Innovations

Road traffic accident deaths, injuries, driver's safety and socio-economic development in Nigeria

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Abstract
The design of roads can have a considerable impact on their safety. Ideally, roads should be designed keeping in mind the safety of all roads users. This would mean making sure that there are adequate facilities for pedestrians, cyclists, and motorcyclists. Measures such as footpaths, cycling lanes, safe crossing points, and other traffic calming measures can be critical to reducing the risk of injury and death among these road users. Safe vehicles also play a critical role in averting crashes and reducing the likelihood of serious injury. However, socio-economic development influence road safety but few studies have assessed both the short-and long-run relation between economic performance and road safety in Nigeria. Based on the literature gathered, government, policy makers, road safety agencies, motorists and motorcyclists should invest in road infrastructure enforcement of traffic regulations and safety measure that will reduce injuries.

Keywords:1.*Development; 2.Infrastructure; 3.socio-economic; 4.Accidents; 5.Roads; 6.Drivers; 7.Nigeria.*

1.0 Introduction

Every year the lives of approximately 1.3 million people are cut short as a result of a road traffic crash. Between 20 and 50 million more people suffer non-fatal injuries, with many incurring a disability as a result of their injury. Road traffic injuries cause considerable economic losses to individuals, their families, and to nations as a whole. The losses arise from the cost of treatment as well as lost productivity for those Killed or disabled by their injuries, and for family members who need to take time off work or school to care for the injured. Road traffic crashes cost most countries 3% of their gross domestic product (WHO, 2021).

There are thousands of Nigerians who have become permanently deformed and disabled due to loss of one body part or another in road accidents they were involved in at various points. It is alarming that auto crashes, especially on Nigerian highways, are on the rise on a daily basis showing no sign of abating at least, not in the near future. On one hand, the frequent crashes have also become stumbling blocks towards achieving national security in the country (Atubi, 2017, 2018, 2020a, 2020b, 2020c, Modibo, 2021).

The latest Nigeria's National Security strategy 2019, recognised land transportation as a vital aspect of the socio-economic well being of Nigeria. It is a major facilitator of growth and development, tourism, education, health and socio-economic development, thus making it an

enabler of national security. The land transportation system covers about 204,000km of roads and accounts for over 80 percent of the national transportation needs (Atubi, 2021a, 2021b; Modibo, 2021).

However, a daunting report by the Federal Road Safety Corps (FRSC) indicated that the corps recorded not less than 22,320 road traffic crashes (RTCS) involving 36,031 vehicles with 5,471 deaths in Nigeria. It is estimated that about 15 persons die in Nigeria on a daily basis due to road traffic accidents or four persons every six hours, or 426 per month (FRSC, 2021). The figures really indicated a terrifying situation. Comparatively, Nigeria's road traffic deaths and injuries are some of the highest in any country. The global average stands at 17.4; the African average is 26.6 of 100,000 inhabitants. Norway, which has the safest roads, has a 2.0 casualty rate per 100,000 persons. Zimbabwe has the highest road death rate in the world with average pegged at 74.5 per 100,000 (FRSC, 2021).

The World Health Organisation indicated that road traffic accidents cost low – and – middle – income countries between 1.0 and 2.0 percent of their Gross National Product annually. This is more than the development aid the countries receive. The Federal Road Safety Corps (FRSC) put the economic losses to road traffic crashes at 9.8 billion (WHO, 2020, FRSC, 2018). In Nigeria, most of the highways are not motor-able, filled with a lot of potholes and therefore, unsafe at any speed.

Road traffic injuries are a major cause of death and disability globally, with a disproportionate number occurring in developing countries (See Table 1). Road traffic injuries are currently ranked sixteenth globally among the leading causes of disability adjusted life years lost, and the ranking is projected to rise to seventh by 2030 (WHO, 2018) (See Table 2 and 3).

According to the World Health Organisation, road traffic injures caused an estimated 1.35 million death worldwide in 2016 (WHO, 2018). That is one person is killed every 25 seconds. Only 28 countries, representing 44.9 million people (seven percent of the worlds population) have adequate laws that address all five risk factors (speed, drunk driving, helmets, seat-belts and child restraints). Over a third of road traffic deaths in low-and-middle-income countries are among pedestrians and cyclists. However, less than 35 percent of low-and middle – income countries have policies in place to protect these road users (WHO, 2015). The average rate was 17.4 per 100,000 people. Low – income countries now have the highest annual road traffic fatality rates, at 24.1 per 100,000, while the rate in high – income countries is lowest at 9.2 per 100,000.

Sub-Saharan Africa is the global capital for road traffic deaths. Indeed, there has been no progress in reducing the number of deaths from road traffic incidents in any low-income country between 2013 and 2016 (WHO, 2018, Kazeem, 2019). Not until it happens to a very close relation like son, daughter, wife, husband, father, mother, brother or sister do most people really appreciate the magnitude and seriousness of the mental agony, the sufferings, and the loses (particularly of family pillars and bread winners) involved in each of over 940,659 reported road accidents, with over 318,000 reported fatalities and over 510,000 reported injured people that on the average, have annually been greeting our national highways over the past 59 years (1960-2019) (See Table 3).

2.0 **Impact of Road Crashes on the Economy**

Road crashes kill 1.25 million people and injure 20 to 50 million people every year. Road crashes also bear a heavy economic cost. Crashes come at a cost of USD $518 billion per year to the global economy. The cost of road crashes varies in different economies. Crashes amount to

approximately 1 percent of the Gross Domestic Product (GDP); in middle – income countries the cost is 2 percent of the GDP. Some studies even cite costs as high as 3 percent of the GDP (Peden et al, 2004; UNRSC, 2011 and WHO, 2018).

The cost of crashes in the developing world often exceeds the amount of payments that those countries receive in financial aid. It also points that because of poor reporting and lack of a control data system, we don't know as much as we would like about the cost of crashes in many less developed countries (Together for Safer Roads, 2022). Countries that do not invest in road safety could miss out on anywhere between seven and 27 percent in potential per capital GDP over a 24 year period. This should be a warning to Nigeria that has one of the highest accident fatality rates in the world. It should also compel Nigeria to begin to design programmes and policies to make our roads safe for travellers. The number of peo0ple that have been lost to road accidents is huge (This Day, 2019).

In Nigeria, estimated road traffic death rate per 100,000 population declined from 33.7 in 2010 to 20.5 in 2013. However, the number of road fatalities (5,053) and injured person (30,105) in 2016 was very high (FRSC, 2017). Road traffic deaths and injuries exacerbate poverty in households through the loss of a bread winner, and cost incurred for the treatment and care of persons injured or disabled. Road crashes impede economic growth of countries of mostly people aged 15-44 years (accident for 48% of global traffic deaths) are removed from the workforce thereby reducing productivity (WHO, 2015).

It is estimated that the macro-economic burden of road injuries for 166 countries shows that between 2015 and 2030, road injuries will cost the world economy $1.8 trillion through a combination of diversion – health care expenditure that world otherwise have been used for savings or investment and losses in employment due to mortality and morbidity. This figure is more than the aggregate GDP of Canada (the World's tenth largest economy) in 2017. The economic burden of road injuries is equivalent to an annual tax of 0.12% on global GDP during this period (World Bank, 2019). See Table 4.

Financial loss to the victims or compensation can be calculated by different parameters. Financial compensation can be for pain and sufferings from the accident, financial losses of the future in the form of reduction in expectancy of life and future loss income. Past lost income on medical expenses, repair of vehicles, hire vehicle and travel expenses has also to be included for total financial loss. Insurance company outlay and interest on the compensation claim and legal fees are also part of financial losses and may be claimed in a case of motor vehicle accident claim (Bolton, 2016). Financial losses due to accidents can be measured by adding costs of emergency services costs, medical costs, legal and court cost, lost productivity, property damages, workplaces loss, insurance administrations costs (NHTSA, 2010; NSCIF, 2013). Wage and productivity loss, motor vehicle damage, employer's uninsured cost, fire loss and motor vehicle duplication costs also adds to the financial losses (NSCIF, 2013; Rakesh, 2016).

It is apparent that road accident is a complex phenomenon not only in terms of its diverse causes but also in the nature of its effects on lives and property. Apart from the humanitarian aspects of road safety, the injuries and fatalities, which occur as a result of road accidents, have serious social and economic consequences which have made prospective travellers to develop phobia for spatial interaction. This under normal circumstances would have prevented and nipped in the bud all business initiatives that would have taken place at location different from the locations of business tycoons given the fear of the unknown in relation to likelihood of being involved in road traffic accidents (Atubi & Gbadamosi, 2015).

Indeed, a World Bank study has shown that the economic development of regions and nations is associated with an increase in the number of injuries and deaths from road traffic

crashes (Kopits, et al, 2005). Road traffic injuries place a heavy burden not only on global and international economies but also on household finances. Many families are driven deeply into poverty by the loss of bread winners and the added burden of caring for members disabled by road traffic injuries. Also, among males of the economically active age-group, motor vehicle injuries are the third most important cause of death in developing countries. However, the health and economic burden of road traffic injuries have not been fully recognized (Zwi, 1993). Accurate epidemiological data from many of the developing countries are difficult to find in the literature (Van et al, 2006). Hospital logs or police records from which data on accident injuries could be sourced under estimate the total burden of the injuries (Balogun et al 1992; Asogwa, 1992; Atubi; 2012t). Besides, despite the importance of injury as a public health problem, few studies have been concerned with the economic and social impacts. This is due to many factors most of which are related to availability of reliable data (Afukaar et al, 2003).

Nigeria, Africa's largest country and economy by population and gross domestic products (GDP), loses as much of three percent of her GDP to road crashes (AFDB, 2019). Growing vehicle ownership and rapid urbanisation across the continent are factors which have increased the incidence of road accidents.

Apart from the human losses that accident brings, road accidents are not economically sustainable. Studies estimate that road accidents come at a cost equivalent to about 3% of the gross domestic product (GDP) in countries with a high GDP per capital (Elvik, 2000; Wijnen & Stipdonk, 2016). The European commission calculates this cost based on the sum of four components; the human cost, the lost of production, medical costs and administrative costs. Deaths on the road entail a cost of 3,273 euros per person, meaning the cost associated with the loss of life in 2018 would be 82 billion euros (European Commission, 2019; Francisco, Jose & Juan, 2020).

Unlike most countries where the departments in the Transport Ministry calculate the costs of road accident casualties, in a bid to identify the value of prevention, there is no such effort in Nigeria. But even at that, it is obvious that the costs are very high both in economic and human tolls. In the African setting for instance, and particularly in Nigeria, men are generally regarded as bread winners of their families and naturally expected to provide for their needs which explains the frenetic disposition in the pursuit of a means of livelihood by most of them.

It is therefore, not surprising that the Federal Road Safety Corps (FRSC) has not hidden it concern on the negative impact which road accidents have been exerting on the economy. For instance, in the last quarter of 2018, economic loss worth N9.8 billion was lost in 196 traffic crashes recorded across the country (FRSC, 2018). The newly adopted 2030 agenda for sustainable development has set an ambitious target of mitigating the global number of deaths and injuries from road traffic crashes by 2020, positing that without sustained action, road traffic crashes are predicted to become the seventh leading cause of death by 2030 (WHO, 2018; Atubi, 2020b).

3.0 **Causative Factors in Road Traffic Crashes**

Understanding underlying factors leading to crashes are very important when planning effective crash reduction and prevention measures, and this requires obtaining accurate information about the problems involved. Researches are continually searching for ways to gain a better understanding of factors that affect crash occurrence (Savolainen et al, 2011; Lord & Mannering, 2010; Atubi, 2014, 2007b, 2012x, 2011a, 2012a, 2020a, 2020b, 2021a and 2021b)

Atubi (2020a) revealed that most of the road traffic accidents in Nigeria were caused by the carelessness of drivers, poor vehicle maintenance, inadequate road traffic signs and markings, and unfavourable climatic conditions; indicating that influence of alcohol and use of phones while driving constituted the minor causes of road traffic accidents. The important thing was human factors responsible for accidents in Nigeria were over speeding, rash driving, not following traffic rules, carelessness while crossing roads, playing on road, alcohol intake, fatigue and sleepiness (Atubi and Gbadamosi, 2015). Over speeding, over loading and disregard to road signs or regulations were the first three main road traffic accident causing factors in Nigeria (Atubi and Onokala, 2009).

Afolabi and Gbadamosi, (2017) in a review of crash reports, stated that human, mechanical, and environmental characteristics are the salient factors of RTC in Nigeria, Uzondu et al, (2019), in an observational study, reported that the incorrect use of indicators and tailgating were the two road user behavours that were prevalent among road users in Owerri, Imo State, Nigeria.

Table 5 shows the main causes of road traffic crashes in Nigeria according to the FRSC in 2018 and 2019. The top 3 identified causes of crashes are speed related factors (speed violation, loss of control, and dangerous driving) which accounts for 57.8% of all causes of crashes in Nigeria in 2018. The top 5 factors identified in table 5 all relate to driving behavour, which is a confirmation of the suggestion by Hingson et al, (1996) that changes in driver behaviours offers the largest opportunity towards the reduction of road traffic crashes (See Tables 5 and 6).

Driver factors account for up to 90% crashes in Nigeria; this includes inappropriate speeding and speed – related factors, poor knowledge of traffic regulations including road signs and markings, drink driving, driver fatigue, wrongful overtaking etc. The fist four which are linked to driver behaviour have consistently been the highest probable cause of road traffic crashes in Nigeria in a long time.

Atubi (2010c) examined the variance spectra of road traffic crashes in Lagos State Nigeria and found that more that 90% of road traffic crashes in Lagos State could be contributed to over speeding and recklessness on the part of drivers. Drinking and driving has been identified as a problem which requires a multi-dimensional coordinated approach if it is to be effectively addressed.

Similarly, Olajuyigbe et al (2014) found human factors as the major cause of crashes in all the districts of the city of Abuja, Nigeria. These human factor include dangerous driving, wrong over taking, speed, loss of control and fatigue. This is followed by road factor which is essentially the nature of the road. This agrees with the findings of Hirasawa and Asano (2003) who reported that the high rate of fatal accidents and the sharp increase in the last ten years of road accidents in Hokkaido, Northern Japan could be attributed to changes in road surface conditions. Other unobserved causes are vehicle factors (brake failure, tyre burst and abandoned vehicle) and environmental factors including bad weather conditions that often affect visibility thereby causing poor vision to the drivers.

In a study of the determinants of road traffic accidents among commercial vehicle drivers in Gboyin Local Government Area of Ekiti State, Nigeria, Ojo (2015) revealed that driving under the influence of alcohol was the most significant determinants of road traffic accidents. Other significant determinants were excessive speeding, indiscriminate parking, impressionistic, driving, and sleepiness.

Using mostly secondary data on vehicular accidents obtained form the Nigeria police force and federal road safety commission, Atubi (2018) examined a forty-five year review of number of injured from road traffic accident (1970-2015) in Lagos State. The result showed that

the proportion of variation in the number of injured from road traffic accidents explained by the independent variable of length of roads, presence of road safety and population was 41%. The results specifically showed that the higher the length of roads (km) the more the number of injured from road traffic accidents while the number of injured decreases with increase in population. The study indicated that the presence of road safety had positive but not significant effects on the number of people injured from road traffic accidents.

4.0 Theoretical Framework

The following theories have been identified as relevant to the study:

1. The domino theory of H.W. Heinrich
2. Systems Theory
3. Personality Theory

4.1 The Domino Theory of H.W. Heinrich

H.W. Heinrich developed the original domino theory of accident causation in the late 1920s. Heinrich believed that unsafe act caused more accidents than unsafe conditions. Therefore, his philosophy of accident prevention is focused on eliminating unsafe acts and the people – related factors that lead to injury. Although written decades ago, his work in accident causation is still the basis for several contemporary theories. According to Heinrich's early theory, the following five factors influence all accidents and are represented by individual dominos:

- ***Social Environment and Ancestry:*** Some characteristics such as recklessness, greed, and bad temper are originated from either inheritance or social environment. In other words, such traits can be raised, natured and nurtured contributing to fault of persons. Negative character traits leading a person to behave in an unsafe manner can be inherited or acquired as a result of the social environment.
- ***Fault of Person:*** Some unpleasant manners or traits such as ignorance, recklessness, and bad temper can be innate. Also, such traits can appear due to life environments contributing to unsafe acts or unsafe conditions. Negative character traits are why individuals behave in an unsafe manner and why hazardous conditions exits.
- ***Unsafe Acts or Unsafe Conditions:*** Unsafe acts and unsafe conditions are labelled on the domino at the centre of sequences contributing to an accident. They are the most significant factor to cause an accident. Lifting up this domino is the easiest and the most efficient option in order to prevent an accident. Unsafe acts committed by individuals and mechanical or physical hazards are the direct causes of accidents.
- ***Accident:*** Accidents are the undesirable and the events that happen and cause injury. The events can be such as a person's fall from height and striking a person due to collapse of objects. Falls and the impact of moving objects typically cause accidents resulting in injury.
- ***Injury:*** Injuries are the consequences of suffering danger to someone's body. Typical injuries resulting from accidents include lacerations and fractures.

4.2 Systems Theory

Systems theory is a widely used interdisciplinary theory which originated from the general systems theory, developed by an Austrian Biologist Karlung Von Bertalanffy in 1950. Relating this theory to the study, the three components making the road traffic system are the road (environment), the vehicle (mechanical) and the road users (human) and the tree factors are operationally related in road safety or causation of road traffic crashes (RTCs). Atubi (2006) posited that, defect in any of the three main components could lead to the malfunctioning of others and consequently lead to system failure which in turn could result in road traffic crashes.

Road traffic crashes result from actual failure of the road users, the vehicle or the fixed facilities to discharge properly their respective functions in the traffic system. The three components operate independently and interactively to cause crashes, hence the strategies to reduce road traffic crashes are woven around ensuring that there is no breakdown in the interactions among the components. Hughes et al (2016), observed that the components of the road safety system comprise the constituents parts which alone, or in combination, cause road crashes.

4.3 Theory of Habitual Behaviour

This theory argues that it people conduct themselves frequently without previous specific deliberation, their activity is normal. Therefore, when individuals first behave in a particular manner, they typically determine what to do and how to achieve those outcomes and prevent certain consequences. However, when such acts are replicated in the same way, clear rational decision – making reduces and behaviour is related to the setting (Verplanken & Wood, 2006). Almost all behaviour (95% of behaviour) is a form of habitual behaviour (Wagenaar & Beck, 1992). When road users can observe from the environment what behaviour are expected from them (such as speed) and what other road users' behaviour can be expected (such as overtaking), traffic is more predictable and consequently more safe (See Fig. 1).

Fig. 1: A Schematic Illustration of Habitual Behaviour

Source: Culled from Verplanken & Wood (2006)

This theory applies to the present study as it explains the reasons behind the behaviour of drivers in a particular manner.

5.0 Road Safety and Improved Drivers' Behaviour in Nigeria

Several factors contribute to road traffic crashes in Nigeria. Obedience to the traffic rules and driving in a disciplined way can help drivers to know and protect each other's movement. To drive a vehicle safety requires that one must possess specific skills that must be learnt properly. When one drives with the right skills, there is a higher chance that the person will be safe and getting into a crash is reduced to an extent. To improve the safety performance of drivers, training and education are very important. Driving is a profession that requires total

concentration. Every driver should know the basic rules and regulations of driving. This is necessary in order to ensure good driving culture.

In Nigeria, the Federal Road Safety Commission is mostly responsible for developing these measures. In response to the UN decade of action for road safety, FRSC launched "safe road in Nigeria" with the calm of reducing road crash deaths and injuries by 50% by 2030. It is based more on changing driving behaviour than advocating for good road infrastructure. The FRSC has stepped up the campaign in Nigeria to ensure that these objectives are met by strengthening legislation and enforcement in the following areas:

i. Drink Driving

This is universally believed to be unacceptable and a serous threat to traffic safety. The maximum authorised blood alcohol content (BAC) in Nigeria is 0.5g/i. FRSC (2015) shows that driving under the influence of alcohol accounted for an estimated 1% of the total cause of vehicle crashes in the country in 2012. Recently there have been efforts to amend the maximum BAC to 0.2g/I for novice drivers (less than one year driving experience) and 0.01 g/l for commercial drivers. The dangers inherent in driving under the influence of alcohol include impaired vision, poor sense of judgement, indulging in excessive speed etc. The FRSC has been organising and running publicity campaigns against drink – driving with private sector support, but enforcement of the law is still very weak and need to be strengthened.

ii. Speeding

Speed violation and inappropriate speed have been identified as a major contributor to road traffic crash in Nigeria. Current national speed limits on Nigerian roads are as follows: Urban roads: 50km/h, Rural roads: 80 km/h and expressways: 100 km/h. Ironically, only very few Nigerian drivers are aware of the different speed limits because most of them do not have the required training and tests before obtaining a driver's licence and will not on their own go through the highway code. In addition to these, most roads have no speed limit signs at all. Consequently, in 2016 the compulsory installation and use of speed limiting devices were introduced to commercial vehicles in the first instance, although enforcement and compliance began in 2017. There is a plan to extend this to private vehicles pending success with the commercial drivers. An increase in average speed is directly related both to the likelihood of a crash occurring and to the severity of the consequences of the crash. For example, every 1% increase in mean speed produces a 4% increase in the fatal crash risk and a 3% increase in the serious crash risk. The death risk for pedestrians hit by car fronts rises rapidly (4.5 times from 50km/h to 65km/h). In car-to-car side impacts the fatality risk for car occupants is 85% at 65km/h.

iii. ***Seatbelt Use***

Seat belts are highly effective in protecting vehicle occupants and significantly reduce their risk of being fatally or seriously injured in the event of a crash (Cummings et al, 1995; Evans 1996; Atubi, 2013). The seatbelt policy was made compulsory in Nigeria in 2003, which makes it an office for front seat occupants of vehicles not to war seat belts (Atubi, 2006 and 2013) while the enforcement for rear seat occupants started in 2015. The law is exclusively enforced by the FRSC.

iv. Education and Training

Driver education (and training) is a common approach to improving road safety as the aim is to change the risky behaviour of the driver. The general premise of driver training is that lack of knowledge about safe driving and/or inappropriate attitudes are responsible for unsafe behaviours which often lead to road crashes. Therefore, the primary goal of driver training should be to increase knowledge and ensure that road users drive safely. Thre is subtaintial evidence that driving skills improve during training and several studies have suggested that higher order skills such as risk – assessment, hazard perception, situational awareness and the development of a responsible attitude contribute more to reducing crash risk than advanced driving skills (Hatakka et al, 2003; Bates et al, 2014; Atubi, 2014). Driver training and education should occur within an evidence – based holistic and life long driver licensing system, such as graduated driver licensing, with a developmental curriculum providing support and legitimacy for the things that do reduce risk.

v. Enforcement

Enforcement is based on the principle that people try to avoid penalties. People have the impression that there is a high chance that they will be penalised when violating a rule. The subjective chance of apprehension is primarily affected by the actual level of enforcement which is affected by how much people see or hear about enforcement. Therefore, the chance of apprehension can be increased by applying enforcement, publicising specific enforcement activities and by feedback on the results of enforcement activities (Atubi and Gbadamosi, 2015; Atubi, 2021b).

Improvements of traffic law enforcement have been shown to lead to rapid reductions in deaths and injuries when best practice is applied. Thus it should be part of an integrated road safety policy. One of the recommendations highlighted in the WHO (2018) was about enforcement.

Conclusion

More than 90% of road traffic deaths occur in low-and middle-income countries. Road traffic injury death rates are highest in the African region. Even within – high – income countries, people from lower socio-economic backgrounds are more likely to be involved in road traffic crashes. The safe system approach to road safety arms to ensure a safe transport system for all road users, such an approach takes into account people's vulnerability to serious injuries in road traffic crashes and recognises that the system should be designed to be forgiving of human error. The cornerstones of this approach are safe roads and roadsides, safe speeds, safe vehicles, and safe road users, all of which must be addressed in order to eliminate fatal crashes and reduce serious injuries.

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