Capstone Project - The Battle of Neighborhoods (Week 2)

ROAD TRAFFIC ACCIDENT CAUSES IN GHANA PER REGIONS, VEHICLE TYPES ETC

Introduction

Road accidents in Ghana have been identified as one of the major causes of deaths in the country. It is classified as the second major cause of death in the country following malaria. According to the road traffic crashes in Ghana statistics for the year 2009 by Building and Road Research Institute, shows that there were 12,299 road accidents for the year 2009, Afukaar et al (2009). There were total of 18,496 casualties with 2,237 of them losing their lives, while 6,242 sustained serious injuries. This reveals that there was an average of 6 deaths every day in Ghana which was caused by road accidents. The most dangerous part of it all is that most of the people who are killed by road accidents are those in the age group that constitute the work force of this nation. It is in this regard that more attention needs to be placed on the research into road accident and its impact on human lives and properties in Ghana.

Background of The Study

Vehicular accident in this country has become one of the growing concerns to most Ghanaians in recent times. This is as a result of the tremendous effect of accidents on human lives, properties and the environment. Many researchers have come out with the causes, effects and recommendations to vehicular accidents. These causes include drink driving, machine failure and over speeding, Sagberg, Fosser, and Saetermo(1997), National Road Safety Commission (2009) and Adams (1982). Yet every year the road safety commission, Ghana Statistical Service and other organizations would report an increase in vehicular accidents; Annual Report, National Road Safety Commission, Ghana (2009). The mere increase in the number of accidents is not enough for one to conclude that really there is an increase in vehicular accidents; hence the need to analyze the accidents data statistically to check whether there is any evidence of increasing road accidents as years go by resulting to large number of people losing their lives.

This research will consider road accidents and its impact on human lives and properties in the entire ten regions of Ghana. It is estimated that the population of Ghana stands at 24,223,431and there are over 1,030,000 registered vehicles which ply the various road network in the country. Apart from the Ghanaian registered vehicles there are other vehicles from the neighboring countries which moves in and out of the Ghana due to the various ports we have in the country. There are not less than 10,000 recorded road accidents annually in Ghana. These accidents cause over 1,600 people to lose their lives and more than 15,000 getting injured.

Researchers have been modeling vehicular accidents with crash prevention models in various parts of the world. However, it is extremely difficult to just apply models which have worked somewhere to data obtained from

different country due to the variations in the various factors pertaining in different countries, Fletcher et al (2006).

There has not been much statistical research in the field of road accident in Ghana. This might have been as a result of the inadequate information available on road accidents and its impact on human live and properties in the country.

These road accidents have killed a lot of people in this country and as such it is described as one of the major causes of death in Ghana. The causes of death of casualties in road accidents have been associated with secondary collision, improper handling of casualties and inadequate emergency services in the country.

The Building and Road Research Institute of the Council for Scientific and Industrial Research has been publishing the descriptive statistics of road crashes in Ghana for the past ten years. In these documents are certain factors which could be possible contributors of the death of casualties in road accidents in Ghana. These factors include location of the accident, the age and sex of the casualty, the type of vehicle involved in the accident, nature of the road, weather conditions, the days of the week, the time of the day, and the ownership of the vehicle involved in the accident.

Salifu (2004) has developed a forecasting model for traffic crashes for unsignalized urban junction, Afukaar and Debrah (2007) have also model traffic crashes for signalized urban junction in Ghana and Ackaah (2011) has modeled traffic crashes on rural highways in the Ashanti region.

It is however surprising that in spite of the numerous factors identified by researches as the causes of road accidents in Ghana and its consequences on human lives and properties; nobody has modeled the causes of road accidents and its contributions to the death and survival of casualties in Ghana to authenticate the contributions of each of these factors to the casualties‟ death. Furthermore, there has not been any work on the likelihood of a casualty surviving in road accident or the possibility of a casualty surviving in a particular type of vehicle getting involved in a road accident.

Many researchers prefer the use of traffic accident to road accident but for the purposes this thesis the two would be used interchangeably.

Road accident is defined as any activity which distracts the normal trajectory of a moving vehicle(s), in a manner that causes instability in the free flow of the vehicle. The accident is that the vehicle(s) involved veer(s) off the road, collide, run over, vehicle on fire, etc.

The national road safety commission describes casualties as persons killed, seriously injured and slightly injured. The word casualty in this thesis shall be referred to any person involved in road accident. This will be grouped as casualties who survived and those who are killed in the road accident.

Vehicular accident has always been attributed to human errors such as high alcoholic content in the blood stream of the driver, over speeding, wrong overtaken among others. It has also been linked to poor road network, poor surfacing of the roads, witchcraft and the death-dying nature of some of the vehicles which ply the roads. There

are numerous suggested solutions, various interventions by government, nongovernmental organizations and other road stakeholders to curtail road accident and its replica effects on human lives and properties, it could be possible that these factors such as type and nature of the road, age and sex of casualty contribute casualty survival in road accidents in the country and have still not been considered. It is in view of this that this research seeks to identify if there is any relationship between the casualty survival in road accident and these factors.
It is therefore important to statistically analyze the accident data to ascertain the truth or otherwise of these possibilities.
When it is confirmed that there is a relationship, then it will be prudent to apply some mathematical and statistical models such as Poisson regression and/or negative binomials to fit a model to the accident data for better prediction for decision making.

1.2 Problem Statement

The road accidents in this country seem to be in ascendency. These accidents have been categorized by the National Road Safety Commission as fatal, serious and minor.
This classification is based on the extent of damage to human lives and properties. The root causes of road accidents and its effects on human lives and properties have been associated with human errors and superstition. The purpose of this thesis is to find out the contributions of other factors such as types of vehicles which ply the road, road description and surface type, days of the week in which the accident occurred, the age of the casualties in the road accidents.

1.3 Objective of The Research

This research seeks to achieve the following objectives;

1. To perform descriptive analysis of the data.

2. To model road accidents fatality in Ghana using Poisson regression.

3. To validate the models with negative binomial regression.

1.4 Methodology

The research combined both quantitative and categorical data for the analysis. Secondary data was taken from the Council for Scientific and Industrial Research; Building and Road Research Institute. Poisson regression and/or negative binomial regression would be the main tools for data analysis. Data analysis would be done using Microsoft Excel Minitab and R statistical packages.

1.5 Significance of The Study

It is imperative to research into the vehicular accident data in Ghana to come out with the reality on the ground so that;

1. Policy makers could come out with strategies to reduce the numerous deaths caused by vehicular accidents to the barest minimum in the country.

2. To fit a model to accident data in the country for better prediction of number of people who are killed in road accidents in order to plan for future occurrence.

3. To create a platform for future studies into vehicular accident and its effects on human lives and properties in Ghana.

Limitations and The Scope of The Research

The availability of road accident data in this country is usually difficult to come by and even if it obtained, the information on it is normally scanty. It is believed that not all accidents are reported to the police for records to be made on them due the human nature and Ghanaian hospitality attitude. Also, it is possible that the police might not have filled the accident report form for all accidents which might have been reported to them. It is therefore imperative to admit that the data provided by Building and Road Research Institute might be under recorded. However, there is enough evidence from the various researchers who have used road accident data from Building and Road Research Institute that their data is reliable and representative.

Data Source

The data for this thesis was a secondly data obtained from the Building and Road Research Institute of the Council for Scientific and Industrial Research. The data was originally collected using accident report form by the Motor Traffic and Transport Unit of the Ghana Police Service. This study considered accident data for ten-year period from 2001 to 2010. The number of people killed by road accident was used as the response variable in all models and the other variables such as age of casualty, the day the accident occurred which resulted in the death of the people, the time people were killed, vehicle type and road user class as the explanatory variables.

The Number of People Killed by Road Accidents in Ghana

There were 114,770 road accidents which occurred in Ghana from 2001 to 2010 which killed 19,088 people. This shows that on the average, 11,477 road accidents occurred every year and 1,909 lives are lost through these accidents.

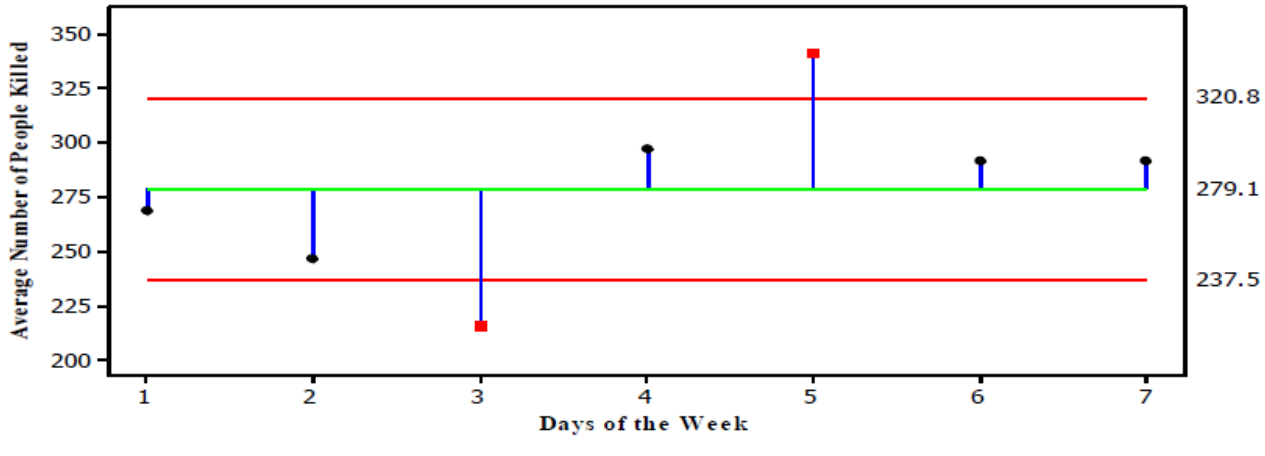
Age Distribution of People Killed by Road Accidents in Ghana.

The figure 4.1 below shows the distribution of the number of people who were killed by road accidents and their age groupings. It is clear from the figure that the youth is the most vulnerable to road accident. The age group 26-35 recorded 4469 casualties from 2001-2010, the highest number of deaths. This was followed by 16-25 which recorded 2982, a little above those killed in the age group 36-45 which had 2949. This result is not surprising since research has shown that most people who are at risk in road accidents are in the ages between 15 and 44 years, Margie et al (2002). The age group which recorded the least number of deaths is people of over 65 years which recorded 824 people who died in road accidents within the ten year period. It should be noted however that people of over 65 years are pensioners and are mostly not in active service and therefore do not travel regularly.

It is interesting to note from the graph above that the risk of one getting killed by road accident in Ghana increases from infancy till one gets to the early adulthood. Thus, at the age of 26 to 35 one is at the peak of dying through road accident but as one grows past the 35 years, the risk level begins to reduce gradually till 65 years and over where the risk of dying in road accident decreases drastically. In fact, the count distribution from graph above could be assumed to be following the normal distribution since almost half of the data lies to right of the Age 26-35 and the other half of the data lays the left of the age 26-35.

Total Number of people killed by Road Accidents

Year	Total No. of People Killed
2001	1660
2002	1666
2003	1734
2004	2185
2005	1784
2006	1856
2007	2043
2008	1937
2009	2237
2010	1986



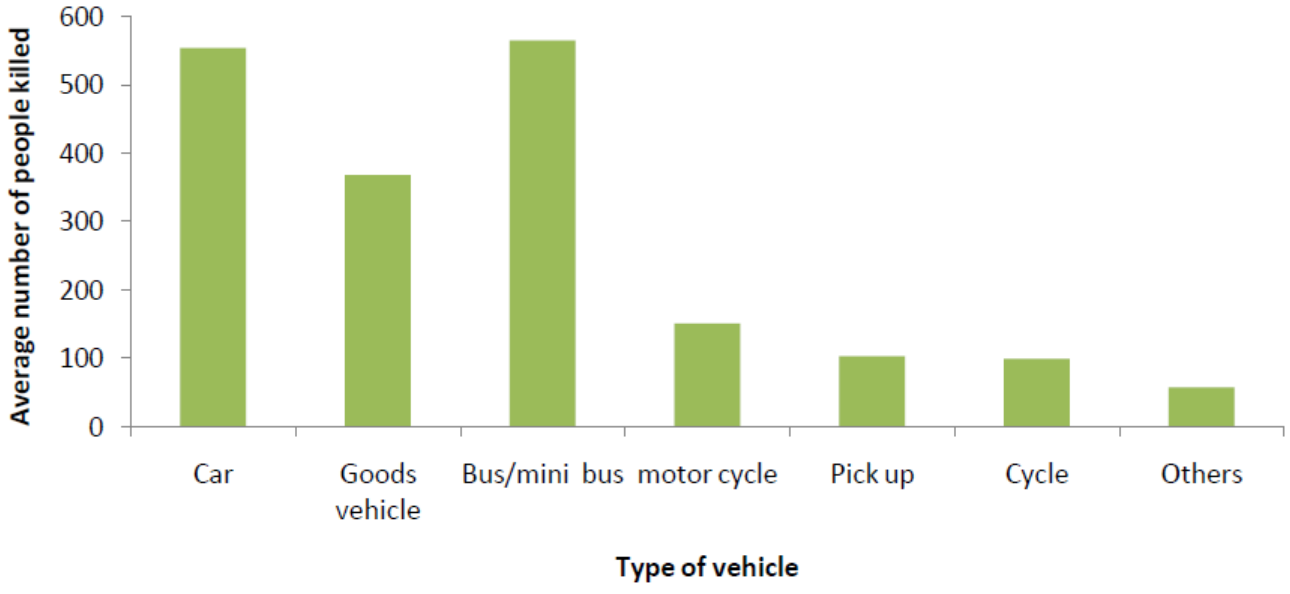
The number of people who were killed by road accidents

Vehicle type	Total number of people killed	Percentage killed	Ave killed
Car	5527	29.2063	553
Goods vehicle	3675	19.41978	368
Bus/mini bus	5650	29.85627	565
motor cycle	1495	7.900021	150
Pick up	1033	5.458677	103
Cycle	979	5.173325	98
Others	565	2.985627	57

From Table 4.5 above, it could be seen that Bus/Mini bus killed 5,650 people from 2001 to 2010 which constitute 29.2% of the total number of people killed via road accident in the same period.

This was followed closely by cars which killed 5,527 representing 29.9% of those who were killed by road accidents. Goods vehicle was the third on the list of type of vehicles which kill most people in accidents with 3,675 people who were killed for the ten-year period. This figure represents 19.4 % of the total deaths through road accidents in Ghana from 2001 to 2010. The type of vehicle which killed the least number of people for the years under consideration is others. Only 565 people were killed by other type of vehicles such as tractor, bulldozer, tipper, mixer and loading box which constitute just 3% of the total number of people killed by various

types of vehicles through road accidents. The average number of people killed by various types of vehicles in Ghana is as shown in the graph below.



Conclusions

This research aimed at modeling the number of people who are killed by road accidents in Ghana.

The results also revealed that the most affected people who die through road accidents in Ghana are the youth. Out of 1909 people who are killed via road accidents on the average, 447 of them are people in the age group of 26-35, 298 are in 16-25 and 295 are those of the ages from 36-45.

This initial result was confirmed by the model 4.2 which indicated that the expected number of people who are killed in road accident and are in the ages from 26-35 is approximately four times that of the base level for every year. Those in the age groups of 16-25 and 36-45 have expected number killed to be three times that of the base level for every year. This gives us a cause to worry since the work force of the country is being killed by road accidents.

The preliminary analysis of the number of people who are killed at any given day in the week showed that most people are killed on Fridays in road accidents and Wednesday is the day which recorded the least number of people killed by road accident. It was found that on the average 341 people are killed on Friday every year and 216 are killed on Wednesday.

Recommendation

Looking at the state of road accidents and the number of people who are killed via road accidents in Ghana, it is recommended that;

1. Education on road accidents should be intensified especially among the youth

2. Social activities such as funerals, marriage ceremonies and festivals which are always performed at the week endings should be reduced to help minimize the number of accidents at the week endings.

3. Since the type of vehicle involved in the accident affects the number of people expected to be killed, drivers of vehicles such as cars and buses should be given special training to be able to avoid preventable accidents.

4. The accident data base of the country should be expanded to include more variable so that researcher could really determine the actual factors contributing the casualties‟ death in road accidents.

5. Finally, institutions that enforce road traffic regulations should do well to apply the law especially on Fridays so that all perpetrators of traffic offences shall be brought to book to deter others from repeating such offences.

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