

An Econometric Study of the Road Safety Impact of Nigeria's Federal Road Safety Commission

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Abstract: Following a depressing record of incidences, injuries and fatalities on Nigerian roads, the government established the Federal Road Safety Commission in 1988. The Commission was charged with reducing and mitigating the on-going carnage. The study set out to investigate, econometrically, to what extent the Federal Road Safety Commission has accomplished its *raison d'être*. Amassing fourteen-year time series data for the periods pre and post Commission establishment, a paired samples t-test analysis was undertaken, using the SPSS Version 11.0 for Windows. Findings are that crash frequencies and injuries on Nigerian roads are on the decline, while the trend of deaths remains stable. Apposite recommendations were then proffered. The study should contribute to the literature on safer road strategies in particular and surface transportation traffic management in general.

Key words: Carnage, safety, accident, severity index

INTRODUCTION

The Federal Road Safety Commission of Nigeria, FRSC, was established by the FRSC Act Cap 141, Laws of the Federation of Nigeria. The Act was subsequently amended by the promulgation of Decree Number 35 of 1992. According to Ibrahim and Olukoju (2003), the FRSC was charged with the responsibility of reducing to the barest minimum the incidents of road traffic accidents and the consequent human and material losses. In pursuit of this objective, the FRSC instituted a harmonization of the various road traffic laws into the National Road Traffic Regulations (NRTR, 1997). Notable among these laws were the Highway (motor traffic) Ordinance of 1913 in Southern Nigeria, which was Nigeria's first transport law. Others were the Motor Traffic Ordinance of 1916 of nationwide applicability; the Road Traffic Act; the Federal Highway Act and the law of Carriage.

Up to the late 1970s, there was little concern about road safety matters in Nigeria. Little significance was accorded to road traffic accidents, prevention strategies and remedies (Wakawa and Oyeyemi, 2003), despite the danger signals visible in available road crash data. In 1960, the number of accident cases reported was 14, 130, resulting in the deaths of 1083 persons and injuries to 10, 216 others. In respect of accident cases, the worst year in the 1960s was 1963 with 19, 835 cases reported. The worst

year in terms of persons killed was 1968, with 2808 deaths, while the worst year in injuries was 1966, with 13, 000 persons injured.

By the turn of the seventies, all the road crash indices had skyrocketed! The highest incidents of reported crashes, deaths and injuries for the period were 40, 881 in 1976, 9252 in 1978 and 30, 023 in 1978 respectively. These depressing figures naturally provoked a national consternation, as a result of which the FRSC was set up in 1988.

The alarming trend was consistent with the growth in Nigeria's vehicular fleet, given that more than ninety percent of total transportation demand is satisfied by the road subsector alone. Studies by Onakomaiya (1981) indicate that vehicle registration in Nigeria increased from 2461 in 1947 to about 120,000 in 1976, from where it went to a total national fleet of about 600, 000 in 1986. A similar but recent study put the total national fleet at 1, 125, 756 in the year 2000 (Adeniyi, 2002).

The upward trend in vehicular traffic also gave rise to increasing carnage on Nigerian roads. According to Bolade and Ogunsanya (1991), for the world's developing countries, Nigeria features the highest accident fatality and severity rates, leading other 37 countries by 240 deaths in 1000 accidents reported, followed by Ethiopia and Malawi with 200 and 180 deaths respectively in 1000 reported accidents.

To curb these incidents and increase the safety of life on Nigerian roads, the government set up the Federal Road Safety Commission. The 1988 FRSC decree assigned the following responsibilities to the body: preventing and minimizing road accidents on the highways; educating drivers, motorists and other road users on the proper use of the highways and clearing obstructions on any part of the highway that are capable of causing accident. How far the FRSC has gone in the pursuit of these objectives is the subject of the current study.

The objective of this study is to find out whether or not the Federal Road Safety Commission, since its creation in 1988, has succeeded in reducing the spate of road accidents in Nigeria. Specifically, the objectives are:

- To establish if there has been reduction in reported cases of accidents in Nigeria since 1988;
- To find out whether the number of persons killed in road accidents has reduced since 1988 and
- To establish if there has been decline in injuries occasioned by road mishaps since 1988.

The hypothesis: The following hypotheses are defined to govern the study:

- There is no reduction in reported accidents since 1988;
- The number of persons killed in road accidents has not reduced since 1988 and
- There has been no decline in injuries occasioned by road mishaps since 1988.

Synopsis of the literature: Road safety refers to reduction in road risk and crash costs, of which there are generally two approaches. One approach is to prevent crashes by, among others, increasing traffic law enforcement. The other approach, according to the Victoria Transport Policy Institute (2005), is to adopt strategies intended to make crashes safer by reducing the amount of damage that occurs in a crash, particularly for vehicle occupants. These approaches calculated to instigate crash injuries have been widely criticized and designated safe crashing (Gladwell, 2001).

The FRSC of Nigeria was created to adopt both approaches to pursue the objective of accident reduction. The literature on traffic safety research shows a preference for the term crash over accident. The latter implies a random event while the former emphasizes that such events have a cause and so are preventable (James, 1991; Miller, 1991; Wang *et al.*, 1999; Blincoe, 1995).

Crashes are also called collisions and incidents and are measured in injuries, fatalities and damages. Injuries and fatalities are summatively referred to as casualties. Traffic accidents constitute a major health risk across the world.

Murray *et al.* (1996) have conducted a major study involving a comparison of worldwide health risks. They come to the conclusion that Traffic crashes, are the eight leading cause of death and disability in developed countries and the tenth in developing countries. A further finding from the study is that among adults aged 15-44, road accidents are the leading cause of injury, death for men and the fifth leading cause for women. The study ended with the projection that traffic mishaps could increase to become the third most common cause of death worldwide if the trends at the time of the research continued. The projection is more or less corroborated by Kopits and Cropper (2003) who use international historical trend data to estimate that currently about 720, 000 people die annually in traffic crashes, with the Likelihood of increasing to about 1.2 million in 2020.

Disturbing as these figure are, they represent a far cry from the realities of the Nigerian situation. Data from the FRSC shows that the number of deaths resulting from the carnage on Nigeria roads was 10, 202 in 1982 and 11, 382 in 1983; declining to only 9,620 in 1992 and 8, 012 in 2001. These figures are consistent with findings by Adiele (1996) and Odedekun (1991). It is not surprising then that traffic crashes are implicated as the most common cause of death and disability for people in the prime of life (Victoria Transport Policy Institute, 2005).

Empirical evidence indicates, that the incidence of road accidents is positively correlated to vehicle mileage (Butter, 1996; Bath 1993; Mercer, 1987). Following from this, it can be expected that the Nigerian road carnage would exacerbate as growing affluence and an expanding middle class occasion more vehicle mileage in the country. Litman (2001) concludes that a strong positive relationship exists between annual mileage and annual crashes, all else being equal. It would thus appear that the road accident trend in Nigeria should be upward in the time series covered by this study.

This would imply that part of the strategy of the FRSC should include a mileage reduction mechanism. But it may be queried, how many vehicle miles must be reduced, on average, to eliminate a traffic fatality? The solution is not that straight forward.

Greenberg (2004) has actually carried out studies in which he analyzed the relationship between mileage and crashes. He found there were 42, 387 highway fatalities and 2.7498 trillion vehicle-miles traveled in the US in 2000, averaging one fatality every 64,873,554 vehicle miles.

Multiple vehicle crashes accounted for 45% of all motor vehicle fatalities, while single vehicle crashes (42% of fatalities) and vehicles crashing into pedestrians (13% of fatalities) accounted for the rest.

For single vehicle crash fatalities, a 10% reduction in vehicle miles traveled, VMT, could be expected to result in a 10% fatality reduction from single vehicle and vehicle/pedestrian crashes, all other things being equal. For multiple vehicle crash fatalities, a 10% reduction in VMT would be expected to result in a 19% fatality reduction among such crashes, since if either of the two vehicles had not been on the road, the fatal crash would most likely not have occurred (there is a 90% chance for each vehicle involved that it would still have been on the road had such a VMT reduction been realized or 0.9×0.9 , or 81% chance, that they both still would have been on the road). Therefore, for every 1,000 fatal crashes resulting from a particular level of VMT, a 10% VMT reduction would initially appear to reduce single vehicle crash fatalities from 550 to 495 and multiple vehicle crash fatalities from 450 to 364.5, saving 140.5 lives through an overall 14.05% reduction in fatalities. It is thus established that VMT reduction can reduce crash fatalities. But in the Nigerian situation, VMT reduction is not part of the terms of reference of the FRSC, although many other strategies have been invoked to pursue the main *raison d'être* of reducing both the incidence and severity of crashes.

MATERIALS AND METHODS

The analytical technique adopted is the paired-samples:

T-test this procedure compares the means of two variables by computing the differences between the values of the two variables for each case and tests whether the average differs from zero.

Data utilized for the study was obtained from the Federal Road Safety Commission. The first set of data consisted of road accident statistics showing the number of cases reported, the number of persons killed and the number of persons injured for the period 1974-1987. The second set of data show the same statistics for the period 1988-2001. The two sets of data relate to the immediate fourteen years before and since the establishment of the Federal Road Safety Corps.

The said statistics are reproduced in the Table 1 and 2.

Analysis of data: The time series data is analysed using SPSS Version 11, which yielded results relating to paired samples statistics, paired samples correlation and paired samples t-test.

Table 1: Accident statistics in Nigeria 1974-1987

| Year | Cases | Persons killed | Persons injured |
|------|---------|----------------|-----------------|
| 1974 | 28893 | 4992 | 18154 |
| 1975 | 23651 | 5552 | 18660 |
| 1976 | 40881 | 6761 | 20132 |
| 1977 | 35351 | 8000 | 28155 |
| 1978 | 36111 | 9252 | 30023 |
| 1979 | 29271 | 8022 | 28854 |
| 1980 | 32138 | 8736 | 21203 |
| 1981 | 33777 | 10202 | 25484 |
| 1982 | 37094 | 11382 | 26337 |
| 1983 | 32109 | 10462 | 28539 |
| 1984 | 28892 | 8830 | 26866 |
| 1985 | 28979 | 9221 | 23861 |
| 1986 | 25188 | 8154 | 23858 |
| 1987 | 26515 | 7912 | 22176 |
| | 412.335 | 117.478 | 320.128 |

Source: Federal road safety commission, Abuja

Table 2: Accident statistics in Nigeria 1988-2001

| Year | Cases | Persons killed | Persons injured |
|------|---------|----------------|-----------------|
| 1988 | 25792 | 9077 | 22747 |
| 1989 | 2987 | 8714 | 24413 |
| 1990 | 21721 | 8154 | 23687 |
| 1991 | 22498 | 9525 | 22686 |
| 1992 | 22909 | 9620 | 24508 |
| 1993 | 21412 | 9454 | 25759 |
| 1994 | 18218 | 7420 | 24146 |
| 1995 | 17000 | 6647 | 17938 |
| 1996 | 16793 | 6364 | 14554 |
| 1997 | 9034 | 3616 | 15290 |
| 1998 | 16046 | 6538 | 10786 |
| 1999 | 12424 | 5429 | 17341 |
| 2000 | 12705 | 6521 | 20677 |
| 2001 | 13801 | 8012 | 23249 |
| | 254.340 | 105.091 | 287.781 |

Source: Federal road safety commission, Abuja

The tests of the study hypotheses are based on the output in respect of the paired samples t-test as presented below.

Presentation of results: The high points of the results of the paired samples t-test, which forms the basis for analysis of findings and testing of hypotheses, are here tabulated. Complete results are in Table 3.

Findings: From the results just displayed, the principal findings are as follows.

First, in respect of the number of accident cases reported the t-statistic turned up to be 6.690, which is greater than 1.771, the value of the critical t at the 5% level of significance.

Second, concerning the total number of deaths in the two time periods, the t-statistic came up with a value of 1.043, which is less than the critical t value of 1.771.

Third, a comparison of injuries in the two time periods produced a t-statistic of 2.116, which is greater than the critical value of 1.771.

What do these findings mean?

Table 3: The difference between the mean deaths in the two periods is not significant, statistically

| | Mean | Standard deviation | Standard error of the mean | t-statistic | Significant 2-tail |
|---------------------------------|----------|--------------------|----------------------------|-------------|--------------------|
| Cases | | | | | |
| 1974-1987 and 1988-2001 | 13822.14 | 7726.56 | 2065.011 | 6.690 | 0.000 |
| Deaths 1974-1987 and 1988-2001 | 884.79 | 3173.26 | 848.09 | 1.043 | 0.316 |
| Injures 1974-1987 and 1988-2001 | 3894.79 | 6887.71 | 1840.82 | 2.116 | 0.054 |

$T_{\text{tab } 0.05} = 1.771$

Table 4: Paired samples statistics

| | Mean | Std deviation | Std error of mean |
|-----------|----------|---------------|-------------------|
| Cases | | | |
| 1974-1987 | 31346.43 | 4900.87 | 1309.81 |
| 1988-2001 | 17524.29 | 6616.23 | 1768.263 |
| Deaths | | | |
| 1974-1987 | 8391.29 | 1778.10 | 475.22 |
| 1988-2001 | 7506.50 | 1761.69 | 470.83 |
| Injuries | | | |
| 1974-1987 | 24450.14 | 3918.28 | 1047.20 |
| 1988-2001 | 20555.36 | 4584.74 | 1225.32 |

Source: SPSS V.II Output

Table 5: Paired samples correlation

| | |
|---------------------------------|--------|
| Cases 1974-1987 and 1988-2001 | 0.125 |
| Deaths 1974-1987 and 1988-2001 | -0.607 |
| Injures 1974-1987 and 1988-2001 | -0.308 |

Source: SPSS V.II Output

Interpretation of results: By convention, once the generated t value is greater than the critical t value from tables at any chosen level of significance, there is enough basis to reject the null hypothesis. Should the reverse hold, that is, if the calculated t-statistic turns out to be less than the critical or table value of t, then there are no sufficient grounds to reject the null hypothesis.

Given this setting and the fact that on the issue of number of accident cases in the two periods (1974-1987 and 1988-2001), the calculated t (6.690) is greater than the critical t (1.771), the null hypothesis cannot find a basis not to be set aside. In other words, there is significant difference between the mean accident cases in the period 1974-1987 and the mean accident cases in the period 1988-2001. Any hypothesis that the two means are of zero difference cannot be upheld on the basis of the foregoing results and findings. It should be noted, from Appendix IV, that is, the mean number of accident cases for the 1974-1987 period is 31, 346.43, compared to 17, 524.29 in the 1988-2001. The results indicate that the difference between the two means is greater than zero, significantly. This is corroborated by the magnitude of the standard deviations and standard errors. For the former time period, the corresponding values are 4900.87 and 1309.81, compared to 6616.23 and 1768.26 for the latter.

With respect to the comparison of deaths in the two periods, the mean number of deaths in the pre-FRSC era

is 8391.29 while it is 7506.50 for the post FRSC time period (Table 4). Thus there is a decline in deaths of crash causation since the establishment of the FRSC. This is in absolute terms.

However, a comparison of the t-values provides deeper insight into the analysis. Table 3 and the results tabulated previously give the value of the derived t as 1.043 while the table value remains at 1.771. The derived therefore is less than the critical t value. What this means, by convention, is that the null hypothesis has grounds to be upheld. In other words, the difference between the mean deaths in the two periods is not significant, statistically, so that fatalities in the pre-and the post-FRSC era can be regarded as being of the same magnitude. They do not differ at the 5% level of significance.

Concerning the situation with respect to injuries resulting from road mishaps, there is again an absolute difference in mean occurrences, with the larger number being recorded in the pre-FRSC period of 1974-1977, as shown in Table 4. On going through the paired samples t-test, computations produce a t-statistics of the value of 2.116, which is greater than the critical t-value of 1.771. It then follows, by convention, that, since the generated t-value is of greater magnitude than the tabulated one, the said difference in mean injurie between the periods under comparison is statistically significant shown in Table 5. This provides sufficient ground to reject the null hypothesis and accept the alternative hypothesis.

RESULTS AND DISCUSSION

It is quite remarkable and of significance that the overall number and trend of accident cases reported in the two periods under comparison is declining. What is explanatory to this commentary is the fact that in the periods under review, there has been an upward surge in automobile ownership in Nigeria, at the same time as traffic densities both in and out of cities has been growing. Studies conducted in Nigeria rather convey the impression that heavier traffic densities are causative to a higher incidence of accidents (Onakomaiya, 1981; Wakawa and Oyeyem, 2003; Bolade and Ogunsanya, 1991).

It is thus an extraordinary achievement to slow down the rate of accidents when, ordinarily, they should have been increasing. The orchestrated efforts which gave rise to this feat were provoked by the erstwhile prevailing trend. Wakawa and Oyeyemi (2003) discovered that road accidents constituted a major cause of death and loss of property in the country from independence in 1960 to June, 1988 when the FRSC was established. According to them, the country, in that time period, recorded 677,180

accidents, which claimed 154, 687 lives while 522,513 others were maimed or deformed. Nigeria then maintained first position in the world accidents chart.

Before the arrival of the FRSC, some efforts had been made, more or less in futility, to decelerate the national accident rates. These road safety measures included the National Road Safety Commission created in 1974, saddled with only an advisory role; the Road Safety of Oyo State created in 1977 and the legislative Acts on road safety matters such as the Federal Highway Act, 1991; Federal Highway Declaration Order, 1971; Federal Highway Amendment, 1973, Road Traffic Accident Act of 1976 and State Traffic laws of 1976.

With these antecedents, the FRSC pursued with all vigour its set task, resulting in the significant decline in reported accidents in the period since its creation.

Concerning deaths, the preceding analysis shows a numerical decline in the post FRSC era. However, the decline is not of such a magnitude as to be statistically significant. Stated in different words, there has been no real reduction in the carnage on Nigerian roads in spite of the efforts of the FRSC that led to significant fall in accident cases. Indeed, the coincidence of decline in the incidence of accidents with a statistically unabating deaths will seem to convey a depressing impression.

The impression which emanates from the coexistence of a downward trend in accident cases with a stable trend in deaths is that the elasticity of deaths with respect to accidents is growing. What this implies is that the ratio of deaths to accident cases is higher since the FRSC era than the period before. This situation can be occasioned by a geographical shift in the venue of accidents.

Studies by James (1991), Miller (1991) and Blincoe (1995) provide evidence to the effect that more accidents occur in cities and urban centres which are characterized by high traffic densities and lower travel speed than in rural and sparsely populated areas; but crash severity indices and fatalities are higher in the latter. So, in this Nigerian case, it can be inferred that the operations of the FRSC are urban-biased in distribution, causing a relocation of the crashes from urban to rural areas and from city streets to highways where each crash is associated with more deaths.

Lastly, the results show a statistically significant decline in injuries resulting from accidents. This is not inconsistent with expectations, given the earlier finding to the effect that crash frequencies are on the decline since the inception of the FRSC. However, it would appear that the injuries are fairly more serious in the era since the FRSC and must be contributing their fair share to the unabating deaths.

CONCLUSION

It is now apposite to draw out the conclusions from this study by juxtaposing the findings to the hypotheses defined at the outset to govern the study.

The first conclusion is to the effect that data analyses and empirical findings there confirm that there has been a significant reduction in reported accidents since 1988. On this basis therefore, hypothesis one is rejected.

In the second place, computations and findings relating to the total outlay of deaths lead to the logical conclusion that the spate and state of fatalities have not changed from what they were before 1988. In the face of this scenario, there is justifiable ground to uphold hypothesis two-the number of persons killed in road accidents has not reduced since 1988.

Finally, hypothesis three has to be discountenanced. The results and findings from data analyses indicate that there has been a statistically significant fall in the magnitude of injuries attributed to road mishaps since 1988.

RECOMMENDATION

Given the foregoing conclusions, it is recommended that the FRSC be given all budgetary and logistic support to continue the good job it has been doing. The mitigation and reduction of frequencies and injuries associated with the existence of the FRSC goes a long way to confirm that the government policy that gave birth to the FRSC is people-friendly.

However, the apparent relocation of crashes to the highways where fatalities are higher and the crash severity index worsen leaves room for grave concern. What is recommended, in this respect, is that the FRSC redistribute its operations more out of the urban center. In order not to incur a negative trade off that will compromise the gains of accident and injuries reduction, there should be an enlargement of the current size of the FRSC with respect to personnel, manpower and operational equipment.

REFERENCES

- Adeiele, S.C.K., 1996. An Empirical Investigation into Nigeria's Road Accident Causation Factors-Mimeo.
- Bath, S., 1993. Influence of socioeconomic factors on the exposure to crash risk for young drivers, traffic safety research Dept, ICBC. <http://www.icbc.com/>.
- Blincoe, L.J., 1995. Economic Cost of Motor Vehicle Crashes, 1994, NHTSA, USDOT www.nhtsa.doc.gov/people/economic/ecomvc1994.html).

- Bolade, T. and A.A. Ogunsanya, 1991. Accident control and safety measures in mass transit operation in Nigeria, Ibadan: Ibadan University Press.
- Butter, P., 1996. Automobile Insurance Pricing. A Paper Presented at National Conference on Women's Travel Issues, Baltimore. (www.now.org/).
- Gladwell, M., 2001. Wrong Turn: How the fight to make America's Highways Safety Went off Course. The New Yorker, (<http://www.newyorker.com/>), pp: 50-61.
- Greensberg, A., 2004. How many vehicle miles must be reduced, on average, to eliminate a traffic fatality? Online TDM Encyclopedia-Evaluating Safety and Health Impacts, www.vtpi.org.
- Ibrahim, B.G. and A.A. Olukoju, 2003. An Appraisal of the Dynamics of the National Uniform Licensing Scheme From 1990 to Date. In: Oyeyemi, B.O. (Ed.), Strands in Road Traffic Administration in Nigeria, Ibadan: Clemeve Media Konsult, pp: 93-106.
- James, H., 1991. Under-reporting of road traffic accidents. Traffic Eng. Control, 32: 574-583.
- Litman, T., 2001. Distance-based vehicle insurance: Feasibility, Costs and Benefits-Comprehensive Technical Report. Victoria Transport Policy Institute (<http://www.vtpi.org>).
- Mercer, G.W., 1987. Influences on passenger vehicle casualty accident frequency and severity: Unemployment, Driver Gender, Driver Age, Drinking Driving and Restraint Device Use. Accident Anal. Prevent., 19: 231-236.
- Miller, T., 1991. The costs of highway crashes, washington: FHWA Publication No FHWA-RD-055.
- Murray, C., 1996. Global Burden of Disease and Injury: Center For Population and Development Studies, Harvard University School of Public Health (<http://www.hsph.harvard.edu/orgainzations/bdu>).
- Odedokun, M.O., 1991. Accident and Productivity Level in the Transport Industry. In: Bolade, T. and A.A. Ogunsanya (Eds.), Accident Control and Safety Measures in Mass Transit Operation in Nigeria, Ibadan: Ibadan University Press, pp: 51-73.
- Onakomaiya, S.O., 1981. Understanding Road Accidents in Nigeria. In: Onakomaiya, S.O. and N.E. Ekanem (Eds.), Transportation in Nigeria's National Development. Proc. Nat. Conf., pp: 445-549.
- Victoria Transport Policy Institute, 2005. Evaluating Safety and Health Impacts TDM Encylopedia, www.vtpi.org.
- Wakawa, M. and B.O. Oyeyemi, 2003. Causes, Effects and Prevention of Road Traffic Accidents. In: Oyeyemi B.O. (Ed.), Strands in Road Traffic Administration in Nigeria, Ibadan: Clemeve Media Kansult, pp: 1-12.
- Wang, J., R.R. Knipling and L.J. Blincoe, 1999. The Dimensions of Motor Vehicle Crash Risk. J. Transport. Stat. 2: 19-43 (<http://www.bts.gov/>).