identified in the study area. In a similar vain, there will be room for comparative RTA analysis and studies between different states of Nigeria. In this regard, the influence of nature of road and months of the year can be determined for various parts of the country with a view to understanding the variations their individual and collective influences have on RTA occurrence.

Further studies are necessary in Delta State to ascertain the categories of vehicles that are frequently involved in RTA more than the other vehicle types. The development of other modes of transportation, such as the railway, is necessary to reduce pressure and over dependence on the roads. In developed countries, such as U.S.A., UK, France and Canada, road is not the only principal mode available for inter-urban transportation. Railway, inland water way and air ways are equally available at reduced cost. The contrast is the case in developing countries, like Nigeria, Ghana and Liberia, where there is over-dependence on road transport resulting to increased congestion and traffic accident. This measure if adopted will significantly reduce road traffic accident cases not only in Warri and its environs, but also in Nigeria generally.

## Conclusion

This study is one of the current attempts at placing transportation safety in the realm of burning national issues. This is to enable transportation geographers make more definitive and deterministic statements about processes and trends in the discipline. Despite the incomprehensiveness and non-availability of similar studies, particularly in the south-south geopolitical zone of Nigeria this study represents a huge success in analysis of general trend, spatial pattern and effects of fatal road traffic accident occurrences over a period of time. However, a lot remains to be done even in this respect.

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