# **CHAPTER FOUR**

# **DATA ANALYSIS AND RESULTS**

This chapter presents the analysis ad results of the data collected for the study. It starts with the descriptive relating to the demographics of the persons involved in road crashes over the period, types of vehicles involved, locations and crash-type, weather and ligh conditions and drivers’ errors resulting to the crash. The chapter ends with an association test to ascertain the relationship the accident severity and the underling condition that gives rise to it.

* 1. Fatalities and Casualties by sex

Over the period, it is obvious that males recorded higher fatalities and casualties than females, even so with a wide range. For instance, in 2011, fatality in males was 1695 as against 504 in females while casualty in males was 11573 as against 4646 in females. The cases of fatality seem to be oscillating between the years while U-shaped for casualties. There was a fall in the record of fatalities in 2013 to 2015, a rise in 2016, and so on till 2018 when it kept increasing through to 2019. On casualties however, 2011 and 2012 recorded high figures and relatively lower figures from 2013 through to 2017 when the numbers started to increase again in 2018 to 2019.

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Figure 1: Fatalities and Casualties by sex

* 1. Fatalities and Casualties by Age Group

The study looks at the trend of fatality and casualties in age distribution over the period under review. It is discovered that persons that fall into age group of 26 and 35yeaars recoded higher cases of both fatality and casualties in road crashes over the period – recording 658 fatalities in 2011, 661 in 2012 and 564 in 2016, 617 in 2019 and 5728 casualties in 2011, 5119 in 2012, 3875 in 2016 and 5013 in 2019. The second age group to record higher cases is the 36 – 45 years group. Persons 0 to 5years and those above 65 years on the other hand recorded the least cases over the period – less than 150 fatalities in each year and less than 320 casualties in all years. Similarly, to the cases by sex, while the fatal cases rise and falls, the casualty cases look a bit curvy for persons 26 – 35years and almost straight for the rest of the age groups.

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Figure 2: Fatalities and Casualties by Age Group

4.3 Fatalities and Casualties Road Environment

Considering the road environment where these incidences occurred, the study categories them into two – urban and non-urban, where the urban denote cases recorded in towns and/or cities while non-urban denoted cases recorded elsewhere. Figure 3 below shows that majority of the crashes resulting in fatalities and casualties were recorded in non-urban areas throughout the years under study. The highest record of fatality in urban areas was in 2012 (recording 936) with the lowest in 2014 (recording 662) while the highest for non-urban areas was in 2011 (recording 1531) with the lowest in 2014 (recording 1061). On casualty cases, the highest in urban areas was recorded in 2019, i.e., 7735 with the lowest of 5438 in 2017 and the highest for non-urban was recorded in 2011 i.e., 9793 with the lowest in 2015 i.e., 6344.

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Figure 3: Fatalities and Casualties Road Environment

4.4 Vehicle Type Involved in Crashes

The looks at the types of vehicles involved in road crashes or accidents over the period. Vehicles on record includes cars, heavy goods vehicles, buses and mini vans, tricycles, bicycles, and others. Among the type of vehicles captured in this study, it is revealed from the figure below that, cars recorded the most occurrence of road crashes over the period, followed by buses and minibuses whiles pick-ups and bicycles were at the bottom. The highest record of road accidents was recorded in 2012 where car crashes alone was very close to nine thousand (i.e., 8983), buses and minibuses recorded slightly below four thousand (i.e., 3991). The second highest record of road crashes occurred in 2011 where 8172 cars, 3692 buses and minibuses, 2492 heavy goods vehicles and so on as illustrated in the figure were recorded. In 2019 however, motorbikes, tricycles and rickshaws had a drastic increase in road crashes, recording 3401 cases, second to cars which recorded 7296 cases. From the figure below, it is seen that after 2013, cases of road crash involving motorbikes, tricycles and rickshaws keeps rising up to 2019.

Figure 4:Vehicle Type Involved in Crashes

4.5 Location of Crashes Resulting in Deaths and Injuries

The locations where crashes occur resulting in injuries and fatalities was of interest for this study. Hotspot areas where crashes occurred including the roundabouts, cross junctions, T-junctions, Y-junctions, stag X, while others occur at places which are not junctions. From the data collected, it was revealed that majority of the crashes happened at locations which are not junctions recording many death cases with a lot more injuries. For instance, in 2011 crashes which occurred at places which are not junctions recorded 10623 injuries and 1789 death. Even the lowest case recorded at this location – which is still overwhelming was in 2019 where there were 8748 injuries and 1609 death. Next to the not-a-junction location was the T-junctions. From 2015 to 2019, injuries cases as a result of vehicular crashes ranged between 800 and 1700 per year while death cases also ranged between 120 and 200 per year. Following these aforementioned locations is cross junctions, then roundabouts and the others.

Figure 5: Location of Crashes Resulting in Deaths and Injuries

4.6 Collision Type Resulting in Deaths and Injuries

In the numerous road crashes recorded in this study, it was discovered that accidents were by given circumstances which the study terms as collision type. In figure 6 below, it is seen that most of the accidents that resulted in injuries were as a result of the vehicle running of the road. In 2015 there were 2647 road crashes reported to have occurred as a result of the vehicle going off road, of which 246 lives were lost. This same circumstance contributed to 2730 injuries and 304 deaths in 2016, 2870 injuries and 306 deaths in 2017, 2737 injuries and 327 deaths of 2018 and 3123 injuries and 336 deaths in 2019. The next major collision type per the study was crashes with pedestrians. In 2015, there were 2341 injuries and 821 deaths reported to have been resulted from crashes with pedestrians. Nonetheless there were 1988 injuries and 810 deaths in 2016, and the highest record falling in 2019 with 2523 injuries and 783 deaths. Following these two leading collision types is head-on crashes which recorded cases ranging between 1600 and 2400 per year. Other collision types recorded in the study include rear end, 90 degrees, side swipe, object on road, object off road, parked vehicles, and hitting of animals.

Figure 6: Collision Type Resulting in Deaths and Injuries

**4.7 Weather Conditions Prevailing during Crashes**

Weather has a tremendous influence on road safety, as is commonly acknowledged. According to studies, particularly inclement weather is linked to an increase in the incidence and severity of collisions. The severity of an accident may be influenced by the current meteorological conditions. Weather, however, might not be the primary cause of a collision. In this study, most of the crashes occurred under a clear weather condition. In 2015 for instance, road crashes that led to injuries of victims involved were 8795 under clear weather, 95 under foggy conditions, and 65 under rainy conditions while 1,371, 13 and 9 respectively are those which led to loss of lives. The numbers kept increasing per year to 2019 where 11,213 crashes resulted in injuries and 1,696 resulted in loss of lives.

Figure 7: Weather Conditions Prevailing during Crashes

4.8 Light Conditions Prevailing during Crashes

From the data collected, it is revealed as shown in figure 8 below that, majority of the road crashes over the period happened during the day which claimed more lives and leaving dozens in injury. In 2019, daylight accidents which resulted in injuries were as many as 7135 while 1096 were killed. The figure increased in 2019 where 8677 accidents resulted in injuries and 1242 killed. Accidents which occurred at night per this study categorized into three, night with streetlights on, night with streetlights off, and night with no streetlight. Among these, night with streetlight on recorded the highest number of road crashes leading to injuries and deaths – and was consistent through out the years. Second to this are those that occurred on roads which had no streetlights, and those that occurred on roads whose streetlights were off recorded relatively smaller numbers. For instance, in 2019, crashes that led to injuries on roads whose streetlights were off were 32 with 5 deaths.

Figure :Light Conditions Prevailing during Crashes

4.9 Day of Occurrence of Crashes

The study also considered the days of the week in which road crashes occur most frequently – resulting in injuries or in deaths. The graph below shows the trend of the incidence recorded over the period. It is discovered that road crashes were most likely to occur on Mondays and on Saturdays and these result in injuring the victims involved. The graphs also shows that injuries recorded in these crashes were exceedingly higher (clustering at the top of the graph ranging between 1000 and 2300) than death records (at the bottom of the graph, ranging within 500. The study reveals that road crashes which were less likely to result in injuries occurred on Wednesdays. From the figure below, it is seen that 2019 for instance, 2220 road crashes that resulted in injuries were recorded on Saturday on which day 315 crashes led to loss of lives. 2018 recorded 2003 injuries crashes and fatality crashes, 2015 recorded 1873 injury crashes and 264 fatality crashes, among others. On Mondays on the other hand, 2019 recorded 2013 road injury crash and 308 fatality crashes, 2018 recorded 1726, 305 respectively for injury and deaths, 2017 recorded 1649 and 287 respectively, and so on. These recorded cases for Saturday and Monday are however low as compared to the other days, especially Wednesday.

Figure 9: Day of Occurrence of Crashes

4.10 Hour of Occurrence of Crashes

Another parameter of interest in this study was the time of the day in which road crashes occurred resulting in injuries and fatalities. The figure below clearly shows that crashes are more likely to occurred in given periods of the day than others. From the figure it is seen that from 10 pm through midnight to 4 am, though crashes do occur, few result in fatality and death. However, from 4 am the frequency increase and keeps increasing till 10 am, then it parallels till 2 pm. The cases of road crashes rise again from 2 pm, peeks between 4-6 pm and begin to fall. For instance, from 12 midnight to 2 am in 2015, road crashes that led to injuries were 287 and 45 deaths, but between 4 pm to 6pm that same year road crashes that led to injuries rose to 1911, killing 280.

Figure 10: Hour of Occurrence of Crashes

4.11 Driver Error Associated with Deaths and Injuries

Most a time, road accidents are said to be as a result of the drivers’ fault or error. In this study, it is revealed that diverse errors on the part of the vehicle driver cause crashes on roads leading to injuries and fatalities. Leading among these is driver’s inattentiveness. This has resulted in the injuries of post victims and killing many too. In 2015 inattentiveness of drivers caused 4887 road crashes resulting in injuries and 781 resulting in death. In 2016 injury and death accidents recorded on roads were 4464 and 896 respectively. 2017 recorded 4168 injury crashes and 767 fatal crashes, 2018 recorded the highest – 5232 injury crashes and 854 fatal crashes while 2019 records 4838 injury crashes and 734 fatal crashes. Second to inattentiveness was over-speeding (too fast) which recorded 1925 injury crashes in 2015, 1991 in 2016, 1829 in 2017,2294 in 2018 and 3659 in 2019 with fatalities as follow, 393, 521, 397, 541 and 676 respectively. Others that led to these crashes i.e., injuries and fatalities include, in order of magnitude, lost of control, improper overtaking, too close to other vehicles, inexperience of drivers, improper turning, no signal when turning, fatigued/asleep among others.

Figure 11: Driver Error Associated with Deaths and Injuries

Chi-square Test of Independence

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| Factors Affecting Road Crash Casualties | | | | | | | |  | |  | |  | |  | |
|  |  | |  | |  |  |  | |  | |  | |  | |  |
|  |  | | **Persons Killed** | | *Percentage* | **Persons Injured** | *Percentage* | |  | | *Chi-square* | |  | | *P-value* |
| **Light Condition** | Day | | 5703 | | 58.2 | 37427 | 66.4 | |  | | *309.06* | |  | | *2.2E-16\** |
|  | Night no Street Light | | 1088 | | 11.1 | 4588 | 8.1 | |  | |  | |  | |  |
|  | Night Street Light off | | 295 | | 3.0 | 924 | 1.6 | |  | |  | |  | |  |
|  | Night Street Light on | | 2716 | | 27.7 | 13418 | 23.8 | |  | |  | |  | |  |
|  | ***Total*** | | ***9802*** | |  | ***56357*** |  | |  | |  | |  | |  |
|  |  | |  | |  |  |  | |  | |  | |  | |  |
| ***Weather*** | Clear | | 7480 | | 76.3 | 46563 | 82.6 | |  | | *272.70* | |  | | *2.20E-16\** |
|  | Fog | | 372 | | 3.8 | 1471 | 2.6 | |  | |  | |  | |  |
|  | Rain | | 50 | | 0.5 | 515 | 0.9 | |  | |  | |  | |  |
|  | Other | | 1900 | | 19.4 | 7808 | 13.9 | |  | |  | |  | |  |
|  | ***Total*** | | ***9802*** | |  | ***56357*** |  | |  | |  | |  | |  |
|  |  | |  | |  |  |  | |  | |  | |  | |  |
| ***Days*** | Monday | | 1399 | | 14.3 | 8244 | 14.6 | |  | | *15.45* | |  | | *1.79355E-05\** |
|  | Tuesday | | 1190 | | 12.1 | 7277 | 12.9 | |  | |  | |  | |  |
|  | Wednesday | | 1254 | | 12.8 | 6766 | 12.0 | |  | |  | |  | |  |
|  | Thursday | | 1281 | | 13.1 | 7745 | 13.7 | |  | |  | |  | |  |
|  | Friday | | 1528 | | 15.6 | 8408 | 14.9 | |  | |  | |  | |  |
|  | Saturday | | 1665 | | 17.0 | 9641 | 17.1 | |  | |  | |  | |  |
|  | Sunday | | 1485 | | 15.1 | 8276 | 14.7 | |  | |  | |  | |  |
|  | ***Total*** | | ***9802*** | |  | ***56357*** |  | |  | |  | |  | |  |
|  |  | |  | |  |  |  | |  | |  | |  | |  |
| ***Hour of Occurrence***  ***of Crashes*** | 00-02am | | 260 | | 2.8 | 1061 | 1.9 | |  | | *309.62* | |  | | *2.20E-16\** |
|  | 02-04am | | 247 | | 2.6 | 1128 | 2.1 | |  | |  | |  | |  |
|  | 04-06am | | 512 | | 5.4 | 2502 | 4.6 | |  | |  | |  | |  |
|  | 06-08am | | 598 | | 6.3 | 3818 | 7.0 | |  | |  | |  | |  |
|  | 08-10am | | 733 | | 7.8 | 5110 | 9.4 | |  | |  | |  | |  |
|  | 10-12noon | | 775 | | 8.2 | 5490 | 10.1 | |  | |  | |  | |  |
|  | 12-2pm | | 847 | | 9.0 | 5653 | 10.4 | |  | |  | |  | |  |
|  | 2-4pm | | 1114 | | 11.8 | 7670 | 14.1 | |  | |  | |  | |  |
|  | 4-6pm | | 1307 | | 13.8 | 8267 | 15.2 | |  | |  | |  | |  |
|  | 6-8pm | | 1710 | | 18.1 | 7777 | 14.3 | |  | |  | |  | |  |
|  | 8-10pm | | 865 | | 9.2 | 4044 | 7.4 | |  | |  | |  | |  |
|  | 10-12midnight | | 477 | | 5.1 | 2020 | 3.7 | |  | |  | |  | |  |
|  | ***Total*** | | ***9445*** | |  | ***54540*** |  | |  | |  | |  | |  |
|  |  | |  | |  |  |  | |  | |  | |  | |  |
| ***Location*** | Not at Junction | | 8613 | | 87.9 | 46904 | 83.2 | |  | | *181.45* | |  | | *2.20E-16\** |
|  | Cross Junction | | 216 | | 2.2 | 2054 | 3.6 | |  | |  | |  | |  |
|  | T - Junction | | 768 | | 7.8 | 5867 | 10.4 | |  | |  | |  | |  |
|  | Stag X | | 50 | | 0.5 | 447 | 0.8 | |  | |  | |  | |  |
|  | Y - Junction | | 15 | | 0.2 | 173 | 0.3 | |  | |  | |  | |  |
|  | Roundabout | | 42 | | 0.4 | 532 | 0.9 | |  | |  | |  | |  |
|  | Railway | | 6 | | 0.1 | 19 | 0.0 | |  | |  | |  | |  |
|  | other | | 92 | | 0.9 | 359 | 0.6 | |  | |  | |  | |  |
|  | ***Total*** | | ***9802*** | |  | ***56355*** |  | |  | |  | |  | |  |
|  |  | |  | |  |  |  | |  | |  | |  | |  |
| ***Collision Type*** | Head -On | | 2735 | | 23.0 | 10203 | 18.1 | |  | | *3192.90* | |  | | *2.20E-16\** |
|  | Rear end | | 1142 | | 9.6 | 9477 | 16.8 | |  | |  | |  | |  |
|  | 90 Degrees | | 285 | | 2.4 | 2782 | 4.9 | |  | |  | |  | |  |
|  | Side Swipe | | 454 | | 3.8 | 5147 | 9.1 | |  | |  | |  | |  |
|  | Ran off Road | | 1854 | | 15.6 | 14107 | 25.0 | |  | |  | |  | |  |
|  | Object on Road | | 41 | | 0.3 | 328 | 0.6 | |  | |  | |  | |  |
|  | Object off Road | | 216 | | 1.8 | 1393 | 2.5 | |  | |  | |  | |  |
|  | Parked Vehicle | | 337 | | 2.8 | 1514 | 2.7 | |  | |  | |  | |  |
|  | Pedestrian | | 4588 | | 38.6 | 11150 | 19.8 | |  | |  | |  | |  |
|  | Hit Animal | | 13 | | 0.1 | 71 | 0.1 | |  | |  | |  | |  |
|  | Other | | 210 | | 1.8 | 185 | 0.3 | |  | |  | |  | |  |
|  | ***Total*** | | ***11875*** | |  | ***56357*** |  | |  | |  | |  | |  |
|  |  | |  | |  |  |  | |  | |  | |  | |  |
| ***Driver Error*** | None | | 1455 | | 14.8 | 11582 | 20.6 | |  | | *1038.00* | |  | | *2.20E-16\** |
|  | Inexperience | | 272 | | 2.8 | 1553 | 2.8 | |  | |  | |  | |  |
|  | Inattentive | | 4023 | | 41.0 | 23589 | 41.9 | |  | |  | |  | |  |
|  | Too Fast | | 2528 | | 25.8 | 11697 | 20.8 | |  | |  | |  | |  |
|  | Too Close | | 116 | | 1.2 | 1075 | 1.9 | |  | |  | |  | |  |
|  | No Signal | | 17 | | 0.2 | 183 | 0.3 | |  | |  | |  | |  |
|  | Improper Overtaking | | 347 | | 3.5 | 1553 | 2.8 | |  | |  | |  | |  |
|  | Improper Turning | | 50 | | 0.5 | 311 | 0.6 | |  | |  | |  | |  |
|  | Fatigued/Asleep | | 27 | | 0.3 | 217 | 0.4 | |  | |  | |  | |  |
|  | Other + Lost Control | | 541 | | 5.5 | 4096 | 7.3 | |  | |  | |  | |  |
|  | Unknown | | 426 | | 4.3 | 501 | 0.9 | |  | |  | |  | |  |
|  | ***Total*** | | ***9802*** | |  | ***56357*** |  | |  | |  | |  | |  |

Table 1: Chi-square Test of Independence