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Making road traffic system less hazardous requires the understanding of the system as a whole. This paper provides an analysis of road safety statistics for Bauchi environ. Accident data were compiled from Federal Road Safety Corps Bauchi's daily accident register. These data were analyzed using MS EXCEL. Fatal accidents were found to constitute 20% to 26% in the area. The serious accident cases were found to range from 42% to 55%. 15% to 26% of all persons involved in road traffic accidents in Bauchi environ dies. The three major causes of road traffic accident in Bauchi Environ in their ranked order for the period 2002 to 2004 are dangerous driving 39% to 49%, speed variation 21% to 28% and tyre burst 9% to 21%. Human factors constituted 71% to 85% of the yearly causes of accident while vehicular factors accounted for 11% to 23% and Environmental factors were found to be 4% to 5% yearly.

INTRODUCTION

For everyone killed, injured or disabled by a road traffic crash there are countless others are deeply affected. Many families are driven into poverty by the cost of prolonged medical care, the loss of a family breadwinner or the extra funds needed to care for people with disabilities. Road crash survivors, their families, friends and other caregivers often suffer adverse social, physical and psychological effects. Road traffic crashes are predictable and can be prevented. Many countries have shown sharp reductions in the number of crashes and casualties by taking action including: raising awareness of and enforcing laws governing speed limits, alcohol impairment, use of seat-belts, child restraints and crash helmets; formulating and implementing transport and land-use policies that promote fewer, shorter and safer trips; encouraging

the use of safer modes of travel, such as public transport; and incorporating injury prevention

measures into traffic management and road design; making vehicles more protective for occupants, pedestrians and cyclists, and more visible using daytime running lights, high-mounted brake lights, reflective materials on cycles, carts, rickshaws and other non-motorized forms of transport.

The Convention of Road Traffic¹ defines a fatal accident as when a person injured dies within 30 days of the crash (and as a result of the crash). This definition is not universally applied. Some countries use death, 'on the spot', within 24 hours, 3 days, etc. definitions. There is also no single accepted indicator that accurately describes the overall road safety situation in a particular country. The number of fatal crashes per million vehicle kilometers traveled per annum as a measure of exposure to motor vehicle traffic - is the most common method often used in highly motorized countries. However, because of the absence of accurate data on vehicle usage in most African countries, it is not possible to apply this method. Instead, fatality rates, the number of reported fatalities per 10,000 registered motor vehicles, are regularly used. Fatality risk calculated as the

number of deaths per 100,000 Population per annum is also, the indicator commonly used by the World Health Organization (WHO) and the ministries of health sector to report diseases and causes of death.

In Nigeria, Road safety research is an orphan. Road safety is inadequately researched and information is lacking on many aspect of the problem. The objective of this paper therefore is to provide an analysis of road safety statistic for Bauchi Environ. To properly appreciate the situation, the paper first reviewed the global road safety statistic. It then examined the African road safety situation and finally analyzed the Nigeria road safety statistic. Most of the road crashes are largely known to be due to a range of human error, road and vehicle factors. These factors include: 1) Over speeding, perilous overtaking; 2) Alcohol and drug abuse; 3) Driver negligence, poor driving standards; 4) Vehicle overload; 5) Poor maintenance of vehicles; 6) Bad roads and hilly terrain; 7) Negligence of pedestrians; 8) Distraction of drivers (e.g. speaking on cell phones). These factors are commonly cited in routine police statistics. There are however broader underlying inter-related factors. These contribute to the rising magnitude and burden of road traffic injuries.

GLOBAL ROAD SAFETY STATISTIC

The first road traffic mortality occurred in 1896². Currently Road traffic injuries are ranked 9th globally³ among the leading causes of disease

burden, in terms of disability adjusted life years (DALYs) lost. In the year 2020, road traffic injuries are projected to become the 3rd largest cause of

disabilities in the world.⁴ The World report on road traffic injury prevention, the first report on the subject developed jointly by WHO and the World Bank, presents the current knowledge about road traffic injuries and what can be done to address the problem. The 2004 World Report indicated⁵ that Road traffic crashes kill 1.2 million people a year or an average of 3242 people every day and account for 2.1% of all deaths globally. It estimates Road traffic crashes to injure or disable between 20 million and 50 million people a year. Developing countries bear the brunt of the global fatalities and disabilities from road traffic crashes^{6,7}, 90% of road traffic deaths were found to occur in low-income and middle-income countries. Nigeria belongs to the low-income countries. Countries in the WHO Western Pacific Region and the WHO South-East Asia Region currently account for more than half of all road traffic deaths in the world. The problem is increasing in the developing countries at a fast rate, while it is declining in all industrialized nations.

Road traffic deaths are predicted to increase by 83% in low-income and middle-income

countries, and to decrease by 27% in high-income countries⁵. These figures amount to a predicted global increase of 67% by 2020. Most nations with long history of motorization are actively seeking and achieving decreases in the number of fatality. The changes in road traffic fatality⁸ for the period 1990-2000 shows that among other countries, Estonia recorded 53% decrease, New Zealand recorded 37% decrease, UK recorded 34% decrease, Japan recorded 29% decrease, Australia recorded 22% decrease, and USA recorded 6% decrease. The current global regional distribution of estimated road deaths, motor vehicle ownership and population shown in table 1 revealed⁹ that the Asia and Pacific countries has the highest total fatality of 44% while the Middle East and North Africa countries has the least total road fatality of 7%. Sub-Saharan Africa alone with only 4% of the global vehicle registered accounts for 10% of the total road fatalities, and the economic, social and health consequences are grave. Conversely, the high-income nations, with 60% of the total global vehicle fleet contribute only 14% of the annual road deaths.

There exist a high positive correlation between the regional population and percentage of total fatality. More than half of all global road traffic deaths is said to occur among young adults. Their ages ranged between 15 and 44 years of age. 73% of the deaths have been found to be male⁵. In low-income and middle-income countries such as Nigeria, the most vulnerable road users were found to be pedestrians, cyclists, users of motorized two-wheelers and passengers on public transport.

From a global perspective vehicle ownership levels throughout Sub-Saharan Africa are amongst some of the lowest. Motorization levels are expressed as the number of officially licensed vehicles per 1,000 Population. In Western Europe most countries have motorization level of 500 to 700 vehicles per 1,000 Population, while in Eastern Europe the motorization level is from 100 to 300 and in Latin America from 40 to 200. In Asia however, there is wide variation in vehicle ownership levels ranging from 5 vehicles/1,000 people in Bangladesh to over 500 in Brunei. However 60 per cent of countries were found to have a motorization level in the range 20 to 60, which is comparable with those calculated for the majority of African countries.

AFRICA ROAD SAFETY STATISTIC

A number of studies⁹ of road crashes worldwide have been carried out by TRL in recent years. These studies have shown that the road safety situation throughout the African continent is one of the worst in the world. Between 68 and 82 thousand lives were estimated in the studies to be lost in road crashes in Sub Saharan Africa in 2000. This estimate has factored in the problem of under-reporting in official police statistics, the traditional source for road casualty data. While the figures are greater than those being reported by the police, they are lower than previous WHO projections. The estimated fatality figure of 190,191 for Sub-Saharan

Africa was presented in the 2004 World Report⁶, based on health care data. In Africa, Southern African countries were found to have the highest regional motorization levels, and reported the highest fatality risk. Countries with particularly high fatality risk levels appear to be Botswana, Swaziland, Lesotho and South Africa. Fatality rates varied significantly within the African regions with nine countries reporting in excess of 100 fatalities per 10,000 motor vehicles. The East Africa region (Tanzania, Ethiopia, Uganda, Malawi) reported extremely high fatality rates.

The fatality rates per 10000 motor vehicles in most African countries are estimated⁹ to lie in the range 50 to 150. In comparison the fatality rates for Latin American countries ranges from 10 to 35, Asian – Pacific countries ranges from 8 to 37, Eastern Europe countries ranges from 3 to 40, and the industrialized counties ranges from 1.5 to 5. Thus whilst some of figures are of dubious accuracy, it can be said that the highest fatality rates worldwide are to be found in Africa. Those countries with the highest (and believable) rates, all in excess of 100, include Ethiopia, Malawi, Tanzania, Uganda and Ghana. To put these values in perspective, the highest peacetime fatality rate recorded in Great Britain was 32 fatalities per 10,000 motor vehicles in 1930⁹.

Based on official police record, the regional distribution of fatality rate (per 10,000 vehicles) where data were available, were found⁹ between 73 to 245 for East African countries, 6 to 87 for South African countries, 8 to 270 for Central African countries, and 10 to 132 for West African countries. The Fatality risk levels appear to vary consistent within the Africa regions. The fatality risk were estimated to be between 0 to 12 for East African countries, 2 to 31 for South African countries, 1 to 5 for Central African countries, and 2 to 9 for West African countries. The motorization level on the other hand were found to be for 1 to 14 East African countries, 1 to 121 for South African countries, 0 to 20 for Central African countries, and 11 to 29 for West African countries. The region with (marginally) the lowest fatality risk levels is Central Africa. From a regional point of view the highest vehicle ownership levels were to be found in Southern African countries with values ranging from over 30 in Zimbabwe, 55 in Botswana, 67 in Swaziland, and 120 in South Africa. Two West African countries of Gambia and Gabon are with levels of about 17 and 29 respectively⁹. The overall average increase in road traffic deaths from 1985 to 1996 in nineteen African countries some of which trend data were available was found to be 7 per cent⁹.

NIGERIAN ROAD SAFETY STATISTIC

Road accident is a serious problem that has been neglected by Nigerian passed and present governments. Fatal road accidents were said¹⁰ to be on the rise in Nigeria and the major cause of death in adults less than fifty years in the country. Statistics from the Nigeria Police shows¹⁰ that from 1955 to 1998 the number of people killed in road accidents had increased from 489 in 1955 to 6,500 in 1998. Statistics for the same period of the injured increased from 4,289 in 1955 to 17,117 persons in 1998. The current¹¹ available statistic for the period 1960 to 2004 as shown in figure 1 indicates the increasing trend of road traffic accident statistics. The number of persons killed was observed to rise from 1083 in 1960 to its highest value of 11382 in 1982. Thereafter it generally decreased continually to 5351 in 2004. The number of accident reported similarly, had also been on the decline since 1976 to 14361 in 2004. It first rose continually from 1413 in 1960 to its highest value of 40881 in 1976. Likewise, the number of persons injured rose continually from 10216 in 1960 to 30023 in 1978. It generally experienced a yearly continuous decrease to 16897 in 2004 thereafter. However, 1989 recorded an abnormally high figure of 34413. These statistics are found¹¹ to be much lower than the estimated values for Nigeria by organizations such as WHO.

World Health Organization (WHO) estimates⁵ that almost 16,000 people die from injuries sustained in road mishaps in Nigeria, each year, and several thousands more end up with non-fatal injuries and permanent disabilities. In contrast, the yearly average of persons killed computed on the bases on figure 1 records for the period 1960 to 2004 is 6186. The two values are significantly different probably because while the WHO's estimate might have been based on hospital records and the 30-days definition of fatality, the police records are based on reported cases by the public and "on the spot" definition of fatality. Figure 2 shows the computed yearly periodic averages of road traffic accidents casualty and reported cases. The averages of reported accidents, persons killed or injured rose from 1960 – 1969 to 1980 – 1989 and thereafter continued to decrease to date. It is recommended that studies be conducted to explain the observed decline.

Computed severity rate (persons injured or killed per 100 RTA) are shown in table 2. These severity rates for Nigeria shows an increasing trend. The rates were computed from available statistic for the period 1960 to 2004. The severity rate of persons killed was observed to increase at a constant rate. The severity rate of persons injured however increased at an increasing rate. Most developed countries have succeeded in checking and even reversing the road traffic casualty. The current

trends in Nigeria indicate that the carnage will increase if immediate remedial actions are not taken.

The road traffic accident record for 2002¹⁰ by state in table 3 showed that the total accident per state ranged from 60 for Sokoto to 4718 for Lagos, with the fatal, serious and minor cases per state ranging from 14 for Kebbi to 891 for Lagos, 24 for Cross River to 2206 for Lagos, and 0 for Kaduna to 1621 for Lagos respectively. Lagos State is observed to produced the highest statistic. The observed number of person per State killed in road traffic accident ranged from 13 for Taraba to 1266 for Lagos, while persons injured per State ranged from 69 for Taraba to 3550 for Lagos. Bauchi State was observed to record 43 fatal, 69 serious and 29 minor cases for the same year 2002. It had a total 141 accident cases for the entire state. The corresponding persons killed or injured were respectively 117 and 452. Computed Bauchi State severity rate of 321 for injuries is ranked second among the Nigerian States with Gombe having the highest rate of 341¹¹.

BAUCHI ENVIRON ROAD ACCIDENT STATISTIC

Raw road traffic data were complied from Federal Road Safety Corps (FRSC) Bauchi's daily accident register. The daily register contain information such as: 1) Date of accident; 2)Time of accidents;

3)location of accidents; 4) types of vehicles involved; 5)cause of accident; 6)number of casualty; 7)category of casualty (male, female or children); and 8)vehicle ownership. All reported accidents are immediately recorded in the daily register. These raw data were analyzed using MS EXCEL. Comprehensive daily register were only available for three years 2002 to 2004. Table 4 shows the summary of the road traffic accidents in Bauchi environ. The total road traffic accident (RTA) recorded was 115 for year 2002, 40 for year 2003 and 47 for year 2004. It was found from table 4 that fatal accidents constituted 20% to 26% of the reported cases of RTA. The serious cases were found to constitute 42% to 55%. The proportion of road traffic accident victims that died was computed to range ranged from 15% to 26%. 74% to 85% of the victims were found to sustain injuries. The computed severity rate of persons killed per 100 RTA almost doubled in three years from 59 in 2002 to 109 in 2004. However, the computed severity rate per 100 RTA for persons injured decreased from 327 in 2002 to 302 in 2004.

The monthly variation of road traffic accidents (figure 3) indicates that RTA oscillates within the year. April, August and December are the worst accident months. These periods also coincide with the festive periods in Nigeria.

The frequency of accidents types namely, fatal, serious and minor shown in figure 4 follows the general monthly pattern of figure 3. The computed number of monthly fatal cases ranged from 0 to 5 with an average of about 2 per month. The number of reported serious cases was found to range from 2 to 14 with the mean value of 4.

The distributions of road traffic accident victim as shown in table 5 reveals that 81% of the victims are male, 19% are female and children constitute 4% of the victims.

The distribution vehicle types (Figure 5) involved in road traffic accident in Bauchi environ shows that car constitute the highest proportion. Its computed yearly percentage was found to range from 44% to 54%. Motorcycles the second highest in proportion had a computed yearly percentage ranging from 22% to 30%. Bicycles had a computed yearly proportional value ranging from 1% to 5%. It was also found that while in 2002 road traffic accident involving two or three vehicles constitutes 40% and 10% respectively, in 2003 their proportions were 60% and 0%, and in 2004 they were 64% and 10% respectively. The fraction involving one vehicle for 2002, 2003 and 2004 were respectively 47%, 40% and 26%.

Among the category that owns vehicle involved in road traffic accident in Bauchi as shown in table 6, the involvements of commercially owned were the highest. Commercially owned vehicles constitute 48% in 2002, 57% in 2003 and 57% in 2004. The government owned vehicles had the least percentages with 10% in 2002, 5% in 2003 and 6% in 2004.

Of the six road traffic accident locations in Bauchi Environ, Bauchi-Jos route consistently recorded the highest frequency of occurrence as shown in figure 6. This was followed by the accident that occurred in the township areas. Bauchi-Jos route constituted 41% to 50% of the distribution of road traffic accident by location, while Bauchi Township constituted 25% to 30%.

The three major causes of accident in Bauchi Environ in their ranked order are dangerous driving, speed variation and tyre burst. The contribution of dangerous driving for the period 2002 to 2004 was 39% to 49%, similarly speed variation accounted for 21% to 28% while tyre burst accounted for 9% to 21%. Human factors constituted 71% to 85% of the yearly causes of accident for Bauchi Environ, while Vehicular factors account for 11% to 23% and Environmental factors were found to be 4% to 5% yearly.

CONCLUSION

In conclusion, the available road traffic accidents in Nigeria for 1960 to 2004 indicated the following.

1. The highest number of person killed in Nigeria was 11382 in 1982.
2. The number of reported accidents in Nigeria has been on the decline since 1976.
3. In contrast, the severity rate per 100 road traffic accident for Nigeria is on the increase.

Finally, from the analyzed road traffic data for Bauchi environ, the following conclusions were found.

1. In Bauchi environ, fatal accidents constitute 20% to 25% of the reported cases of road traffic accident, while serious accidents constitute 42% to 55%.
2. Bauchi Environ records an average of 2 fatal accidents and 4 serious accidents monthly.
3. Motorcycles are the second highest accident prone vehicle types in Bauchi environ. They constitute 22% to 30% of total reported accidents.

4. The three major causes of road traffic accident in Bauchi in their ranked order are dangerous driving, speed variation and tyre burst.

REFERENCE

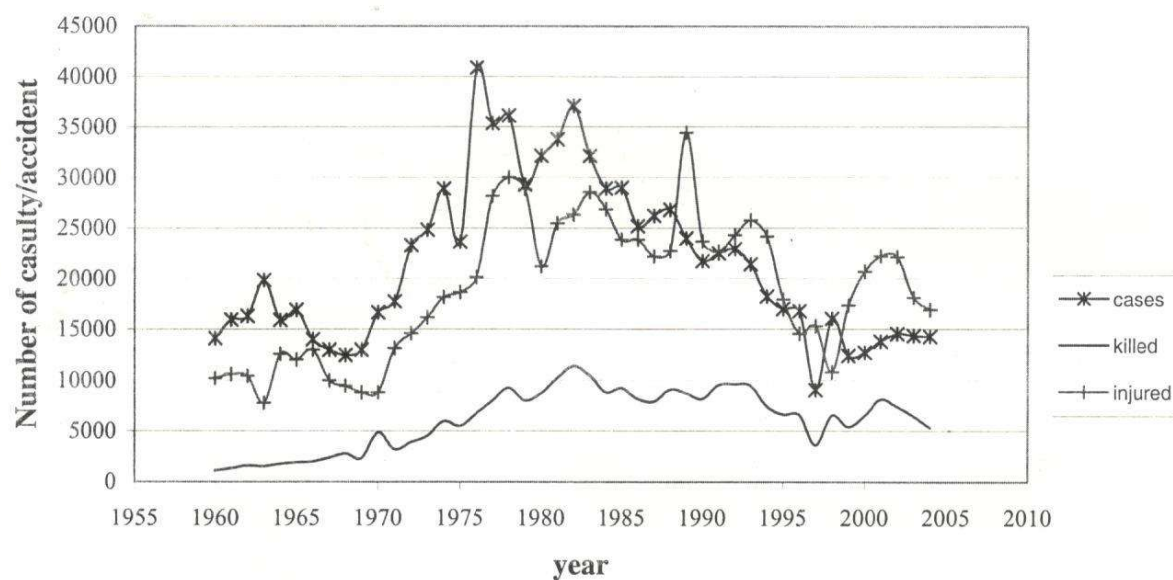
1. United Nation Economic Commission for Europe: Vienna Convention on road traffic, Technical report, United Nation publication, Vienna, November, 1968
2. Peden M, Scurfield R, Sleet D, Mohan D, Hyder A. A., Jarawan E, Mathers C (Eds). 2004. World report on road traffic injury prevention. Geneva, World Health Organisation, 2004. Available at [http:// www.who.int/world-health-day/2004/infomaterials/world_report/chapter2.pdf](http://www.who.int/world-health-day/2004/infomaterials/world_report/chapter2.pdf)
3. Peden M., McGee K, Krug E (Eds). Injuries: A leading cause of global disease, 2000. Geneva, World Health Organisation, 2002. Available at <http://whqlibdoc.who.int/publications/2002/9241562323.pdf>
4. Murray CJL, Lopez AD. The global burden of disease. World Health Organization/ Harvard school of Public Health/World Bank. Harvard University Press, Cambridge, MA. 1996. (Global Burden of Disease and Injuries Series Vol. I)
5. World Report 2004 on Road Traffic Injuries. World Health Organization/ World Bank. Geneva. Available at: www.who.int/violence_injury_prevention
6. Odero W. African's epidemic of road traffic injuries: Trends, risk factors and Strategies for improvement. Harvard center for population and development Studies, Cambridge, MA. Available at [http://www.hasanweb.org/news/Road%20Traffic%20Injuries-seminar%20paper \(April9-04\).pdf](http://www.hasanweb.org/news/Road%20Traffic%20Injuries-seminar%20paper%20(April9-04).pdf)
7. Odero W. Road traffic injury research in Africa: context and priorities. Global Forum for Health Research Conference, Mexico November 2004.
8. Antov D and Roivas T. Road-User Behaviour in Estonia- Belief and Attitudes Towards the Road Safety Measures, 17th ICTCT Workshop Tartu 2004 Available at: www.ictct.org.

9. Jacobs G, Aeron-Thomas A. (TRL Limited).
Africa Road Safety Review: Final Report.
Global Road Safety Partnership; 2000
Available at:
www.safety.fhwa.dot.gov/fourthlevel/toc.htm
10. Ikhu-Omoregbe S. Safety on Nigeria Roads
Third Dimension Technologies
<http://www.3dtechnologies.org/article4.htm>
2005.
11. Yerima M. and Egwurube J. Road Safety: The
Nigerian Approach. 15th International Safe
Communities Conference, University of Cape
Town, South Africa. 9-11 April 2006.

Table 1: Global distribution of estimated road deaths, motor vehicles and population

REGION	FATALITY	MOTOR VEHICLE	HUMAN POPULATION
Sub-Saharan Africa	10%	4%	10%
Industrialized World	14%	60%	15%
Asia/Pacific	44%	16%	54%
Central & Eastern Europe	12%	6%	7%
Latin America/ Caribbean	13%	14%	8%
Middle East/ North Africa	7%	2%	5%

Source: Africa Road Safety Review –Final Report 2000.

**Figure 1 Yearly Variation of Road Traffic Accident in Nigeria¹¹**

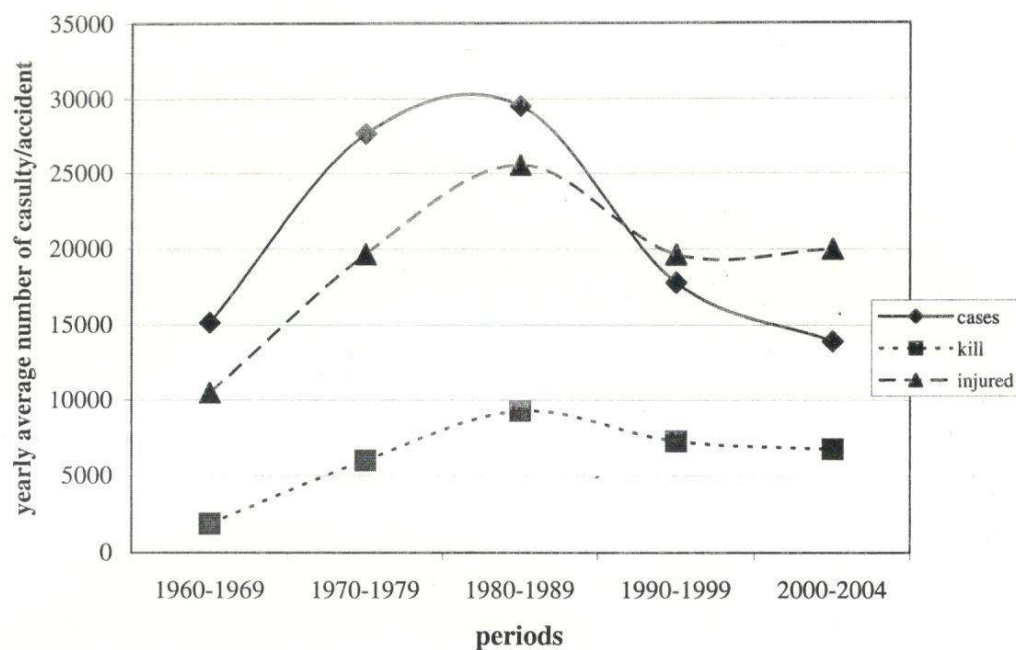


Figure 2 Periodic average values for Nigeria road accident data

Table 2: Periodic Road Traffic Accident Rates for Nigeria¹¹

Period	Severity rate Per 100 RTA	
	Killed	Injured
1960-1969	13	70
1970-1979	22	72
1980-1989	32	89
1990-1999	41	111
2000-2004	49	144

Table 3: Road Traffic Accident Records for 2002 By States¹⁰

State	Total Accidents	Fatal	Serious	Minor	Person Killed	Person Injured
Abia	224	49	116	59	101	362
Adamawa	421	61	307	53	189	1043
Akwa Ibom	109	41	58	10	54	96
Anambra	397	68	140	189	132	333
Bauchi	141	43	69	29	117	452
Bayelsa	83	30	35	18	32	97
Benue	138	28	67	43	78	270
Borno	273	39	153	81	104	360
Cross River	79	49	24	6	56	71
Delta	271	84	157	30	224	540
Ebonyi	107	24	51	32	22	217
Edo	241	65	98	78	144	500
Ekiti	153	44	96	13	71	236
Enugu	270	101	65	104	136	433
FCT	459	124	316	19	263	1248
Gombe	121	35	84	2	84	522
Imo	484	199	235	50	291	916
Jigawa	239	138	72	29	253	610
Kaduna	283	82	201	0	184	611
Kano	1,078	434	445	199	497	935
Katsina	418	231	179	8	415	1067
Kebbi	84	14	64	6	72	210
Kogi	214	94	109	11	247	678
Kwara	237	48	165	24	192	550
Lagos	4,718	891	2206	1621	1266	3550
Nasarawa	272	149	111	12	336	750
Niger	116	31	76	9	92	367
Ogun	1,044	368	577	99	611	1724
Ondo	393	51	100	242	181	311
Osun	96	23	53	20	102	250
Oyo	501	153	312	36	439	1142
Plateau	195	46	106	43	102	497
Rivers	263	79	80	104	87	177
Sokoto	60	15	43	2	20	99
Taraba	211	112	34	65	13	69
Yobe & Zamfara	NA	NA	NA	NA	NA	NA
Total	15,093	4,043	7,004	3,346	7,207	21,293

Remarks: Figures for Yobe and Zamfara States for 2002 are missing. The addition of these figures will give a result higher than the present one. Also, there are observed under reporting eg the Minor accidents for Kaduna state.

Table 4: Summary of RTA Data for Bauchi Environ

Year	No. of RTA	Accident Category			No. Of Victim	
		Fatal	Serious	Minor	Dead	Injured
2002	115	25	48	41	68	376
2003	40	8	22	10	34	101
2004	47	12	20	15	51	142

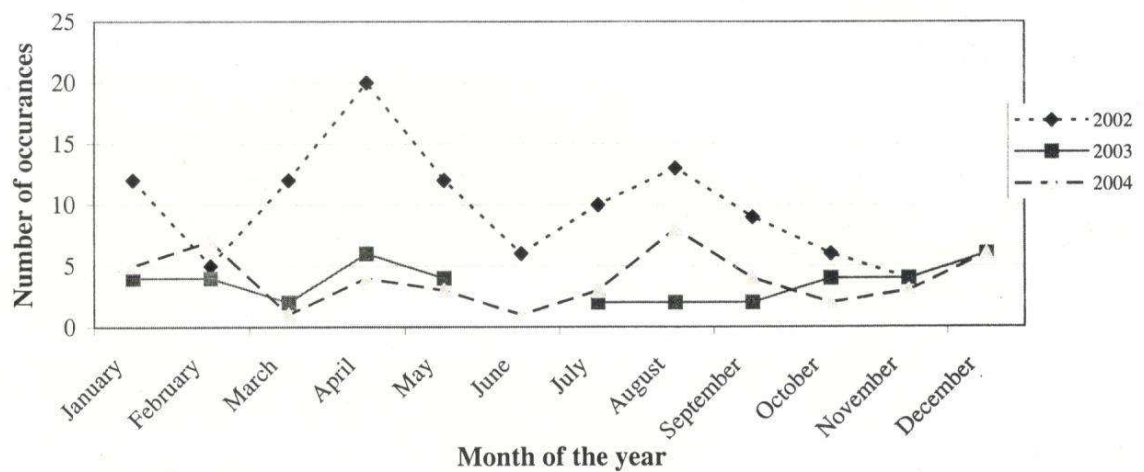


Figure 3 Monthly Variation of RTA for Bauchi Environ

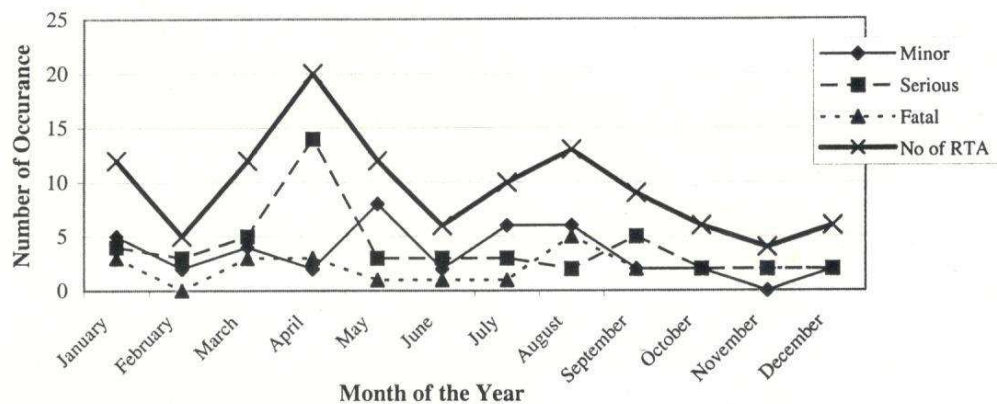


Figure 4 Typical variation in the type of RTA

Table 5: Yearly Distributions of RTA Victims Categories

Year	No of Victim	Male	Female	Children
2002	811	659	151	36
2003	246	198	49	6
2004	284	198	49	7

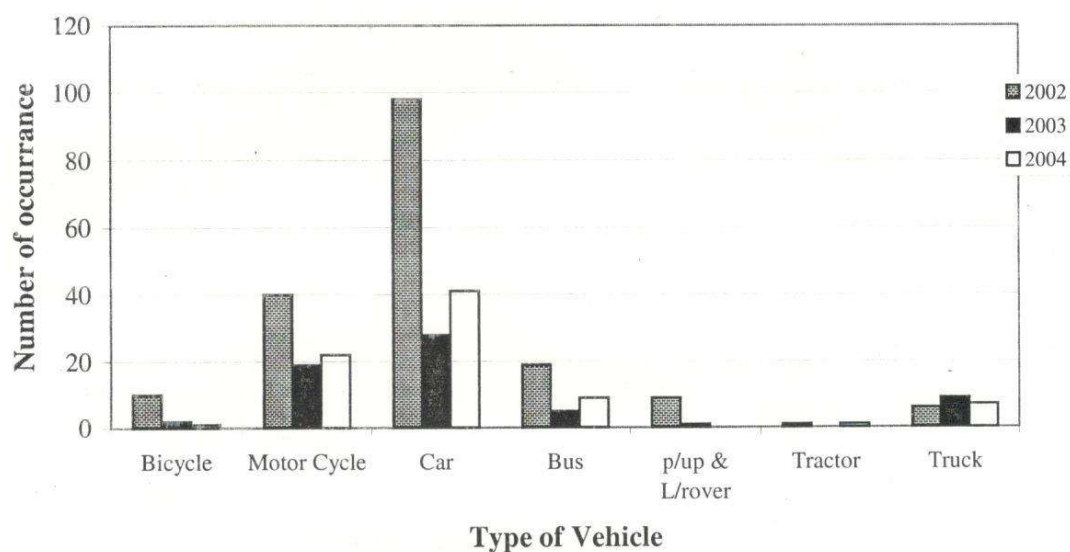


Figure 5 Vehicle Type involved in RTA

Table 6: Yearly Ownership Distributions For Vehicles Involved in RTA

Year	Ownership of Vehicles			Total
	Private	Commercial	Government	
2002	76	86	19	181
2003	25	37	3	65
2004	28	46	4	78

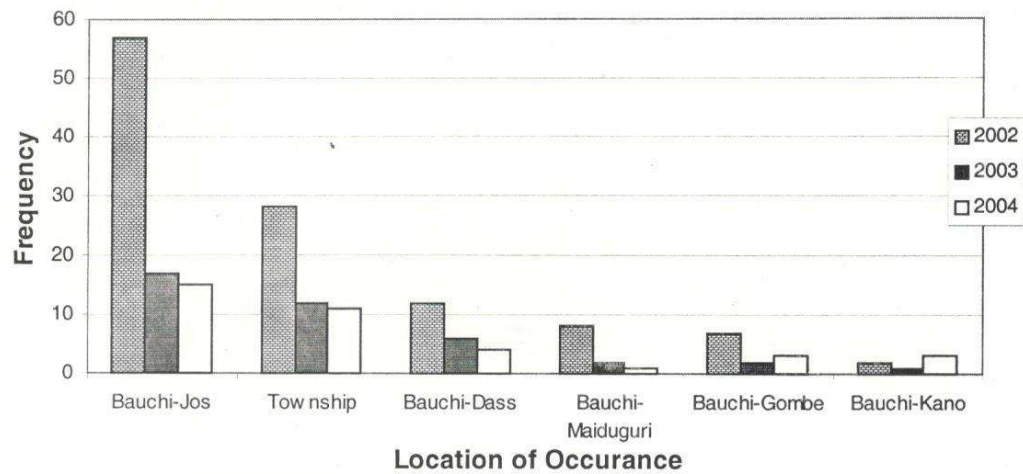


Figure 6 Distribubution for RTA Location Occurances

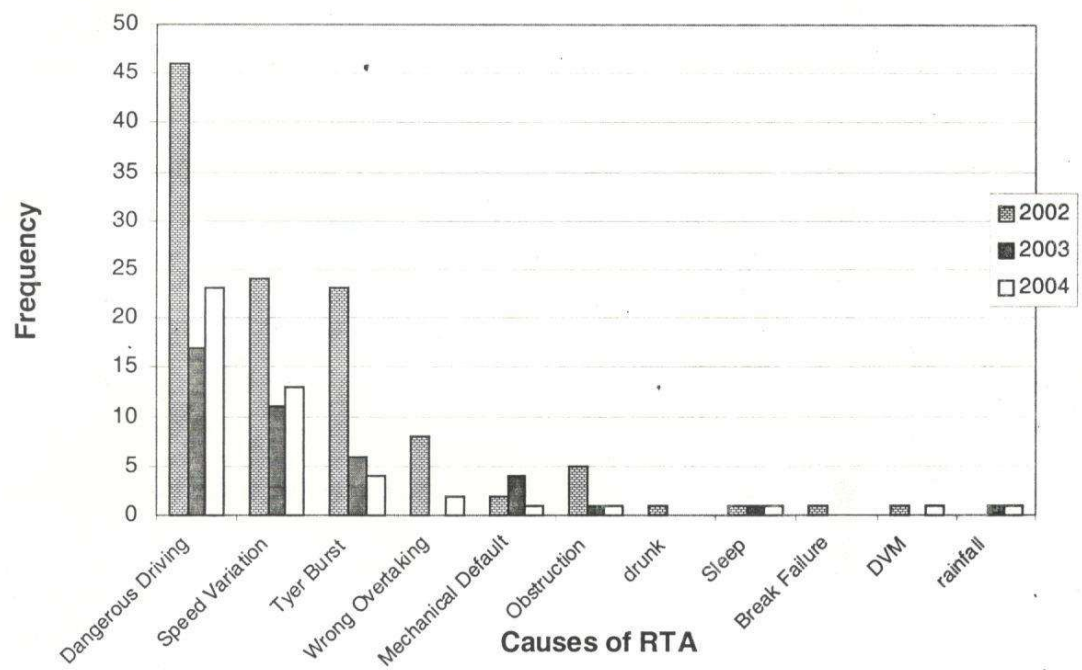


Figure 7: Causes of Road Traffic Accidents