

**DEVELOPMENT OF GUIDELINES TO REDUCE ROAD ACCIDENTS AMONGST
COMMUNITY MEMBERS IN BOTSWANA: A PUBLIC HEALTH ISSUE**

by

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at the

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DEDICATION

This study is dedicated to my parents for always encouraging and believing in me. You are my pillars of faith; you taught me respect, discipline, integrity, and hard work. You will all have the same qualification as my wife and kids because grace and anointing are upon us. I would also like to thank real friends in faith and colleagues.


DECLARATION

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I declare that the study on **DEVELOPMENT OF GUIDELINES TO REDUCE ROAD ACCIDENTS AMONGST COMMUNITY MEMBERS IN BOTSWANA: A PUBLIC HEALTH ISSUE** is my work and that all the sources that I have used or quoted have been indicated and acknowledged through references and that the work has not been submitted before for any other degree at any other institution.

A handwritten signature in blue ink, appearing to read 'Roy Tapera', is shown within a light gray rectangular box.

SIGNATURE

DATE: 23 January 2021

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I would like to express my appreciation to the following who made this study possible:

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- The Ministry of Health and Wellness Health, Research, and Development Division.

GUIDELINES TO REDUCE ROAD ACCIDENTS AMONGST COMMUNITY MEMBERS IN BOTSWANA: A PUBLIC HEALTH ISSUE.

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ABSTRACT

BACKGROUND

The leading and increasing contributor to the regional and global disease burden that leads to death and disability is represented by road accidents. An enormous toll on individuals together with communities and national economies has been observed because of the occurrence of road accidents.

AIM

The study developed guidelines to reduce road accidents amongst automobile drivers in Botswana.

METHODS

Study design

The study was conceptualised using Haddon's theory and the mixed-method sequential explanatory design was utilized to conduct the study. Collection of data for this study was done over a period of time in two consecutive phases.

Study setting

The study took place in Gaborone, and the study was conducted at Broadhurst Police Headquarters, Directorate of transport station, and the University of Botswana.

Data Collection methods:

The data for this study were collected through the usage of focus group interviews and document analysis using a checklist. The first phase involved collecting quantitative data through document analysis of 400 police records using a checklist. The second phase took place in Gaborone at the University of Botswana. It involved collecting qualitative data using two focus group interviews with various stakeholders like traffic police, third party claim officers, and emergency nurses/doctors who have been in contact with people involved in road traffic accidents.

Study Population:

The study population included traffic accident victims' documents at the police headquarters for Gaborone and Francistown, police and traffic officers, lawyers/third party claims officers, and emergency department staff such as nurses and doctors working in Gaborone and Francistown.

Data analysis:

A checklist was used in transforming observations of found categories into quantitative statistical data. Data generated from the content analysis were transformed into quantitative statistical data using a checklist. Quantitative data were entered and analysed principally using the Statistical Package for Social Sciences (SPSS 27) software to generate graphs and tables. Inconsistencies of the data set was managed by cleaning and editing the data. The data that were missing were not statistically imputed. The relationships of independent variables based on Haddon Matrix-like, drunk driving, unlicensed drivers, over speeding, deaths, and injuries were analysed against the dependent variable of having a road traffic accident using logistic regression. Qualitative

data from focus group interviews was transcribed verbatim using a transcription protocol. Using transcription protocol ensured that transcription is done consistently and is of the appropriate type for analytic aims. Tesch's framework for qualitative data analysis was used. UNISA, Botswana Ministry of Health and Wellness, and The Ministry of Defence, Justice, and Security granted the researcher the permission to conduct the study.

Results

The study found that most accidents are caused by the drivers' carelessness followed by animals, both domestic and wild. The accidents had an impact on the health of drivers, passengers, and pedestrians. The accidents resulted in fatalities and lower limb fractures, upper limb fractures, and brain injuries. Over the past five years, Gaborone and Serowe recorded the highest cases of road traffic accidents. Most of the accidents occurred where there were no junction.

Conclusion

It is envisioned that the guidelines informed by research and literature will ensure a decrease in road traffic accidents and consequently fatalities and injuries among Botswana communities.

Key concepts

Development, guidelines, road traffic accidents, community members, drivers.

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LIST OF ACRONYMS AND ABBREVIATIONS

ADAS	Advanced driving assistance system
BAC	Blood alcohol
DALY	Disability-adjusted life years
FGD	Focus group discussion
GNP	Gross National Product
HPDME	Health Policy Development Monitoring and Evaluation
IRB	Institutional Review Board
LMIC	Low to medium-income countries
MDJS	Ministry of Défense, Justice, and Security
MVA	Motor Vehicles Accident Fund
NGOs	Non-Governmental Organisation
NICE	National Institute of Health and Care Excellence
NMA	Near Miss Accident
NSW	New South Wales
OECD	Organisation for Economic Co-operation and Development
OR	Odds Ratio
PhD	Doctor of Philosophy in Public Health
PubMed	Public Medical Library
PTSD	Post Traumatic Stress
RTA	Road traffic accidents
RTI	Road traffic injury
SAF	System Approach Framework
SD	Standard Deviation
SPSS	Statistical Package for Social Sciences

UNECA	United Nations Economic Commission for Africa
UNISA	University of South Africa
UK	United Kingdom
WHO	World Health Organisation

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CHAPTER ONE

ORIENTATION OF THE STUDY

1.1 INTRODUCTION

This chapter provides the overall orientation of the study. The background relates to the Botswana context starting from the global setting, statement of the problem, research objectives and summary of the research methods used.

The leading and increasing contributor to the regional and global disease burden that leads to death and disability is represented by road traffic accidents (RTAs) (Al-Thaifani, Al-Rabeei, and Dallak 2016:1). An enormous toll on individuals, together with communities and national economies, has been observed because of the occurrence of road accidents. According to the World Health Organisation (2021), road traffic accidents contribute to fatalities of approximately 1.35 million people around the globe annually. Road traffic injuries (RTIs) refer to an event that involves at least one motor vehicle that is unexpected and also unforeseen (Whitelegg, 1987:161). The process whereby life is not lost during the time of an accident and/ or 30 days maximum after the accident is referred to as fatal RTIs (World Health Organisation, 2009:28). Middle-income countries, which are motorising rapidly, are the hardest hit. According to the World Health Organisation (2013:1), road traffic accidents are ranked eighth in major causes of human deaths. The report further warns that action needs to be taken at the present moment in order to make it a point that road traffic crashes do not rise to the level of being the cause of death and injuries globally by the year 2025. It was against this background that road traffic crashes have been declared a public health problem by the WHO. In March 2010, the United Nations General Assembly resolution declared 2011-2020 a Decade of Action for Road Safety (MVA Fund, 2012:24).

In the sub-Saharan region, 80% of road traffic accidents are fatal (Vissoci et al., 2017:2). Individuals aged 15-59 years who are referred to as economically active are at the highest risk of dying due to road accidents. Road traffic accidents are attributable to the death of

males aged 15-59 years of age which accounts for 5% of the deaths. Deaths in males caused by malaria, diabetes mellitus, respiratory diseases and digestive diseases are far less than the deaths that are caused by road traffic accidents in males (African Development Bank, 2013:3).

1.2 BACKGROUND INFORMATION ABOUT THE RESEARCH PROBLEM

According to the World Health Organisation (2021), road traffic accidents contribute to fatalities of approximately 1.35 million people around the globe annually. Ninety-three percent of these fatalities come from Low- and Middle-income Countries of which Botswana is part of (World Bank, 2020). According to the World Bank (2020), there is a rise in road traffic accidents, mortalities and injuries resulting in misery and stunted economic growth in LMICs.

Various interventions to reduce road traffic accidents are being introduced. Some of the interventions instituted in LMICs to reduce RTAs include drink-drive legislation with enforcement via breath testing campaigns, which have shown average cost-effectiveness (Bantsola & Mytton, 2017). To prevent distracted driving, the literature supports the ban on cell phone use while driving (Eid & Abu-zidan, 2017; Llerena et al., 2015). According to literature, speed cameras are a worthwhile intervention for reducing the number of road traffic injuries and deaths (Graham, Naik, McCoy, & Li, 2019; Hu & McCartt, 2016; Pilkington & Kinra, 2005; Wilson, Willis, Hendrikz, Le Brocque, & Bellamy, 2010). Interventions designed to reduce fatigue and sleepiness while driving in the world can be classified into three categories: (1) interventions include change in the behaviours, (2) changes in the environment, and (3) educational programmes (Shahbazi et al., 2019).

Botswana's road traffic fatality rate is excessively high relative to its population. On an annual basis, the Botswana Police record close to 1000 deaths and numerous serious injuries resulting from road accidents (Statistic Botswana, 2019). These road accidents are triggered by several factors ranging from excessive speed, potholes, general bad condition of roads, unlicensed drivers, unroadworthy vehicles, lack of enforcement of road traffic rules, poor driving habits, and so forth (Debela, 2019). According to MVA (2019:8), crashes mostly affect young people.

During the period 2006-2012, 71.8% of individuals killed annually were individuals that fell in the 20-54 age group. Individuals aged between 0 and 19 years of age represent

the group that is most affected (after those who are aged between 20 to 54 years of age) accounting for 16.1% of individuals killed in the past seven years. Individuals who are 55 years of age and above are the ones that are least affected and account for 11.0% of the deaths observed during the period (MVA, 2012). By 2019 the average case fatalities due to road traffic accidents among the 20 to 54 years remain the same in Botswana (MVA, 2019).

In Botswana, the total recorded fatalities were 457 in 2019 compared to 462 in 2018 (MVA, 2019). The five-year average shows that between 2015 and 2019, the average recorded fatalities per annum were 445, with another 1203 being seriously injured. Appropriate measures being put in place will lead to being able to avoid most of these injuries and deaths. Reports from the Botswana Police Service (Department of traffic) show that most of these crashes were human error related (MVA 2019).

The age-adjusted death rate is 26.61 per 100,000 of the population ranks, where Botswana is ranked number 42 in the world. Deaths due to road traffic accidents are amongst the top ten (WHO, 2020). Although there is legislation to prevent road traffic accidents in the Road Traffic Act 69:01, the legislations do not meticulously provide solutions to the most prevalent risk behaviours causing road traffic accidents and how to prevent people from practising at-risk behaviours.

According to the National Road, Traffic Act, No 30.93 of 1996, Part VII, section 44-74 of the act on driving and other offences relating to the use of vehicles on the road only describes offences and penalties but lacks a clear description of what drivers can do to help themselves from engaging in at-risk behaviours; therefore the researcher seeks to develop guidelines that target the most prevalent at-risk behaviours contributing to road traffic accidents. The guideline will be for the Ministry of Transport and the Police. The findings informed the guidelines of this study. RTAs remain the highest cause of mortality globally, continentally, and nationally (WHO, 2020).

RTAs are the major socio-economic problems of developing countries, especially those in Africa (Chen, 2010:247; WHO, 2009; United Nations Economic Commission for Africa, (UNECA), 2009) as cited in Gebru (2017:15). Socially, road traffic death leads to

profound human sorrow and death, contributing to the loss of any country's developmental resources. This is because it makes people disabled, lose their properties, human rights are violated, lose safety and fundamental freedom, and reduces access to sustainable prosperity (Gebru 2017:16). Road traffic accidents have become a huge public health problem in Botswana, with a significant impact on mortality and morbidity. They are in the top ten causes of mortality in Centre for Disease Control and Prevention, Global Health Botswana website (WHO, 2015:2).

1.3 STATEMENT OF THE RESEARCH PROBLEM

Despite road traffic control regulations and stiff penalties for road traffic offences renewed in 2009 (Mphela, 2011:264; Sebego et al., 2014:33), road traffic accidents in Botswana are increasing at an alarming rate, and such accidents costs are estimated to be equivalent to 1 to 2% of the GNP. This hurts the health and development of the nation (Republic of Botswana 2017.1).

The Sustainable Development Goal 3 target might not be attainable. The goal ensures healthy lives and promotes well-being for all ages through, among others, reducing global death and injuries by 50% from road traffic accidents by 2020 (WHO, 2015:40). Each year, about 480 people are killed, and another 1500 are seriously injured on the road in Botswana (MVA, 2016; Statistics Botswana, 2016:30). According to Botswana Police Service, road traffic accidents rose by 7.4% from 17 341 in 2018 to 18 623 in 2019, whereas casualties rose by 3.2% from 6 243 in 2018 to 6 442 in 2019 (MVA, 2019). These deaths affect the lives of family members, specifically children who are left parentless, impacting their health negatively due to lack of essential food, leading to malnutrition and other complications requiring hospital admissions.

This makes more people dependent on government fees for survival due to their ill-health. However, studies revealed that behaviour changes are not necessarily associated with fines and increased penalties (e.g., speeding and alcohol-impaired driving), (Elvik & Christensen, 2007:689; Lawpoolsri, Li & Braver, 2007:26; Wagenaar, Maldonado-Molina, Erickson, Ma, Tobler & Komro 2007:982).

In the opinion of the victims, defective brakes, bad conditions of the vehicle and defective tires are the most common unsafe conditions of the vehicle that are the apparent cause of the RTA. In addition, bad conditions of the road surface, roads that are waterlogged, obstacles on the road and debris on the roads have been highlighted by victims as the common unsafe conditions of the road that are the apparent cause of the RTA (Singh et al., 2016:815).

This shows a knowledge gap in other causes of road traffic accidents in the country. Therefore, the researcher must look critically into all the factors causing RTAs to develop holistic guidelines, looking into all the causes and possible prevention strategies. From the above problem statement, the following aim of the study was developed.

1.4 RESEARCH AIM/PURPOSE

The purpose of the study was to develop guidelines to reduce road accidents amongst community members in Botswana.

1.5 RESEARCH OBJECTIVES

The objectives of this research were to:

- Explore and describe the factors contributing to road traffic accidents amongst automobile drivers in Botswana.
- Explore and describe the effects of road traffic accidents on the health of the drivers and community members.
- Review and analyse data on road traffic accidents in Botswana for the past five years.
- Develop guidelines for stakeholders to reduce road traffic accidents.

1.6 RESEARCH QUESTIONS

- What are the factors contributing to road traffic accidents in Gaborone, Botswana?

- What are the effects of road accidents on the health of a driver and community members?
- How are the patterns of road traffic statistics for the past five years?
- How can the guidelines for stakeholders to reduce road traffic accidents be developed?

1.7 SIGNIFICANCE OF THE STUDY

The results obtained from the study led to the development of evidence-based guidelines for the prevention of road traffic accidents in Botswana. The policymakers might be alerted by the findings on different prevention strategies that might affect the country. This will inform interventions for reducing mortality and morbidity due to road traffic accidents. This will also save resources for the government and human resources at the hospitals attending to road traffic injuries. This will also benefit public members from injuries, deaths, and costs incurred due to road traffic accidents will be significantly reduced.

1.8 THEORETICAL/META-THEORETICALGROUNDING/THEORETICAL FRAMEWORK

The study was conceptualised using Haddon's theory. Haddon (1983:32) described road transport as an ill-designed "man-machine" system needing comprehensive systemic treatment (Haddon 1983:32). These descriptions led to the production of what is currently known as the Haddon Matrix which then illustrates the interaction of the three factors which are: human factors, vehicle factors and environment factors. The crash event can be distinguished into three phases which are: pre-crash phase, crash phase and the post-crash phase. The dynamic system is modelled by the nine-cell Haddon matrix where each cell of the matrix gives an allowance of opportunities for the intervention in order to reduce the road crash injuries (see Table 1.1). The matrix classifies risk factors to road crash before the crash, during the crash, and after the crash in relation to the person, vehicle, and environment. Pre-crash, crash and post-crash phases can be examined thoroughly in relation to the human, vehicle and equipment, and environmental factors. Therefore, Haddon theory can be used as a diagnostic tool to identify all risk factors linked with a crash.

It is imperative to identify corrective measures that avert crashes targetting human factors like police enforcement, prevention of alcohol use, and experience of the drivers in the pre-crash phase. In the pre-crash phase, vehicle and equipment factors also play a crucial role in preventing road crashes. The roadworthiness of a vehicle, the state of the braking system, the state of tyres, and speed management can be improved to avoid crashes. Environmental factors also play a role in preventing crashes by having road designs and road layout that does not put the drivers at risk of crashes.

The crash phase is associated with corrective measures that avert injuries from occurring or lessen their severity by identifying human factors (seat belts use), vehicles and equipment factors, and environmental factors (crash-protective roadside objects).

The post-crash phase includes all events that reduce the crash's adverse consequences, for example, with human factors, having first aids skills, fire risks from the vehicles, and environmental factors (availability of rescue facilities).

Table 1.1: THE HADDON MATRIX APPLIED TO A ROAD TRAFFIC CRASH

Phase	Human factors	Vehicles and equipment factors	Environmental factors.
Pre-crash	Attitudes	Roadworthiness, Lighting	Road design and road layout
	Knowledge	Braking, Tyres	Speed limits
	Use of alcohol	Speed Management	Pedestrian facilities
	Driver experience		
	Police enforcement		
Crash	Use of restraints (seatbelts)	Occupant restraints (seatbelts)	Crash-protective, roadside objects (side slope guard rails or roadside embankments).
		Other safety devices (airbags)	
Post-crash	First-aid skill	Easy of access	Rescue facilities
	Access to medics	Fire risks	Congestion

1.9 DEFINITIONS OF KEY CONCEPTS

Road Traffic Accident is defined as 'the product of an unwelcome interaction between two or more moving objects, or a fixed and moving object' (Whitelegg 1986:161). In this study, road traffic accident refers to a random accident followed by a situation in which one or more road users have failed to cope with the road environment.

Driver

A driver is any person who drives or guides or is in actual physical control of any vehicle (Government of Botswana, 1996). In this study, a driver is any person who drives any vehicle.

Automobile

An automobile is a car or powered road vehicle designed to carry a small number of people (Oxford English Dictionary, 2012:42).

Automobile driver

In this study, an automobile driver is any person driving a car.

Guidelines

Guidelines are systematically developed evidence-based statements that assist providers, recipients, and other stakeholders in making informed decisions about appropriate health interventions (WHO, 2003:2). This study defines guidelines as systematically developed evidence-based statements on preventing road traffic accidents amongst automobile drivers.

1.10 OPERATIONAL DEFINITIONS

For the quantitative study in phase one, the independent variables included human factors, age, time of accidents, personal profiles of drivers involved, vehicle and equipment factors, environmental causes of road traffic accidents, and the impact of road traffic accidents on victims' health. Road traffic accidents were a dependent variable affected by independent variables.

1.11 RESEARCH METHODOLOGY

The study was conceptualised using Haddon's theory. The study was conducted following the mixed-method sequential explanatory design. Data were collected over a while in two consecutive phases. The researcher first collected data on drivers' profiles (age, time of accidents, use of drugs or alcohol, use of restraints and impairment) and health effects on victims. The first phase used a quantitative cross-sectional design. The study used systematic probability sampling where every second document was included in the sample until 400 documents with necessary information related to road traffic accidents were reached. This was followed by a qualitative exploratory and descriptive design using two focus group discussions to gather more information from the stakeholders until data saturation occurred. That is, no new information emerged. Tesch's eight steps of data analysis were followed. The detailed information regarding the methodology is described in chapter three of this study.

1.12 ETHICAL CONSIDERATIONS

The researcher obtained approval to conduct the research project from the University of South Africa, Department of Health Studies. The researcher applied to conduct the research study to the Botswana Ministry of Health and Wellness and the Ministry of Defence, Justice, and Security. The researcher presented a request letter and the ethical clearance certificate from UNISA to the Ministry of Health and Wellness requesting institutional consent. Institutional consent was granted by the Ministry of Health and Wellness (REFERENCE NUMBER: HPDME 13/18/1) and the Ministry of Defence, Justice, and Security (REFERENCE NUMBER MDJS 1/18/5 III (18)) after communicating using a letter prepared by the researcher and an ethical certificate indicating the approval of the proposal.

Furthermore, the researcher secured verbal permission to conduct the study at the respective police stations and hospitals. All relevant bodies were informed about the right to request and access the final report of this study. Each step of the current study was

given due emphasis to maintain its ethicality.

1.13 SCOPE OF THE STUDY

The study population included traffic accident victims' documents at the police stations from Gaborone and Francistown and police and traffic officers, lawyers/ third party claims officers, and emergency department staff such as nurses and doctors working in Gaborone and Francistown. The researcher sought to explore and describe the factors contributing to road traffic accidents amongst automobile drivers in Botswana and describe the effects of road traffic accidents on the drivers' and community members' health. Lastly, to develop guidelines to reduce road accidents amongst community members in Botswana. The researcher hoped that the findings and recommendations would help reduce road carnages in Botswana. Guidelines were developed using logical reasoning processes (Polit & Beck, 2008:13).

The research study was conducted through a sequential mixed-methods approach. The conclusions of this study were drawn from both quantitative and qualitative results. The process of logical reasoning involves both induction and deduction (Brink et al., 2012:5). According to Beck (2008:13), logical reasoning is a problem-solving method that allows researchers to use formal systems of thought. Quantitative research focuses on deductive reasoning, whilst qualitative research focuses on inductive reasoning. In this study, the researcher drew conclusions and recommendations from both quantitative and qualitative findings. Subsequently, the study findings were used to develop guidelines. The study was ethically reviewed and approved by the University of South Africa, the Botswana Ministry of Health and Wellness, and the Ministry of Defence, Justice, and Security.

1.14 STRUCTURE OF THESIS

The thesis was divided into the following chapters:

Chapter 1: Orientation of the study

Chapter 2: Literature Review of the study

Chapter 3: Research Method and Design

Chapter 4: Research Findings

Chapter 5: Discussion of Research Findings

Chapter 6: Guidelines for Botswana community on reducing road traffic accidents.

Chapter 7: Summary of the Research findings, recommendations, limitations, and conclusion

1.15 CONCLUSION

This chapter presented the orientation to the study. The chapter incorporated an introduction to the study, background information for the research problem, research purpose, research objectives, significance of the study, definition of key terms, research design, and method. The next chapter will review the literature relevant to the study topic.

CHAPTER TWO

LITERATURE REVIEW

2.1 INTRODUCTION

The previous chapter presented the overall orientation of the study. This current chapter presents a literature review of the study. The literature review sets the tone of a study and informs the researcher about the existing scientific knowledge gaps (Boswell & Cannon, 2011:118). This chapter provides a global review of factors contributing to road traffic accidents, the prevention of road traffic accidents, and the effects of road traffic accidents on the victims' health.

2.1.1 Literature Review methodology

A thorough literature review was conducted after searching published articles using search keywords like (“road traffic accidents”) OR (“road crashes”) AND (“contributing factors to road traffic accidents”) from different databases such as Scopus, Science Direct, Web of Science, Google Scholar, PubMed, and other relevant journals, WHO reports, and books were also consulted to suit the need for the literature of the study.

2.2 THE WORLDWIDE PROBLEM OF ROAD TRAFFIC ACCIDENTS

In response to the global epidemic created by road traffic crashes, the United Nations General Assembly resolution 64/255 proclaimed the period 2011-2020 as the Decade of Action for Road Safety. This has to be achieved through various activities across all levels to decrease road traffic fatalities around the globe (WHO, 2011). The 2030 Agenda for Sustainable Development recognises that road safety is a prerequisite to ensuring healthy lives, promoting well-being, and making cities inclusive, safe, resilient, and sustainable (World Health Organisation, 2016). Due to road traffic accidents, fatalities continued to increase to a high of 1.35 million in 2016 (WHO, 2018). In recent times, the encumbrance of road traffic injury and fatality was found to be unacceptably high in African countries (Adeloye et al., 2016). However, the registry-based data sets available

from African countries and other low-income countries (LMIC) do not accurately reflect the true incidence and proportion of RTIs due to systematic under-reporting estimated to be as high as 50% in some LMIC. A study done by Wismans et al. (2016) for Asian countries shows that road accidents are causing large problems and high costs in Asia. The accidents have a huge impact on the health of people and productivity. The number of fatalities and injuries is rising in many Asian, both low and middle-income, countries.

2.3. FACTORS CONTRIBUTING TO ROAD ACCIDENTS

2.3.1 OVER-SPEEDING/SPEED VIOLATIONS

In a study done in Lubumbashi, DRC in 2015, Qatar in 2012, Saudi Arabia in 2000, Ghana in 2003, and Kenya in 2012, over-speeding was one of the contributors to road traffic accidents (Afukaar, 2003; Ansari, Akhdar, Mandoorah, & Moutaery, 2000; Bachani et al., 2012; Bener, 2012; Severin, Ben, Nlandu, & Ngatu, 2016). In a study on road traffic accident causes in Dubai from 2002-2008, RTAs were more frequent on roads with high-speed limits and with the presence of trucks (Marzooqi, Badi, & Jack, 2010). In Anambra State, South Eastern Nigeria, speed limits violation was one of the main factors contributing to road traffic accidents from 2010 to 2014 (Anebonam et al., 2019).

2.3.2 INFLUENCE OF ALCOHOL AND DRUGS

In a study done in France, prescription medicines were a risk factor for road traffic crashes (Orriols et al., 2010), and Martin et al. (2017) found that drivers under the influence of alcohol were at risk of being involved in road traffic accidents. Drivers under the influence of cannabis have a high risk of being involved in road traffic accidents (Carfora et al., 2018; Jørgenrud et al., 2018). Studies done in Norway, Jordan, Athens, and Milan have shown a significant association between road traffic accidents and the use of alcohol (Ahlner & Holmgren, 2014; Elliott et al., 2009; Jones et al., 2009; Valen et al., 2019), illicit drugs (Ferrari et al., 2018) and psychotropic drugs (Al-Abdallat et al., 2016; Carfora et al., 2018; Gjerde et al., 2011; Papalimperi et al., 2019). In other countries like Iran, most drivers involved in road traffic accidents use opioids (Assari et al., 2014). Literature shows that having a Blood Alcohol (BAC) level above zero was associated with five times the risk than a zero BAC (Haworth, 2000).

2.3.3 FATIGUE

It is well-known that our ability to perform can be affected by fatigue. Fatigue is an acknowledged road safety hazard of a similar magnitude to alcohol while driving (Jackson et al., 2011; Sadeghi-Bazargani et al., 2016) and is involved in around 19% of fatal crashes in New South Wales (NSW) (Centre For Road Safety Transport for NSW, 2011). Other countries show similar statistics, like the UK, where fatigue causes up to 20% of crashes (Jackson et al., 2011) and the USA with 16.5% of fatal crashes involving drowsy driving (American Automobile Association Foundation for Traffic Safety, 2010).

According to the study which was conducted by MacLean, Davies and Thiele (2003), drivers that reported feeling drowsy while driving accounted for 29% - 55%, those that reported having fallen asleep at the wheel accounted for 11% - 31%, while drivers that reported having had a crash that was due to sleepiness accounted for 4% - 12%. Drowsiness is a risk factor for vehicle accidents and yields a high human and financial cost. Sleep deprivation can lead to the driver feeling fatigued and having lapses of attention which causes severe accidents because the driver who is drowsy may not take evasive action in order to avoid the severity of a potential collision (Moore-Ede et al., 2004). Insomnia is a risk factor for MVAs and near-miss accidents (NMAs) (Garbarino et al., 2017). In a study done in Finland in 2018, short sleep was a significant cause of fatal road traffic accidents. Sleep apnea or acute/chronic diseases and the use of sedative medications and drugs are known risk factors for road traffic accidents due to falling asleep at the wheel (Kalsi, Tervo, Bachour, & Partinen, 2018).

In Peru the working conditions of the drivers, including schedule changes that are irregular, lead to certain community factors namely: sleep disorders, tiredness, being sleepy while driving, sleep deprivation (both acute and chronic). These results support the hypothesis that fatigue and sleepiness among bus drivers are related to road accidents (De Castro et al., 2004). Sleepiness is an inescapable biological phenomenon with profound effects on the mind and body. The negative ramifications are ubiquitous and include impaired cognition and performance, automobile crashes, accidents at work, and other physical and mental health consequences (Higgins, Michael, Austin, Åkerstedt, & Hans, 2017). Fatigued driving is a significant cause of traffic accidents. Approximately 32% of the USA drivers drive while tired at least once a month (National Sleep Foundation, 2008). In a study done by Zhang *et al.* (2016) in China, truck drivers, driving from midnight to dawn,

are at risk of fatigue-related accidents. Lack of street lights contributes to fatigue-related crashes. Lack of experience of driving, slippery roads, and unsafe vehicle status did not have a significant effect on fatigue-related road traffic accidents.

Drivers in developing countries are more likely to drive while fatigued for economic/financial reasons and meeting work schedules, especially commercial vehicle drivers. Surveys of business and public road transport in developing countries have revealed that transport owners, in pursuit of increased profits, frequently force their drivers to drive at excessive speeds, work unduly long hours, and work when exhausted (Zhang et al., 2016). Sleepiness and fatigue need to be managed but it needs to be noted that it is not a simple matter. The process of managing fatigue and sleepiness leads to safety at the workplace and on the road. This type of management is different from safety problems at the workplace and on the road simply because no exposure limit is observed rather managing fatigue is in the form of guiding individuals and not through prescriptions of specific actions through regulations set in place (Williamson, Friswell, Olivier, & Grzebieta, 2014). Brož et al. (2016) have found that many people still drive when they feel fatigued. Not much is known by public regarding the nature and the universality of driving while fatigued and the effects thereof in traffic accidents and these effects have not been sufficiently addressed. Individuals may open windows or listen to music while driving in order to avoid feeling fatigued while they drive but it is only a few of these measures that are effective. Therefore, fatigue driving is called a "silent killer" (Zhang et al., 2016:34-42).

2.3.4 DISTRACTED DRIVING

Distracted driving is any activity that competes for their attention while driving (Koppel, Charlton, Kopinathan, & Taranto, 2011). Literature shows that distracted driving from secondary task engagement is one of the main risk factors to teenage road traffic accidents (Gershon et al., 2019; Severin et al., 2016) and inattention (Sundfør, Sagberg, & Høye, 2019). Distractions can be a manual distraction, visual distraction, and cognitive distraction (Née et al., 2019). In a study done in France from 2010-2015, visual and manual disturbances were the most common causes of road traffic accidents (Née et al., 2019). Distracted driving involves using mobile phones (Alghnam et al., 2019; Choudhary & Velaga, 2017; Zhang, Cui, Yang, Guo, & Wang, 2019), preoccupation with deep

thinking, mind wandering state (Albert et al., 2018; Gil-Jardiné et al., 2017), talking with other passengers (Koppel et al., 2011; Theofilatos et al., 2018), picking things in the vehicle, reaching/ handling objects while driving (Gershon et al., 2019) and using entertainment systems (Eid & Abu-zidan, 2017), eating (Arafa, El-Setouhy, & Hirshon, 2019; Bener, 2012; Klauer et al., 2014), smoking (Mangiaracina & Palumbo, 2007) and looking at a roadside object (Klauer et al., 2014). A strong relationship between mobile phone use and road fatalities at the population level has been documented (Gariazzo, Stafoggia, Bruzzone, Pelliccioni, & Forastiere, 2018; Oviedo-Trespalacios, Haque, King, & Washington, 2017; Rosso, Candura, Perotto, Caramella, & Montomoli, 2018). Distracted driving that causes road traffic accidents also includes eating while driving (Arafa, El-Setouhy, & Hirshon, 2019:372-378). Distracted driving is a significant cause of RTAs among drivers (Klauer et al., 2014). A study done in the United Arab Emirates showed no significant differences between distracted and non-distracted drivers in demographical and physiological factors, injured regions, and outcomes (Eid & Abu-zidan, 2017). According to the literature, being a novice and risk-taking behaviours are risk factors for RTAs among young drivers. However, visual, cognitive, and mobility impairment have been associated with older drivers' crashes (Rolison, Regev, Moutari, & Feeney, 2018a).

2.3.5 OTHER DEMOGRAPHIC CAUSES (AGE AND GENDER)

Young people, those less than 30 years of age, are more likely to be involved and die in road traffic accidents than older age groups (Kharya, Gupta, & Solanki, 2013; Sadeghi-Bazargani et al., 2016). The young population has a higher proportion of deaths, but those over 60 years are at an increased risk (Arafa et al., 2019). According to literature, older adults tend to have a high incidence of seat belt use and a lower incidence of impaired driving (Greene & Smith, 2019). Studies which were done in Sri Lanka, Guinea, Ethiopia, and Kenya show that most road traffic accident victims were males (Bon de Sousa et al., 2016; Gebresenbet & Aliyu, 2019; Kourouma et al., 2019; Seid, Azazh, Enquselassie, & Yisma, 2015; Sisimwo, Mwaniki, & Bii, 2014) of 21-50 years of age (De Silva et al., 2018; Gebresenbet & Aliyu, 2019; Seid et al., 2015). This is consistent with a study done in Norway in which increasing age was significantly associated with a lower risk of being involved in road traffic crashes (Jørgenrud et al., 2018). In contrast to the findings stated earlier, a study from Egypt on road traffic crashes showed that females

were at higher risk than their male counterparts in road traffic accidents (Arafa et al., 2019).

2.3.6 DISEASES AS CAUSES OF RTAs (DIABETES)

Diabetes mellitus is a disease that may affect the eligibility to hold a driving licence and thus increasing the risk of being involved in a road accident. Hypoglycaemia while driving is considered to be the riskiest situation, with diabetes increasing the mentioned risk, for instance, due to impaired vision in the case of possible retinopathy (Brož *et al.*, 2016:223-5). In a meta-analysis study by Hostiuc, Negoj, and Hostiuc (2016:554-68), diabetes was not a risk factor for road traffic accidents. However, old age and insulin-dependent patients tend to have a higher risk. The group of drivers with diabetes being at the most significant risk for accidents are those with a case history of severe hypoglycaemia or hypoglycaemia occurring while driving, or possibility of a road accident. There are two crucial preventative elements indispensable for insulin-treated diabetes patients for them to secure road traffic safety, and that can be done by measuring glycaemia before driving and knowing the prevention and treatment of hypoglycaemia (Brož *et al.*, 2016:223-5).

2.3.7 POOR ROAD DESIGN

A study done in Poland from 2004 to 2014 attributed a lack of adequate road infrastructure to road traffic accidents (Pawłowski, Goniewicz, Schwebel, Shen, & Goniewicz, 2019). Poor road design was a significant contributor to road traffic accidents in Uganda (Pebalo et al., 2012). In countries like Finland, the leading cause of road traffic accidents is very slippery road conditions (Malin, Norros, & Innamaa, 2019). Poor road design is one of the causes of road traffic accidents in developing countries (Huang, Lunnen, Miranda, & Hyder, 2010).

2.3.8 SOCIO-ECONOMIC STANDING

According to a study done in Australia, young drivers from low socio-economic backgrounds were twice as likely to be hospitalised due to road crashes than young drivers from higher socio-economic backgrounds (Chen et al., 2010: 998–1003). A study done in Scotland on road traffic accidents and socio-economic deprivation found a positive trend between RTA activity and socio-economic deprivation (Chichester, Gregan,

Anderson, & Kerr, 1998). This is consistent with a study done in Iran and Sweden, which found that drivers of the low socio-economic level were more at risk for fatal accidents (Hasselberg & Laflamme, 2003; Shahbazi, Saeed, Nazari, Soori, & Khodakarim, 2019). This is because deaths and injuries from a traffic crash concentrated among people who used low-priced cars. These vehicles did not have advanced safety features. In contrast, a study done using the French Gazel cohort found that socially advantaged subjects had the greatest road crash involvement risk (Lenguerrand, Martin, Chiron, Lagarde, & Laumon, 2008).

2.3.9 WEATHER CONDITIONS

Weather conditions play both primary and secondary (fatigued driver) crucial roles in road traffic accidents (Perrels, Votsis, Nurmi, & Pilli-Sihvola, 2015). Literature shows that road traffic accidents vary according to seasons; for example, precipitation significantly increases the chances of traffic crashes (Stevens, Schreck, Saha, Bell, & Kunkel, 2019). More accidents are recorded when very high temperatures lead to distractions, driver error, fatigue, or sleepiness (Basagaña et al., 2015; Parvareh et al., 2018). In a study done in the USA, fatal accidents were positively associated with heat waves for drivers above 56 years of driving on rural roads (Wu, Zaitchik, & Gohlke, 2018). A study done in Pakistan further reinforced the assertion that rainfall, severe coldness, fog, and heat conditions were directly related to road traffic accidents (Hammad et al., 2019).

2.4. ENFORCEMENT OF ROAD TRAFFIC REGULATIONS

Weak enforcement of road traffic regulations accounts for the high burden of RTCs in low and medium-income countries in general (Museru et al., 2002:37-41; Nantulya & Reich, 2002:1139). Young people admit that fines, speed cameras, and alcohol breath testing reduce risky driving. In Botswana, aggressive policies and other activities such as (education and enforcement) were implemented to minimise alcohol consumption from 2004-2011 and resulted in a significant reduction in road traffic accidents (Sebego et al., 2014). This is also consistent with studies done in China in which traffic legislation might improve road safety by spurring behavioural changes that reduced traffic deaths (Sheng et al., 2018). Low education level, culture, and inefficient law enforcement cause noncompliance with safety laws in low-income countries. Therefore, there is a need for effective and efficient safety education, considering cultural diversity are the key aspects

of reducing traffic-related injuries and fatalities in low-income countries (Urie, Velaga, & Maji, 2016). Law enforcement is one of the most critical measures in reducing road traffic accidents when targeted to speed limits and drinking and driving (Aguilera, Moysés, & Moysés, 2014). Law enforcement would also require police enforcement practices (Nazif-Munoz, Quesnel-Vallée, & Van Den Berg, 2015). In Scotland, changing the legal blood alcohol concentration (BAC) limit for drivers without legislative enforcement did not improve RTA outcomes (Haghpanahan et al., 2019).

2.5 MEASURES TO PREVENT ROAD TRAFFIC ACCIDENTS

Speeding

According to literature, speed cameras are a worthwhile intervention for reducing the number of road traffic injuries and deaths (Graham, Naik, McCoy, & Li, 2019; Hu & McCart, 2016; Pilkington & Kinra, 2005; Wilson, Willis, Hendrikz, Le Brocque, & Bellamy, 2010). In a systematic review of road safety measures, law enforcement had the most significant immediate results to change drivers' behaviour, especially regarding speed limits and drinking and driving. It was followed by engineering strategies to promote a safe environment and education strategies to inform and support other strategies. Still, it did not seem sufficient to encourage cultural changes regarding road safety (Aguilera et al., 2014). This is consistent with another systematic review in which legislation was the most common intervention with the best outcomes when combined with strong enforcement initiatives or a multifaceted initiative (Asefa, Assefa, & Tesfaye, 2014; Staton et al., 2016). In a study done in Thailand in 2003, the recommendations were that for any traffic safety programme, it must be followed by a systematic evaluation, and there must be a coalition of stakeholders to catalyse policy action (Suriyawongpaisal & Kanchanasut, 2003). In another study done in China's two cities of Suzhou and Dalian, there was underreporting of RTA statistics. It is recommended that governments invest in surveillance systems that capture road traffic injuries, key risk factors, evaluating the impact of safety policies, and benchmarking achievements (Bhalla et al., 2013). At the scene of any road traffic accident, there is a need to complete an accident report form and possibly use mobile reporting devices so that contributing factor lists reflect the full range of factors that contribute to road accidents (Rolison, Regev, Moutari, & Feeney, 2018b). A semi-autonomous transport system might provide the next intervention against road fatalities. Health promotion will help raise community engagement and build

coalitions to increase new technologies' uptake (Stevenson & Thompson, 2014). A study conducted in the USA on slowing traffic speed in urban areas proved that brick and granite block paving materials might be a sufficient traffic calming strategy, having implications for reducing adverse health outcomes associated with pedestrian or automobile collisions (Nogueira & Mennis, 2019).

In another study conducted in the United Kingdom, every 1% increase in fuel price resulted in a 0.4% reduction in the number of fatal road traffic accidents (Naqvi, Quddus, & Enoch, 2020). Optimisation of the highway landscape environment is necessary to promote transportation efficiency and improve traffic safety (Zheng et al., 2018). Literature shows that engineering strategies, road safety policies, education strategies, and law enforcement policies are the most common interventions in preventing road traffic accidents (Aguilera et al., 2014; Lefio, Bachelet, Jiménez-Paneque, Gomolán, & Rivas, 2018). Chile reduced road traffic accidents after the 2005 traffic law reform to change road user behaviours, police enforcement, and road investment infrastructure (Nazif-Muñoz, Quesnel-Vallée, & Van den Berg, 2014). In a literature review by Soole, Watson, & Fleiter (2013), average speed enforcement was found to be a highly reliable approach that produces considerable returns on investment through reduced social and economic costs associated with crashes. Although most countries require a vision screening test to renew an individual's driver's licence, there is insufficient evidence to assess vision screening tests' effects on subsequent motor vehicle crash reduction (Desapriya et al., 2014). In a meta-analysis study, on the impact of various speed limits starting with above 50 km/h, decreasing speed by 1km/h results in reduction by 2% in number of crashes (Elvik, Mysen, & Vaa, 1997). An increase in speed by 5 km/h for a vehicle travelling at a speed above 60 km/h doubles the risk of a crash comparable to having a blood alcohol concentration (BAC) of 0.05 gram per decilitre (g/dl) (Mclean & Kloeden, 2002).

Use of alcohol and drug use

Some of the interventions being instituted in LMICs to reduce RTAs include drink-drive legislation with enforcement via breath testing campaign, which have shown average cost-effectiveness (Bantsola & Mytton, 2017). An integrated approach for improving road traffic safety should include: reducing the risk of exposure to an accident, preventing accidents, reduction in bodily injuries sustained in accidents, and lowering the effects of injuries by an improvement of post-accident medical care (Goniewicz,

Goniewicz, Pawłowski, & Fiedor, 2016). In Korea, there was a marked reduction of RTAs in a short period after interventions, which included enforcement of penalties for drunk driving and speeding. The government installed traffic-monitoring cameras. Citizens that reported traffic violations, introduced a road safety evaluation system, the correction of accident blackspots in existing roads and road safety education programs were rewarded financially (Yang & Kim, 2003).

Fatigue and night driving

Driving limits, working hour limits and advice to individuals to take breaks when they feel tired are some of the strategies that can be used to manage fatigue. A significant assumption inherent in this consultative approach is the notion that drivers need to access their particular cognitive information regarding their fatigue levels and drowsiness in order for them to be able to decide to stop and get some rest before their performance is adversely affected leading to their safety being compromised (Williamson et al., 2014). Current solutions to managing driver fatigue for road safety rely on ill-defined relations between drivers' subjective state and behavioural capacity judgments. If we are to succeed in driver fatigue, we need to know whether the current advisory approach can be successful. Unlike the issue of drunk driving, which can be addressed at least in part by proscribing drivers' alcohol consumption and for which there is a clearly defined dose-response relationship between alcohol use and performance effects (Holloway, 1995), for fatigue, the problem is not so clear cut. Emphasis must be to educate drivers about the importance of getting sufficient sleep and avoiding circadian performance troughs (MacLean et al., 2003).

In a study by Gershon, Shinar, Oron-Gilad, Parmet & Ronen (2011), fatigue counter measures that were used as interventions in professional and non-professional drivers included: listening to the radio, opening the window, and talking to passengers were most frequent and effective interventions stated by non-professional drivers. Listening to the radio, face washing, and opening the window were reported as effective interventions for professional drivers. According to Matthews et al. (2012), avoiding circadian driving was identified as an effective intervention. In another study conducted by Verster, Veldhuijzen, & Volkerts (2004), avoidance of using hypnotic drugs, particularly zopiclone and benzodiazepine drugs, was introduced to deal with drowsy driving. In another research conducted by Merat and Jameson (2013) in the UK, the effect of low-cost engineering

methods on the reduction of fatigue while driving in a simulated driving environment was evaluated.

In this study, a simulated environment was used, three features for engineering changes, including rumble strips, V invert lines (chevrons), and variable message signs. The results showed the alertness of the drivers in vehicle control (Merat & Jamson, 2013). Interventions designed to reduce fatigue and sleepiness while driving in the world can be classified into three categories: (1) interventions include change in the behaviours, (2) changes in the environment, and (3) educational programmes (Shahbazi et al., 2019).

A study done in Ghana showed that the risk of death in a night traffic crash was higher than during the daytime. In the same study they recommended provision of functioning street lights in built-up areas, road line markings, delineators and signage for the highways and arterial roads (Ackaah, Apuseyine & Afukaar, 2020).

Distracted driving

Strict controls on cellular phone usage in vehicles to avoid distractions during driving will reduce road traffic accidents (Gariazzo et al., 2018). Other studies support the ban on cell phone use while driving (Eid & Abu-zidan, 2017; Llerena et al., 2015). There is a need to implement a holistic systems approach to the problem of distracted driving. This will improve the existing knowledge and interventions from the traditional approach (Young & Salmon, 2015). Some studies have recommended laws and regulations on road safety to fine smoking behaviour during vehicle driving as it is a distractor (Mangiaracina & Palumbo, 2007).

Some researchers suggest that driver inattention may be preventable by a system orientated approach which includes a combination of vehicle technology, road environment improvements, appropriate signs, markings, education as well as enforcement regarding the use of mobile phones (Sundfør et al., 2019). Technological and behavioural interventions that keep the drivers' eyes on the road and discourage engagement in distracting secondary tasks can prevent RTAs caused by distractions (Gershon et al., 2019:494-500). Making advanced driving assistance systems (ADAS), which help track drivers' eyes and gazes available to most vehicles, will help curb

accidents caused by fatigue (Khan & Lee, 2019). When planning interventions for accident prevention, practical interventions should focus on the groups with the greatest need without widening the gap between socioeconomic differences in health outcomes (Shahbazi et al., 2019).

Seat belt use

Literature shows that seat belt use saves lives and reduces the severity of road traffic injuries (Mahfoud et al., 2015). The risk of fatality is reduced by 40% among drivers and front-seat passengers using a seat belt (World Health Organisation, 2013). A study done in Saudi Arabia's two Riyadh suburbs showed that seat belt use increased after enacting seat belt use laws, resulting in a significant drop in certain types of injuries due to traffic accidents (Bendak, 2005). In Iran, 62.4% of the drivers stated that they always wore seatbelts while driving and attributed this to avoiding fines, fear of injuries, and respecting the law (Sadeghnejad, Niknami, Hydarnia, & Montazeri, 2014). Delays by relevant government departments in implementing and enforcing seat belt laws in low and lower-middle-income countries were found to be catastrophic (Martin, Lagarde, & Salmi, 2018).

Systems Approach

The system approach shifts the blame of road crash fatalities and injuries from road user behaviour and choices to a system of shared responsibility with human fragility at the centre. All the road system elements should be "forgiving" to road users who are accepted as being prone to error. The approach places focus on four critical causal factors that determine the forces during the crash to reduce the severity of the crash outcome: safe roads and roadsides, safe speeds, safe vehicles, and safe road users (World Bank, 2020). In countries like Pakistan they use the Systems Approach Framework (SAF) to implement human vehicle design interventions and make the environment safer for road users (Khan & Fatmi, 2014).

2.6 EFFECTS OF ROAD TRAFFIC ACCIDENTS ON THE HEALTH OF DRIVERS AND COMMUNITY MEMBERS.

People involved in RTAs may develop psychological symptoms. It can be extreme to be described as PTSD (post-traumatic stress disorder) and can cause impairment in daily life for those affected (European Transport Safety Council, 2007). Post-traumatic stress disorder (PTSD) is characterised by disturbing thoughts and recalls avoidance, and hyperarousal after an experience of a life-threatening situation (European Transport Safety Council, 2007). Psychiatric symptoms and disorders are frequent after significant and less severe road accident injuries. Post-traumatic symptoms are common and disabling (Bridget Bryant, Duthie, & Mayou, 1993). In a study to investigate the psychosocial consequences of road traffic accidents on drivers and passengers in South Africa in 2004, both drivers and passengers showed a significant decline in their well-being (Peltzer & Renner, 2004). Most road traffic accidents result in high levels of distress during and immediately after the accident are associated with severe post-traumatic stress symptoms (B. Bryant, Mayou, Wiggs, Ehlers, & Stores, 2004; Di Gallo, Barton, & Parry-Jones, 1997).

A study was conducted in Italy in 2010 to establish the health outcomes of road traffic accidents in the Friuli Venezia Giulia Region, Northeastern Italy, showed that 3,861 DALYs were lost in 2010. Years were lost because premature deaths outnumbered those lost because of disability. The highest number of DALYs lost among 15-44 year-old males (Collarile et al., 2014). In addition to mortality or reduced quality of life, road accidents result in other consequences such as psychological effects. (European Transport Safety Council, 2007; Mayou & Bryant, 2003). The majority of road users involved in road traffic accidents recuperate from their injuries. Still, some of them at no time recover fully and suffer from some kind of lasting disability. In Spain, 15% of those who survive a road crash must be treated in hospitals as in-patients, while 32% are forced to take sick leave from work for at most three months, and another 29% have to remain away from work for at least three months (European Transport Safety Council, 2007). In the Solomon Islands, most drivers involved in road traffic accidents suffered from fractures (Stewart, Negin, Farrell, Houasia, & Munamua, 2015). The results are similar to the South African study in which fractures contributed to the greatest rate of years lived with disability (3.0 years of life lived with disability per 100 000) among those involved in road traffic accidents (Albertyn et al., 2019). Literature has shown that disability from severe lower limb fissures resulting from RTAs is common and can cause permanent disability (Kuppa et al., 2001). Inside impacts and lower extremities are the most frequent site of moderate to severe injuries to survivors (Thomas & Frampton, 1999) and the second most common site of

moderate to fatal injuries for belted occupants (Morgan et al., 1991). Foot and ankle injuries accounted for 8-12% of all moderate to serious injuries sustained by motor vehicle occupants involved in frontal crashes (Crandall et al., 1998). In economic terms, lower extremity trauma is associated with high costs (MacKenzie et al., 1988), and the frequency and economic impact is increasing (Martin et al., 1997). In a study done in Brazil in 2008, road traffic deaths were found to reduce the at-birth life expectancy by 0.8 years for males and by 0.2 years for females (Chandran et al., 2013). In a study done in Cameroon on the pattern of lower extremity injuries due to road traffic crashes, the leg, thigh, and knee were the most injured anatomical parts of the lower extremity. Fractures, lacerations, and bruises were the most recurrent lower extremity injuries (Ngunde et al., 2019).

2.7 GAPS IDENTIFIED IN LITERATURE

Studies done in China and India on road traffic accidents showed that the main challenge impeding effective prevention of road traffic accident strategies is underestimating data provided by governments (Chang et al., 2020; Dindi et al., 2019; Soori & Khorasani-zavareh, 2019). Studies that rely on government data must be supported by other sources of evidence to make the study reliable and valid. Another study done in Iran on the importance of public-private partnership in preventing and reducing road traffic accidents recommended further studies to provide the context and conditions for applying the policy (Azami-Aghdash et al., 2020). Iran implemented an educational awareness programme based on its guidelines but failed because it was implemented in a dispersed manner for some groups (Bakhtari Aghdam, Sadeghi-Bazargani, Azami-Aghdash, Esmaeili, Panahi, Khazaee-Pool, & Golestani, 2020). In a scoping review study on the interventions being done in Africa to reduce road traffic accidents, most of the interventions are too simple. They lack details relative to the context essential for scaling up or replication (Bonnet, Lechat, & Ridde, 2018). Therefore, there is a need to develop guidelines or interventions that are specific and detailed. The same scoping review study revealed that few Africa countries have guidelines to reduce road traffic accidents. Another gap in most studies on road traffic accidents is the evidence of the cost-effectiveness of interventions (Banstola & Mytton, 2017). This calls for interventions or guidelines with monitoring systems for the evaluation of the effectiveness of the interventions.

2.8 GUIDELINES DEVELOPMENT

Guidelines development vary. Other authors suggest that when developing clinical and public health guidelines, equity and gathering evidence that will help make decisions and recommendations are paramount (Teufer, Nußbaumer-Streit, Ebenberger, Titscher, Conrad, Langer, Töws & Gartlehner, 2019). Furthermore, practical steps on guidelines development that address all items include the planning, formulation, implementation and evaluation of the guidelines (Schünemann et al., 2014). According to Steels, Van der Zande and van Staa (2019), to develop effective guidelines, there is a need to use observational data and have a monitoring and evaluation mechanism for the guideline. However, Guidelines International Network (G-I-N) recommends the following key components for high-quality guidelines: panel composition, decision-making process, conflicts of interest, guideline objective, development methods, evidence review, the basis of recommendations, ratings of evidence and recommendations, guideline review, updating processes, and funding (Qaseem et al., 2012).

2.9 CONCLUSION

This chapter reviewed relevant literature concerning the study title, research problem, purpose, research questions, and study objectives. Globally road traffic accidents are a public health problem. Most countries have tried various interventions, some of which have proved to work and others, which did not work. In some instances, some interventions are yet to be tested for their efficacy. In Chapter 3, the theoretical foundations are discussed.

CHAPTER THREE

RESEARCH METHODS AND DESIGN

3.1 INTRODUCTION

This chapter discusses the study design and research method by which the purpose and objectives of the study were achieved. These include the research design, validity of the research design, population and sampling, data collection, validity and reliability of the measurement instrument, pre-testing of the measurement instrument, data analysis, ethical principles, and permission to conduct the study.

3.2 RESEARCH PARADIGM

The researcher utilised perspectives of post positivism to develop instruments, measure variables, and assess statistical results. Then the researcher sought an explanation of quantitative data in more detail by moving to the qualitative phase in which there was a shift to using assumptions of constructivism. This research used two philosophical positions, post positivism and constructivism. A postpositivist uses critical realism philosophy, which believes that all observation is fallible and has an error and that all theory is revisable. The goal of science is to hold consistently to getting it right about reality, even though we can never reach that goal because all measurements are fallible. Therefore, the post-positivist emphasises the importance of multiple measures and observations, each of which may possess different types of errors. They need to use triangulation across these multiple error-full sources to get a better bead on what is happening in reality (Trochim, 2020). Constructivism is associated with a qualitative approach. Research is shaped from individual perspectives to broad patterns and, ultimately to broad understandings.

3.3 RESEARCH DESIGN

Creswell (2014:12) explained that a research design is a plan for conducting research, which involves the intersection of philosophy, inquiry strategies, and specific methods.

Research design is the general or set of coherent steps or plans taken by the researcher for dealing with a research question, including conditions for enhancing the study's integrity (Polit and Beck 2012:17). Research design determines the general approach adopted for this study involving data collection, an instrument for data collection, and analysis. Burns et al. (2013:195) refer to a research design as a blueprint for conducting a study with maximum control over factors that may interfere with the findings' validity. Furthermore, Polit and Beck (2017:273) also described a research design as “the overall plan for addressing a research question, including the specifications for enhancing the study's integrity”, which is slightly more advanced to the definition previously.

Creswell & Creswell (2018:3) outlined that there are three main research designs, which are qualitative, quantitative, and mixed-method. The three are not discrete and thus should not be considered mutually exclusive with rigid boundaries. This study followed a sequential explanatory mixed-method approach (Creswell & Creswell 2018:14; Parahoo, 2014:81).

3.3.1 Mixed method

The mixed-method has been defined as a type of research in which a researcher combines elements of quantitative and qualitative research approaches (e. g., use of quantitative and qualitative viewpoints, data collection, analysis, inference techniques) for the broad purposes of breadth and depth of understanding and corroboration (Johnson et al. 2007:123). In a sequential explanatory mixed-method approach, QUAN and QUAL strands occur across chronological phases. The first phase of quantitative data collection, analysis and results (QUAN data & results) guides the subsequent phase of collecting qualitative data (QUAL data & results), which are used to explain the initial quantitative results (Schoonenboom & Johnson, 2017:110). The mixed-method approach was used to heighten knowledge and validity. The design is of sufficient quality to legitimise multiple validities (Johnson and Christensen, 2017; Onwuegbuzie and Johnson, 2006).

In the sequential explanatory design, the data were collected over some time in two consecutive phases. Thus, a researcher first collected and analysed the quantitative data to identify significant predictors of road accidents to address the study's questions (QUAN

data & results). Qualitative data were collected in the second phase of the study and is related to the outcomes from the first quantitative phase (QUAL data & results). Qualitative interviews in the second phase were meant to explain results from the first phase in more depth (Creswell & Plano Clark, 2011). The 2 phases are complementary, help provide a complete analysis of the research problem, and offer the best chance of answering research questions.

The study involved a two-phase project. The researcher collected quantitative data in the first phase on drivers' profiles (age, time of accidents, use of drugs or alcohol, use of restraints, and impairment) and health effects on victims. The first phase results were used to plan (or build on to) the second, qualitative phase. This design's overall intent was to have qualitative data to help explain these earlier mentioned factors in more detail than the initial quantitative results.

For this study, mixed methods research is defined as a research approach or methodology employing rigorous quantitative research assessing the magnitude and frequency of constructs and rigorous qualitative research exploring the meaning and understanding of constructs (Creswell et al. 2012:27).

3.3.2 Quantitative

Polit and Beck (2017:76) describe quantitative research as a “set of orderly and disciplined procedures used to gain knowledge”. This type of research study uses deductive reasoning to test assumptions in the real world. Thus, the findings are grounded rather than using the researcher’s personal views (Polit & Beck, 2017:76). Quantitative research employs measurements to record and investigate aspects of social reality and is thus also referred to as “empirical research” because it uses numerical data whereby the information is statistically analysed (Polit & Beck 2012:76). The main aim of quantitative research is to establish the relationship between observations in the data collected using mathematical and statistical operations. Quantitative method research provides a broad explanation for behaviour and attitudes or predictions about the

relationship among variables and is completed with variables, constructs, and hypotheses (Creswell, 2014:98-108).

This study used quantitative cross-sectional designs followed by qualitative exploratory and descriptive design (Johnson & Christensen 2012:445). A cross-sectional survey is used to collect data to make inferences about a population of interest (universe) at one point in time. Cross-sectional surveys have been described as snapshots of the populations about which they gather data (Creswell & Creswell, 2018:149).

3.3.3 Qualitative

Qualitative research has been defined as investigating phenomena, typically in an in-depth and holistic fashion, by collecting rich narrative materials using a flexible research design (Polit & Beck 2017:739). It is also described as a systematic, subjective methodological approach used to describe life experiences and give them meaning (Burns et al., 2013:57).

Creswell and Creswell (2018:147), Merriam and Tisdell (2016:24) described qualitative research as a means of exploring and understanding the meaning individuals and groups ascribe to social problems. According to Burns et al. (2013:57), qualitative research is a systematic subjective approach used to describe life experiences and situations to give them meaning. Botma, Greeff, Mulaudzi, and Wright (2010:182) indicated that qualitative research design is used to shed light on the reality that researchers interact in and better understand reality through data generation in feelings, behaviours, thoughts, insights, and actions rather than numerical values.

Phase 1 Quantitative

This study used quantitative cross-sectional designs followed by qualitative exploratory and descriptive design (Johnson & Christensen, 2012:445).

Phase 2 Qualitative

For the qualitative study, focus group discussions were conducted. Both findings of the qualitative and quantitative studies were used to develop the guidelines. The study's main purpose was to develop guidelines to reduce road accidents among community members in Botswana based on document analysis and focus group discussions. All the findings were integrated and interpreted collectively. The purpose was to use the results to complement each other in the interpretation. The focus was to determine a pattern to follow in the development of guidelines. In other words, guidelines were developed using logical reasoning processes (Polit & Beck, 2008:13). The process of logical reasoning involves both induction and deduction (Brink et al., 2012:5). According to Beck (2008:13), logical reasoning is a problem-solving method that allows researchers to use formal systems of thought. Quantitative research focuses on deductive reasoning, whilst qualitative research focuses on inductive reasoning. In this study, the researcher drew conclusions from both quantitative and qualitative findings. Subsequently, the study findings were used to develop guidelines.

3.4 RESEARCH METHODOLOGY

The research methodology is the process or plan for how the study will be conducted and includes the population, sample and sampling, data-collection instrument, and data collection and analysis (Burns & Grove, 2009:264). Research methods are the techniques used to structure a study and collect and analyse information relevant to the research questions (Polit & Beck, 2012:741).

3.5 SETTING AND POPULATION OF THE STUDY

The study was conducted in Gaborone, Botswana. In Gaborone, two sites, namely, the Broadhurst Police Headquarters and the University of Botswana, were used. All the accident records for Francistown were at Broadhurst police headquarters in Gaborone. Stakeholders in Francistown travelled to Gaborone for the focus group discussion. The study population included traffic accident victims' documents at the police headquarters in Broadhurst, Gaborone, police traffic officers, lawyers/ third party claims officers, and emergency department staff such as nurses and doctors working in Gaborone and

Francistown. The University of Botswana was the venue used to conduct focus group discussions for research participants from Francistown and Gaborone. Figure 3.5 shows the road Map of Botswana with routes from cities to towns.

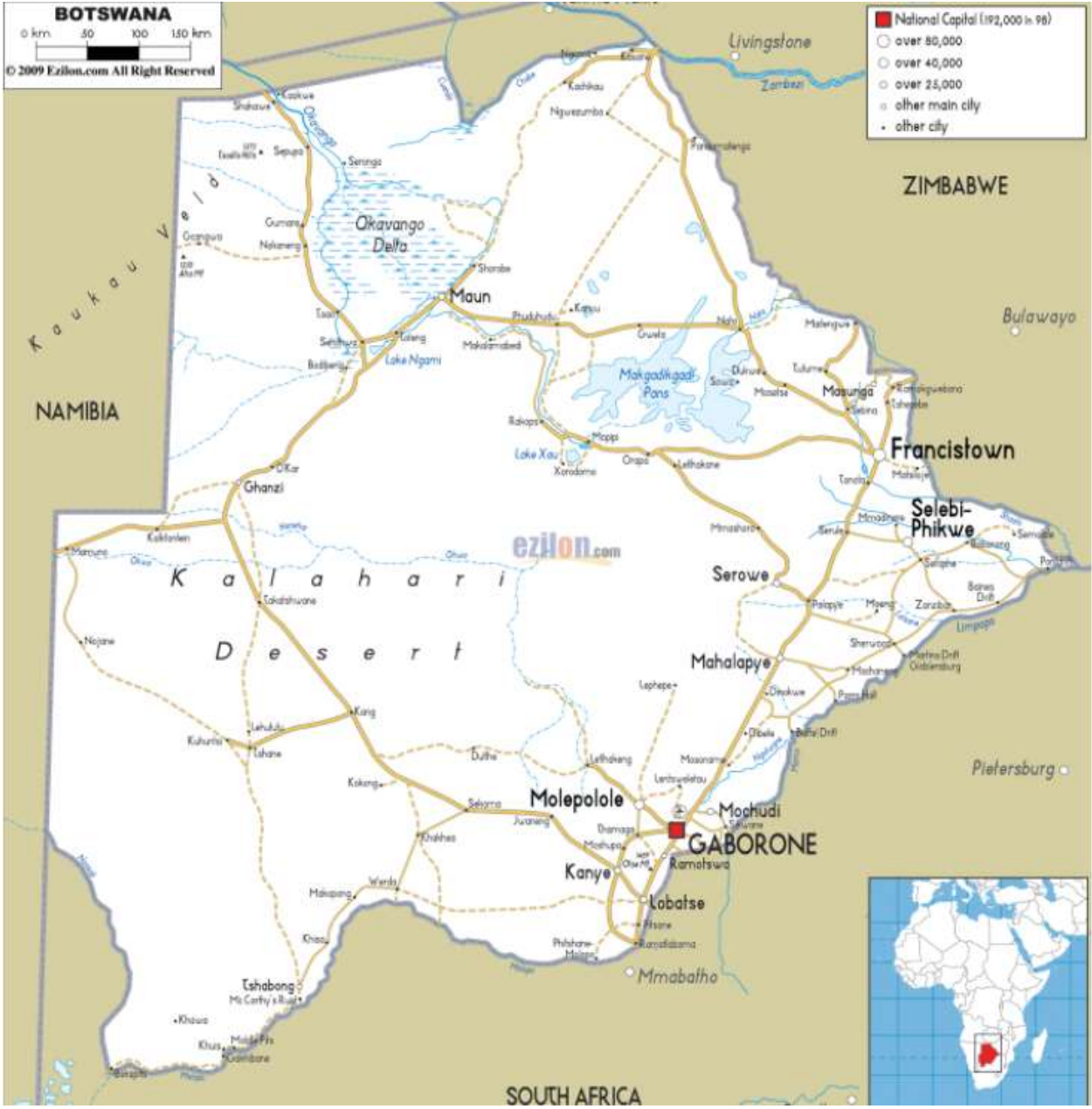


Figure 3.5: The study setting (Gaborone and Francistown) showing road networks (Ezilon, 2020).

3.6 SAMPLE AND SAMPLING METHODS

QUANTITATIVE PHASE 1

SAMPLING

Sampling is the procedure of selecting a portion of the population to represent the entire population, as it is impossible to study a total population (Polit & Beck 2017:743; Burns & Grove, 2011:313). Sampling methods are grouped into probability and non-probability sampling methods. Probability sampling involves the random selection of research participants in the study (Polit & Beck, 2017:743). Non-probability sampling involves selecting participants available at the time of data collection or participants that can significantly contribute meaningfully to the study (Polit & Beck 2017:744). Systematic probability sampling was used in the quantitative phase. The investigator chose all documents using random, systematic sampling. Every 18th or 19th document, depending on the year, was included in the sample until 360 documents with necessary information about road traffic accidents were reached, starting from the first documents provided by the Police from a sampling frame of 6665 documents from 2015 to 2019. For Francistown, every 37th to 42nd document, depending on the year, was included in the sample until 40 documents with necessary information about road traffic accidents were reached, starting from the first documents provided by the Police from a sampling frame of 1575 documents from 2015 to 2019. Tables 3.1 and 3.2 show the proportional sampling size calculations for each year and the sampling intervals. That was seen as the representative sample of documents concerning accidents in the areas. The sample size was calculated using the formula by Polit & Beck (2017:745), who provide a simplified formula to calculate sample sizes. The sample size was determined using the following formula where:

N = is the total number of accidents reported in Gaborone and Francistown in 2016. According to MVA (2016), the total recorded accidents were 9767 in both cities.

e = level of precision or sampling error

n = is the minimum sample size required for the study.

$$n = \frac{N}{1 + N(e)^2}$$

A 95 % confidence level and precision or sampling error of 0.05 was assumed for the formula.

$$n = \frac{9767}{1 + 9767(0.05)^2}$$

= 400

When this formula was applied to the sample, we got 400

A sample size of 400 cases involved in road traffic accidents was randomly selected according to the total number of road traffic accidents in Gaborone and Francistown. According to the 2016 MVA report, Gaborone had 8954 accidents during 2016, while Francistown had 813. Sample size for Gaborone was calculated to be $(8954/9767) * 400 = 360$ and Francistown = $(813/9767) * 400 = 40$.

Table 3.6. 1: Proportional sampling size for each year and the sample intervals for Gaborone.

Year	Gaborone	Proportional Sampling for each year	Sampling Interval
2019	1770	$\frac{1770}{6665} * 360 = 96$	$\frac{1770}{96} = 18$
2018	1322	$\frac{1322}{6665} * 360 = 71$	$\frac{1372}{71} = 19$
2017	1113	$\frac{1113}{6665} * 360 = 61$	$\frac{1113}{61} = 18$
2016	1194	$\frac{1194}{6665} * 360 = 64$	$\frac{1194}{64} = 19$
2015	1266	$\frac{1266}{6665} * 360 = 68$	$\frac{1266}{68} = 19$
Total	6665	360	

Table 3.6. 2 shows that the sampling interval ranged from 37 to 42 depending on the year being sampled from a sampling frame of 1575 documents.

Table 3.6. 2: Proportional sampling size for each year and the sample intervals for Francistown.

Year	Francistown	Proportional Sampling for each year	Sampling Interval
2019	320	$\frac{320}{1575} * 40 = 8$	$\frac{320}{8} = 40$
2018	260	$\frac{260}{1575} * 40 = 7$	$\frac{260}{7} = 37$
2017	307	$\frac{307}{1575} * 40 = 8$	$\frac{307}{8} = 38$
2016	296	$\frac{296}{1575} * 40 = 7$	$\frac{296}{7} = 42$
2015	392	$\frac{392}{1575} * 40 = 10$	$\frac{392}{10} = 39$
Total	1575	40	

QUALITATIVE PHASE 2

SAMPLING

Purposive sampling techniques for various stakeholders like traffic police, third party claims officers, and emergency nurses/doctors who have been in contact with people involved in road traffic accidents was used for the qualitative phase. De Vos et al., (2011:392) argued that purposive sampling enables the researcher to select a particular participant based on a characteristic of interest. Each focus group was conducted with six people, led by a skilled interviewer or moderator. The focus groups' sum was determined by the saturation point (Bryman & Bell, 2011:577). Focus groups were held until no new themes emerged.

3.7 DATA COLLECTION METHODS AND PROCEDURES

A typical procedure involved collecting survey data in the first phase, analysing the data, and then following up with qualitative interviews to explain the survey responses (Creswell, 2014:140). The study involved collecting quantitative data first through document analysis of the police records using a checklist to explore drivers' profile (age, time of accidents, use of drugs or alcohol, use of restraints, and impairments, deaths, and injuries). By systematically evaluating texts (e.g., documents, oral communication, and graphics), qualitative data were converted into quantitative data. Police accident reports and MVA documents' text were reduced to categories consisting of a word, set of words, or phrases coded for specific words indicative of the research questions. A checklist was used in transforming observations of found categories into quantitative statistical data. The second qualitative phase was conducted as a follow up to the quantitative results to help explain the quantitative results. In this phase, focus group discussions with various stakeholders like traffic police, third party claims officers, and emergency nurses/ doctors who had been in contact with people involved in road traffic accidents were conducted.

3.7.1 PHASE 1: QUANTITATIVE: DATA COLLECTION APPROACH AND METHODS

A checklist was developed with statements derived from the Haddon matrix constructs on human causal factors of road traffic accidents (use of alcohol), vehicle conditions (worthiness, braking systems and airbags), and environmental factors (presence of side slope guardrails or embankments) to protect the vehicle occupants. The checklist was used to analyse the documents related to road traffic accidents, as reflected in police stations and hospital records. The drivers' profiles (age, time of accidents, use of drugs or alcohol, deaths, and injuries) were explored. The texts from the drivers' profile and MVA documents were grouped into similar sets comprising of a word, set of words, or expressions coded for specific words or patterns that were suggestive of the research question. A checklist was used in transforming observations of found categories into quantitative statistical data by entering the coded data that was analysed numerically.

3.7.2 PHASE 2: QUALITATIVE DATA COLLECTION APPROACH AND METHODS

Two focus group discussions were used to gather qualitative data. Each group had 6 people, led by a skilled interviewer or moderator. The discussions were relaxed, and often participants enjoyed sharing their ideas and perceptions (Krueger & Casey, 2015:2). A quiet, private, non-intimidating place to talk to the prospective participants was chosen so that people felt relaxed and inclined to speak. The researcher explained what was going to happen in simple terms to the participants during the focus group discussion.

3.7.3 DEVELOPMENT AND TESTING OF THE DATA COLLECTION INSTRUMENT

A checklist was designed based on the Haddon theoretical framework. Before the fieldwork commenced, the checklist was edited to ensure that the statements addressed the objectives of the study in no uncertain terms; there were no spelling mistakes; questions were straightforward, and the checklists were not either too long or too short as to compromise their quality. The edited checklist was pilot tested at Broadhurst Police Headquarters in Gaborone. According to Szklo and Nieto (2014), a pilot study is a small-scale test of the methods and procedures used on a larger scale. It is a technique for testing and validating a research instrument by administering it to a small group of participants from the intended test population. The research participants and documents used during the pilot study were not included in the main inquiry (Unrau, Gabor & Grinnell 2007). The pilot sample was 10% of the overall survey sample (i.e., 10% of 400) = 40. Documents were proportionately picked in the selected enumeration areas for the pilot. This was important because piloting provided the researcher with the opportunity to identify and correct a wide range of possible problems with the instruments. During the piloting stage, the researcher established that information on the number of times someone was involved in the road accidents and when the driver's license was acquired could not be found from police records.

3.7.4 VALIDITY AND RELIABILITY: QUANTITATIVE PHASE 1

Validity denotes the extent to which an instrument measures what it is intended to be measuring (Johnson & Christensen 2012:256; Polit & Beck 2008:768).

INTERNAL VALIDITY

In this research, internal validity were controlled at various levels. As the data was collected through randomisation of road traffic accident reports from the police using systematic sampling to ensure that all the reports had the same chance of being selected, internal validity was ensured. During data analysis, variables were controlled using appropriate statistical analysis methods to ensure that the observed relationship between the independent and dependent variables was statistically sound. The checklist was adjusted carefully based on the results of phase 1. The wording of the statements was arranged carefully to avoid systematic misinterpretations by the participants. The researcher conducted a thorough literature review, which helped ensure that the content domain was fully captured.

EXTERNAL VALIDITY

External validity was ensured through collecting a representative sample size using a probability technique. Besides, accurate data collection methods were applied by deploying skilled research assistants to maximise the response rate. To evaluate the data collection instrument and the study's feasibility, pre-testing was done using a pilot study.

RELIABILITY

Reliability is the uniformity or stability of the measurement instrument, implying that if an evaluation gives reliable outcomes, the scores will be similar on every occasion (Johnson & Christensen, 2012:138; Ross-Kerr & Wood, 2011:209). To ensure the reliability of the tools and minimize random error, this research used a checklist. The researcher used Cronbach's alpha test for internal consistency to provide a unique estimation of a given test's reliability. Cronbach's alpha is the average value of the reliability coefficients one would obtain for all possible combinations of items when splitting into two half-tests (Tavakol & Dennick, 2011:54). In this study, a Cronbach's alpha of 0.73 and above was found among the constructs.

3.7.5 MEASURES OF ENSURING TRUSTWORTHINESS: QUALITATIVE PHASE 2

Four criteria were developed as a framework for the trustworthiness of a qualitative inquiry: credibility, dependability, confirmability, and transferability (Polit & Beck, 2012:584).

CREDIBILITY

Credibility refers to confidence in the data's truth and interpretations (Polit & Beck, 2012:585). In this phase of the research, credibility was ensured through the use of an interview guide, encouragement, reflective summaries, and prolonged engagement with the research participants during data collection. Probing on the participants' answers was done to ensure accurate information was captured during the interview. An independent coder was used to ensure that the researcher's interpretation does not influence the credibility of the qualitative data.

TRANSFERABILITY

Transferability denotes the extent to which findings can be transferred to or have applicability in other settings or groups (Polit & Beck, 2012:585). In this research, transferability was ensured through a full description of the process. The researcher presented the information in sufficient detail as part of the analysis so that someone interested in making a transfer can conclude whether the transfer can be expected (Polit & Beck 2012:585).

DEPENDABILITY

Dependability is the stability of data over time and conditions (Polit & Beck, 2012:585). The researcher shared the raw data (transcribed data) and the study findings with supervisors who assessed the results and the process to ensure it was consistent and scientifically sound.

CONFIRMABILITY

Confirmability refers to objectivity; the findings must reflect the participants' voice and the

inquiry conditions, not the researcher's biases, motivations, or perspectives (Polit & Beck 2012:585). For this research, a guiding set of questions was used for the interview that enabled the researcher to objectively lead the interview process.

3.8 DATA MANAGEMENT AND ANALYSIS

3.8.1 QUANTITATIVE PHASE 1

Data generated from content analysis being quantitative, having been recorded into a checklist, were cleaned and edited for inconsistencies. Missing data were not statistically imputed. Quantitative data were entered and analysed using the Statistical Package for Social Sciences (SPSS 27) software to generate graphs and tables. The analysis consisted of descriptive statistics as well as measures of central tendencies. The relationships of independent variables based on Haddon Matrix-like, drunk driving, over speeding, deaths, and injuries were analysed against the dependent variable, having a road traffic accident using logistic regression. Findings from the quantitative data have been presented as tables and graphs in chapter 4 of this study.

3.8.2 QUALITATIVE PHASE 2

Interviews were transcribed verbatim using a transcription protocol. Using transcription protocol ensured that transcription was done consistently and was of the appropriate type for analytic aims. Tesch's framework for qualitative data analysis (Creswell 2014:185) was used. It follows eight steps and implementation is described below:

1. The researcher obtains an overall picture by carefully reading through all the transcripts and jotting down ideas that emerge. The researcher will go through all the transcripts after data saturation has been detected.
2. The first transcript is selected and read once more. The researcher asks himself/herself: "What is this about?" Thoughts are plotted in a margin. The researcher will write down keywords that stand out in the text that is related to the research problem.
3. After several transcripts have been read, a list of topics will be made. The researcher will carefully examine the words under each topic and identify the sub-themes that emerged from the topics.

4. The list of themes and sub-themes is taken back to the transcripts. The codes given to the topics and sub-topics will be added alongside the appropriate segments in the text. At this stage, the researcher also checks for new or hidden topics or codes. The researcher assigns code names to the themes and sub-themes and adds these codes next to the words in the transcripts' margin.
5. The most descriptive words are selected for topics and are converted into categories. Similar topics are sub-themed under the relevant category. The researcher will continue to describe each theme and sub-theme.
6. The researcher will find the most descriptive wording for the topics and turn them into categories.
7. The researcher will group topics that relate to each other.
8. Each category will be abbreviated, alphabetise these categories/ codes, and assemble the data belonging to each category in one place.

3.9 DEVELOPMENT OF GUIDELINES

The research study was conducted through a sequential mixed-methods approach. The conclusions of this study were drawn from both quantitative and qualitative results. The guidelines were developed using a logical reasoning process. The process of logical reasoning involves both induction and deduction (Brink et al., 2012:5). According to Beck (2008:13), logical reasoning is a problem-solving method that allows researchers to use formal systems of thought. Logical or deductive reasoning involves using a given set of data to deduce other facts by reasoning logically. It involves drawing specific conclusions based on various pieces of evidence. In this study, the researcher drew conclusions and recommendations from both quantitative and qualitative findings, relevant aspects of the reviewed literature, and the researcher's insights. Subsequently, the study findings were used to develop guidelines. The findings were validated and corroborated using Haddon's theory (Table 1.1) and validated with other researchers' results in the reviewed literature. Each evidence statement stands alone as accessible. Essential information was used to support the recommendations based on the study's conclusions (National Institute for Health and Care Excellence (NICE, 2014:108). The guidelines are clear without cross-references to other supporting matters. Guidelines were based on the validity of the evidence in the study of drivers' practices.

3.10 ETHICAL CONSIDERATIONS

Polit and Beck (2012:727) have defined ethics as a system of moral values that is concerned with the degree to which research procedures adhere to professional, legal, and social obligations to the study participants. When humans are used as study participants, care must be exercised to ensure that their rights are always protected (Polit and Beck 2012:150).

3.10.1 VOLUNTARY PARTICIPATION

In social science, research participants should not be forced to give information against their will (Polit and Beck 2012:158). In this research, participants were not required to be involved without their willingness. The researcher respected and ensured that it was the participants' right to withdraw at any time during the interview. Participants were informed of their right to withdraw from the study at any time and without any consequences on them. Participants who were willing to take part in the study were expected to sign a written consent form.

3.10.2 INFORMED CONSENT

Informed consent means the research participants have adequate information about the research, comprehend that information, and consent to or decline participation voluntarily (Polit and Beck 2012:157). The informed consent process was the key to respecting autonomy and providing a reasonable assurance that the participants had not been deceived or coerced. Consent was not obtained from those who were vulnerable, dependent, or cognitively impaired. The participants were informed on the research's full procedure, including the estimated time expected for the interview, the selection procedure, and the number of research participants required. The participants were informed about the purpose and the use of the data collected. Before the interview, the participants were requested to sign the consent form.

3.10.3 CONFIDENTIALITY AND PRIVACY

The most secure means of protecting confidentiality is anonymous. This occurs when the researcher cannot link participants to their data. When research participants are promised confidentiality, a pledge that any information participants provide will not be publicly reported or published in a manner that identifies them and will not be accessible to others. (Polit & Beck, 2012:162).

In this study, no name was asked for and written on the checklist during document analysis (it was anonymous) to ensure confidentiality. Numerical coding was used for identification on the checklist. Additionally, privacy was ensured by conducting the focus groups in a communally conducive environment. Permission to use a tape recorder was sought from the participants. Participants were given the Institutional Review Board (IRB) number for questions about their rights as research participants.

3.10.4 PROTECTING THE RIGHTS OF INSTITUTIONS

For conducting this research, ethical clearance was sought from the Higher Degree Ethics Committee, Department of Health Studies, University of South Africa. An ethical clearance certificate regarding this study was issued from UNISA. The certificate was taken to Botswana Police Service under the Ministry of Defence and Justice and the Ministry of Health and Wellness in Botswana. During the data collection, informed consent was sought from each participant. The probable outcome, anticipated benefits, an explanation of what was involved was disclosed to participants.

3.10.5 RISK THE PARTICIPANTS MAY SUFFER

No discomforts were observed amongst the participants in answering the questions, and no participants were harmed during the data collection process.

3.10.6 ETHICAL CONSIDERATIONS INVOLVED SHOULD DOCUMENTS AND RECORDS BE USED AS SOURCES OF DATA.

An ethical clearance certificate regarding this study was issued from the Higher Degree Ethics Committee, Department of Health Studies, of the University of South Africa, Ministry of Defence, Justice, and Security (REFERENCE NUMBER: MDJSI/18/5III (20),

and the Ministry of Health and Wellness in Botswana (REFERENCE NUMBER: HPDME 13/18/1). Before data collection, informed consent was sought from each Ministry to access and use documents or records in their possession, which contained information related to road traffic accidents. The probable outcome, anticipated benefits, an explanation of what the study involved were disclosed to the Ministries.

3.10.7 ETHICAL CONSIDERATIONS INVOLVED SHOULD FIELD WORKERS BE INVOLVED.

The study was ethically informed, emphasising the protection of participants. The investigator was supported by trained research assistants to ensure that *participants were protected from the possible risk of harm, discomfort, or inconvenience*. Two research assistants were used to collect data after training on collecting data and completing the checklist. Research assistants were trained for five days to fill the checklist by the Principal investigator (Ph.D. student Mr. Roy Tapera). Confidentiality, anonymity, and privacy matters related to research were emphasized during the training to ensure that research assistants understand the implications of breaching confidentiality, anonymity, and privacy. The collected data were kept in a password-protected computer in the researcher's office at the University of Botswana, School of Public Health. The research assistants had no access to the data after collection.

3.10.8 THE PROCESS FOLLOWED TO OBTAIN APPROVAL TO CONDUCT RESEARCH.

Ethical approval was sought from the University of South Africa. After the UNISA's ethical clearance, the proposal was submitted to the Ministry of Defence, Justice and Security, Botswana, and the Ministry of Health and Wellness in Botswana for further written permission and ethical clearance. Before the data collection, the researcher visited the Director of Traffic Branch stationed at Broadhurst Police station to have a meeting and inform him about the study's purpose. The researcher was assigned a police officer responsible for road traffic documents and statistics to work with. Stakeholder representatives were called to participate in the focused group discussions and signed written consent before participation.

3.10.9 COMPENSATION, INCLUDING REIMBURSEMENT AMOUNT, GIFTS, OR SERVICES TO BE PROVIDED TO PARTICIPANTS.

No incentives or any reimbursement amount, gifts, or services were provided to participants.

3.11 SCOPE AND LIMITATIONS

One possible limitation is that factors contributing to road traffic accidents were identified through document analysis using a checklist and focus group discussions. The limitation of document analysis of accident reports at Police stations is that some of the documents were incomplete and had some variables missing. Also, some police documents could have been manipulated.

3.12 CONCLUSION

Chapter 3 described the research design and methods used to collect data during the study. This study followed the mixed-method sequential explanatory design. Data were collected in two consecutive phases. The researcher first collected data from police documents using a checklist. The collected data were on the drivers' profile (independent variables), age, time of accidents, use of drugs or alcohol, use of restraints and impairment, and health effects on victims. This was analysed against the dependent variable having a road traffic accident using logistics regression. Data were analysed using logistics regression. The first phase used a quantitative cross-sectional design. The study used systematic probability sampling where every second document was included in the sample until 400 documents with necessary information related to road traffic accidents were reached. This was followed by qualitative exploratory and descriptive design using two focus group discussions. Qualitative data was analysed using Tesch's framework. The advantages of using a mixed approach were that: the QUAL and QUAN elements complement each other; the approach imparts practicality and reality, given the sophistication of the study's nature; and there is enhanced validity and worth trusted (Polit & Beck, 2014:340). Ethical issues were discussed. The next chapter, Chapter 4, shows the analysed data results, which are presented and described in tables.

CHAPTER FOUR

PRESENTATION AND INTERPRETATION OF THE RESULTS

4.1 INTRODUCTION

In the previous chapter, a detailed description of the research methodology was presented. This chapter discusses the presentation and interpretation of the findings. This chapter focuses on both the quantitative and qualitative parts of the study done in two phases. In the quantitative phase of the study, 400 documents were analysed. Descriptive analysis was performed to give frequencies for the socio-demographic characteristics of the study subjects and then addressing the objectives of the study, which were to:

- Explore and describe the factors contributing to road traffic accidents amongst automobile drivers in Botswana.
- Explore and describe the effects of road traffic accidents on the health of the drivers and community members.
- Review and analyse data on road traffic accidents in Botswana for the past five years.
- Develop guidelines for stakeholders to reduce road traffic accidents.

In the second qualitative phase, two FGDs with six participants in each group were conducted with police officers, nurses, officers from MVA, the Ministry of Transport and Communication, fire officers, and private, non-governmental organizations (NGOs) homogeneously across the groups.

The study followed a sequential explanatory design. Data were collected over a while in two consecutive phases. Thus, the researcher first collected and analysed the quantitative data to identify significant predictors of road accidents to address the study's questions. Qualitative data were collected in the second phase of the study using focus group discussions. The qualitative data from focus group discussions were used as a supplementary source for quantitative data collected in the first phase. The focus group discussion was used to shed light and explain the first phase in more depth. This allowed for a detailed exploration of guidelines to reduce road accidents amongst automobile

drivers in Botswana. The findings represent the participants' views on the guidelines mentioned above.

QUANTITATIVE PHASE RESULTS

4.2 FACTORS CONTRIBUTING TO ROAD TRAFFIC ACCIDENTS AMONGST AUTOMOBILE DRIVERS IN BOTSWANA.

4.2.1 Socio-demographic characteristics

4.2.1.1 Age

Documents of 400 people involved in road traffic accidents were reviewed. Three hundred and sixty-seven were from Gaborone, and thirty-three records were from Francistown. The ages of the people with documents reviewed ranged from 18-77 years with a mean age of 40.04 years (SD \pm 11.20). The age group most involved in road traffic accidents was 36 - 40-year olds with 81 participants (20.3%), followed by 26-30 and 41- 45 year olds with 63 participants (15.8%). (See Table 4.1)

TABLE 4.1: AGE CATEGORIES (N=400)

Age	Frequency	Percentage
16-20	3	0.8
21-25	28	7.0
26-30	63	15.8
31-35	47	11.8
36-40	81	20.3
41-45	63	15.8
46-50	57	14.2
51-55	24	6.0

56-60	13	3.3
61+	21	5.3
Total	400	100

4.2.1.2 Gender (n=400)

Table 4.2 shows that males accounted for 294 (73.5%) of the documents/cases reviewed.

TABLE 4.2: GENDER OF THE PEOPLE INVOLVED IN ROAD TRAFFIC ACCIDENTS

Gender	Frequency	Percentage
Male	294	73.5
Female	106	26.5
Total	400	100

4.2.1.3 Occupation (n= 400)

Most of the people involved in road traffic accidents were employed. Seven percent reported being unemployed. The majority had different types of occupations, which fell in other categories. 20 (5%) government employees and 20 (5%) financial officers were the most reported occupations for most people involved in road traffic accidents (See Table 4.3).

TABLE 4.3: OCCUPATION OF PEOPLE INVOLVED IN ROAD TRAFFIC ACCIDENTS

Occupation	Frequency	Percent
Police Officer	12	3
Government employee	20	5
Student	9	2.3
Lawyer	1	0.3

Financial officer	20	5
Doctor/Nurse	10	2.5
Army/Airforce	6	1.5
Engineer	5	1.3
Unemployed	28	7
Others	289	72.3
Total	400	100

4.2.1.4: Possession of a driver's licence

Drivers involved in road traffic accidents without a driver's licence constituted 5.5 percent of all the people involved in this study's road traffic accidents.

TABLE 4.4: POSSESSION OF A DRIVER'S LICENCE

The driver had a driver's Licence	Frequency	Percentage
No	22	5.5
Yes	378	94.5
Total	400	100

4.2.1.5: Possession of a driver's licence and gender

Slightly more males, 19 (6.5%) than females 3 (2.8%) were involved in road traffic accidents while driving without a driver's licence. There was no difference between gender and driving without a driver's licence (OR: 0.42, 95%CI: 0.12– 1.46), $p>0.05$.

TABLE 4.5: POSSESSION OF A DRIVER'S LICENCE AND GENDER

Gender	Possession of a driver's Licence		
	Yes	No	Total
Male	275 (93.5%)	19 (6.5%)	294 (73.5%)
Female	103 (97.2%)	3 (2.8%)	106 (26.5%)
Total	378 (94.5%)	22 (5.5%)	400 (100%)

4.2.1.6: Possession of a driver's licence and the impact on the health of the victims (N=399)

Among those driving without a valid driver's licence, 6 (27.3%) of them were involved in road traffic accidents that resulted in injuries compared to 46 (12.2%) driving with a valid driver's licence.

TABLE 4.6: POSSESSION OF A DRIVER'S LICENCE AND THE IMPACT OF THE ACCIDENT ON THE HEALTH OF THE VICTIMS

Possession of a driver's licence	Health Impact (Injuries)		
	Yes	No	Total
Yes	46 (12.2%)	331 (87.8%)	377 (94.5%)
No	6 (27.3%)	16 (72.7%)	22 (5.5%)

	52 (13.0%)	347 (87.0%)	399 (100%)
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4.2.1.7: Driver under the influence of drugs or alcohol

Twenty-four (6%) of the drivers involved in road traffic accidents were under the influence of drugs or alcohol.

TABLE 4.7: INVOLVED IN ROAD TRAFFIC ACCIDENTS UNDER THE INFLUENCE OF ALCOHOL

Driver the influence of alcohol	Frequency	Percentage
No	376	94
Yes	24	6
Total	400	100

4.2.1.8: Driving under the influence of drugs or alcohol and gender

Slightly more males 20 (6.8%) than females 4 (3.8%) were involved in road traffic accidents while driving under the influence of drugs or alcohol. There was no difference between gender and driving under the influence of drugs or alcohol (OR: 1.86, 95%CI: 0.62– 5.58), $p > 0.05$.

TABLE 4.8: DRIVING UNDER THE INFLUENCE OF DRUGS OR ALCOHOL AND GENDER

Gender	Influence of drugs or alcohol		
	Yes	No	Total
Male	20 (6.8%)	274 (93.2%)	294 (73.5%)
Female	4 (3.8%)	102 (96.2%)	106 (26.5%)

TOTAL	24 (6.0%)	376 (94.0%)	400 (100%)
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4. 2.2 DRIVER DISTRACTIONS

4.2.2.1 Cause of Accident

Most accidents were caused by driver carelessness with 310 participants (77.5%). The second highest cause of accidents was animals, both domestic and wild as reported by 30 (7.5%) participants. Drivers failing to give priority followed with a report by 18 participants (4.5 %). Driving under the influence of alcohol /drugs contributed to 10 participants (2.5%) contributing towards total accidents. See Figure 4.1.

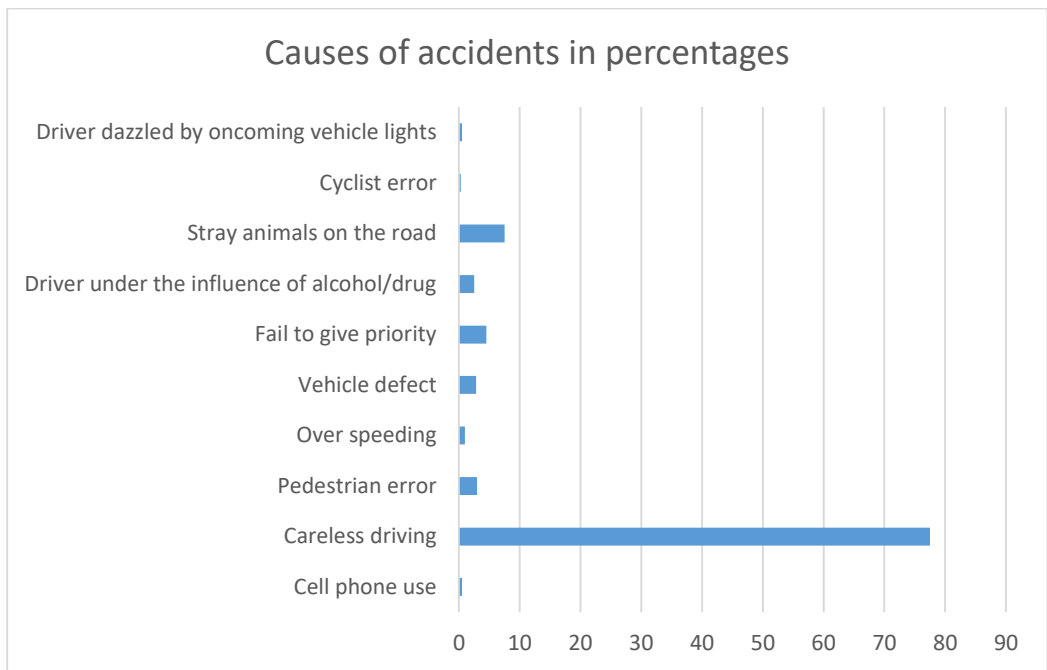


Figure 4.1: The causes of accidents

4.2.3 VEHICLE AND EQUIPMENT FACTORS

4.2.3.1 MODE OF TRANSPORT

Figure 4.2 shows that the transport mode mainly involved in road traffic accidents is a car or van being driven by a driver as reported by 361 (90.3%) participants followed by a bus or minibus as reported by 17 (4.3%) participants. There were no police records on the condition of vehicles and the condition of brakes.

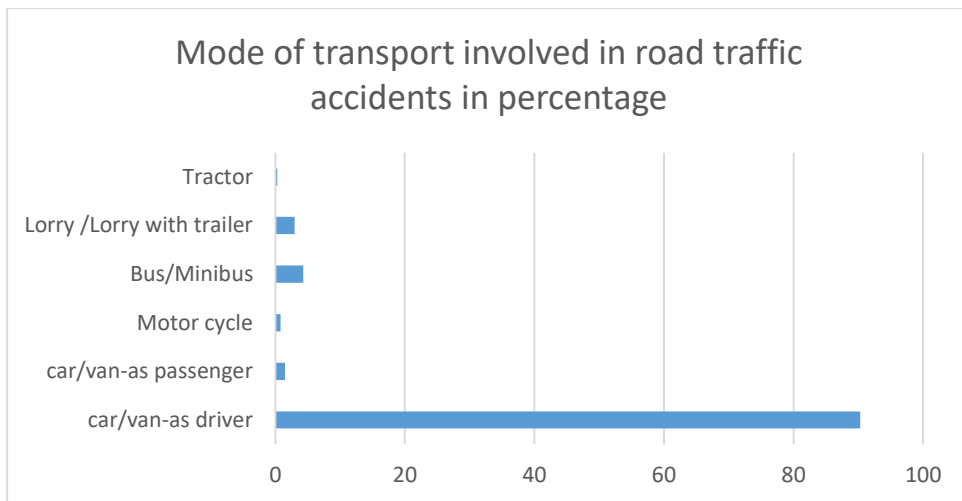


Figure 4.2: Mode of transport involved in road traffic accidents

4.2.3.2 Speed management

Among the drivers involved in road traffic accidents, 5% were reportedly driving above the speed limit.

TABLE 4.9: SPEED MANAGEMENT (N=400)

Speed	Frequency	Percent
Normal	380	95
Above speed limit	20	5
Total	400	100

4.2.3.3 Special conditions existing at the site just before the accident.

Other causes were reported to be the special conditions at the site just before the accident, followed by another vehicle on the way as reported by 83 (20.8%) participants and straying animals as reported by 42 (10.5%) participants, see the figure below.

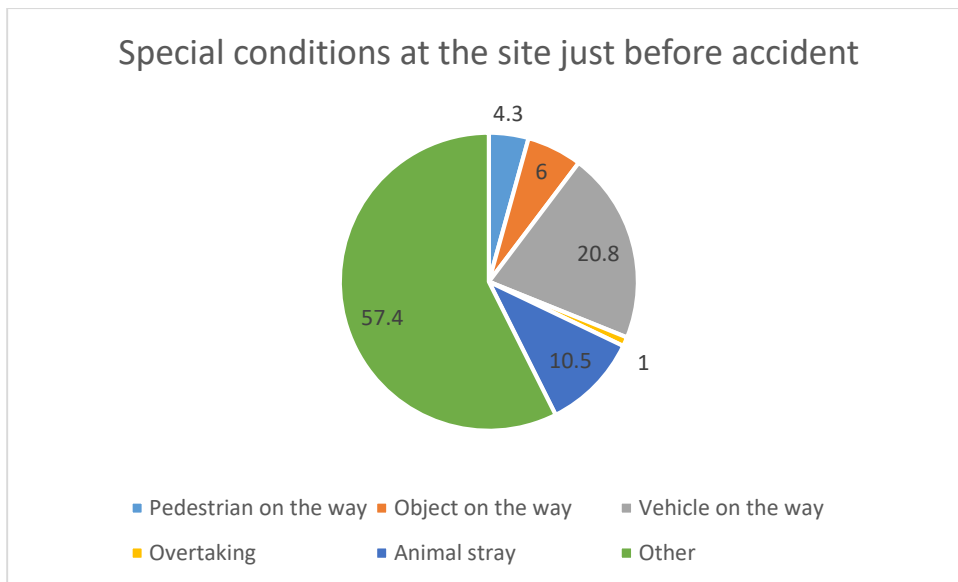


Figure 4.3: Special conditions at the site just before the accident

4.2.4 IMPACT OF ROAD TRAFFIC ACCIDENTS ON THE HEALTH OF DRIVERS AND COMMUNITY

In this study, 51 drivers (13.0%) sustained injuries due to road traffic accidents while eight (2%) succumbed to the road traffic accidents.

TABLE 4.10: IMPACT OF ROAD TRAFFIC ACCIDENTS ON THE HEALTH OF VICTIMS (N=399)

Impact	Frequencies	Percentages
Mortality		
Yes	9	2.4
No	390	97.6
Total	398	100
Injuries		
Yes	52	13
No	347	87
Total	399	100

4.2.5 THE EFFECTS OF ROAD TRAFFIC ACCIDENTS ON THE HEALTH OF THE DRIVERS AND COMMUNITY MEMBERS FOR THE PAST FIVE YEARS

FATALITIES

Figure 4.4 displays the trend of fatalities recorded between 2015 and 2019. In 2015 there were 411 fatalities recorded, which rose to a pick of 462 in 2018. The fatalities slightly went down to 457 in 2019.

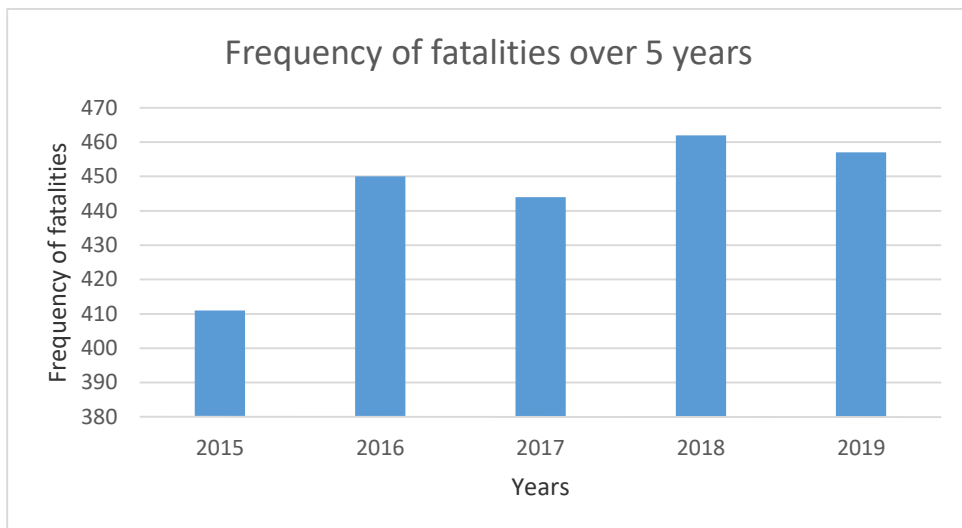


Figure 4.4: Frequencies of fatalities recorded over five years

FATALITIES ACCORDING TO ROAD USER

Over five years, from 2015 to 2019, road traffic accidents claimed more passengers' lives than drivers and pedestrians. In 2015 and 2017, pedestrians were the second victims of accident fatalities. In 2016, 2018, and 2019 drivers were second to the passengers on the number of fatalities recorded due to road traffic accidents.

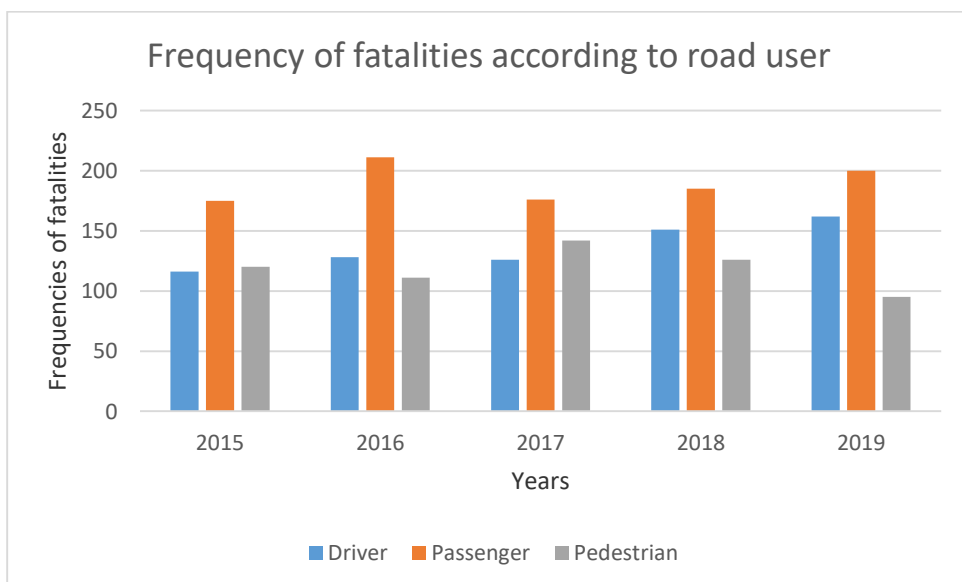


Figure 4.5: Frequency of fatalities according to road user

SERIOUS INJURIES

Figure 4.6 shows that serious injuries had been on a downward trend from 1364 in 2015 to 1099 in 2018. There was a slight rise in serious injuries from 2018 to 2019 by 84 (7.6%) cases.

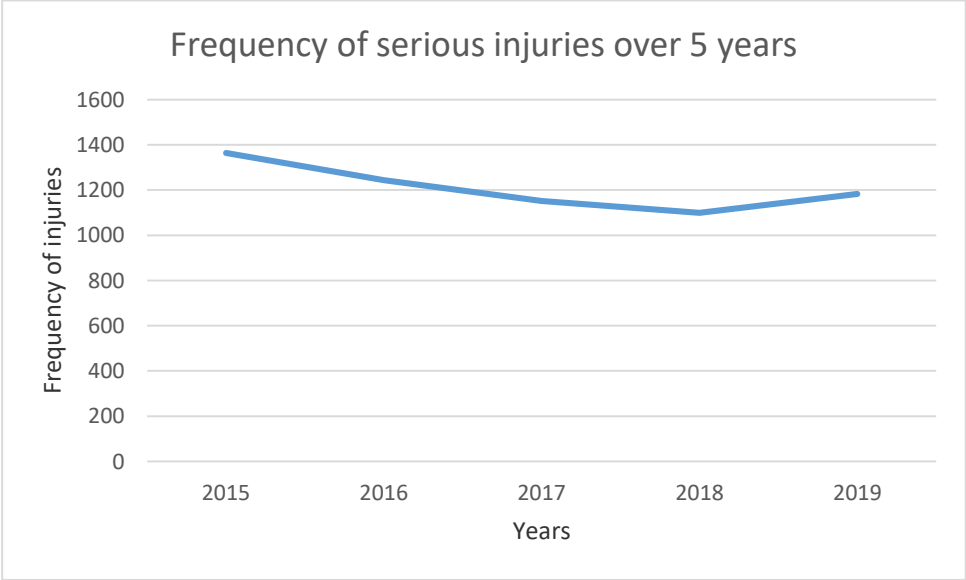


Figure 4.6: Frequency of serious injuries over five years

Throughout five years, serious injuries occurred mostly among passengers, followed by drivers.

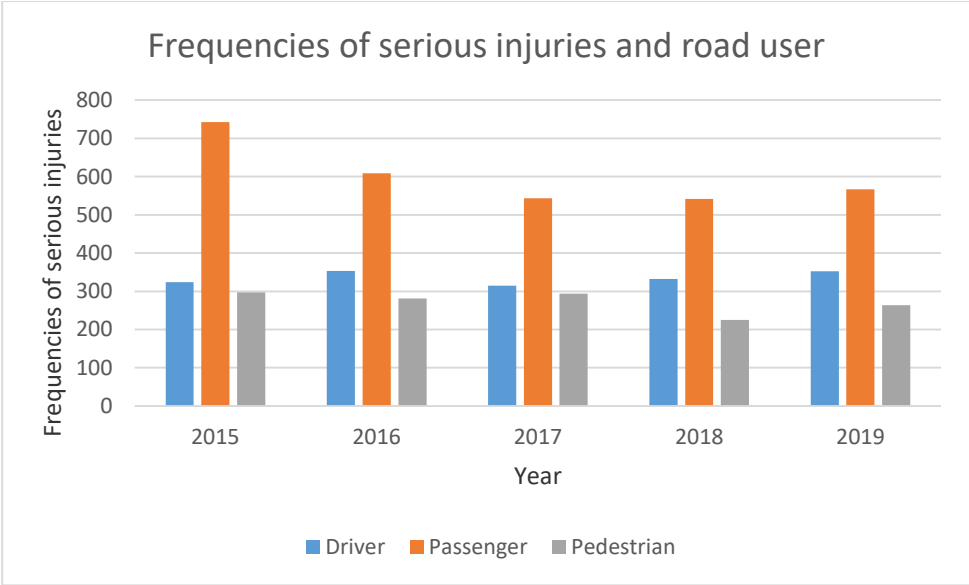


Figure 4.7: Frequencies of serious injuries and road user

CATEGORIES OF INJURIES

Among 424 recorded cases of severe injuries, lower limb fractures (femur, tibia, fibula, patella) were the most common as reported by 138 (32.5%) participants, followed by upper limb fractures as reported by 44 (10.4%) participants, brain injuries as reported by 42 (9.9%) participants, and internal organ injuries as reported by 36 (8.5%) participants.

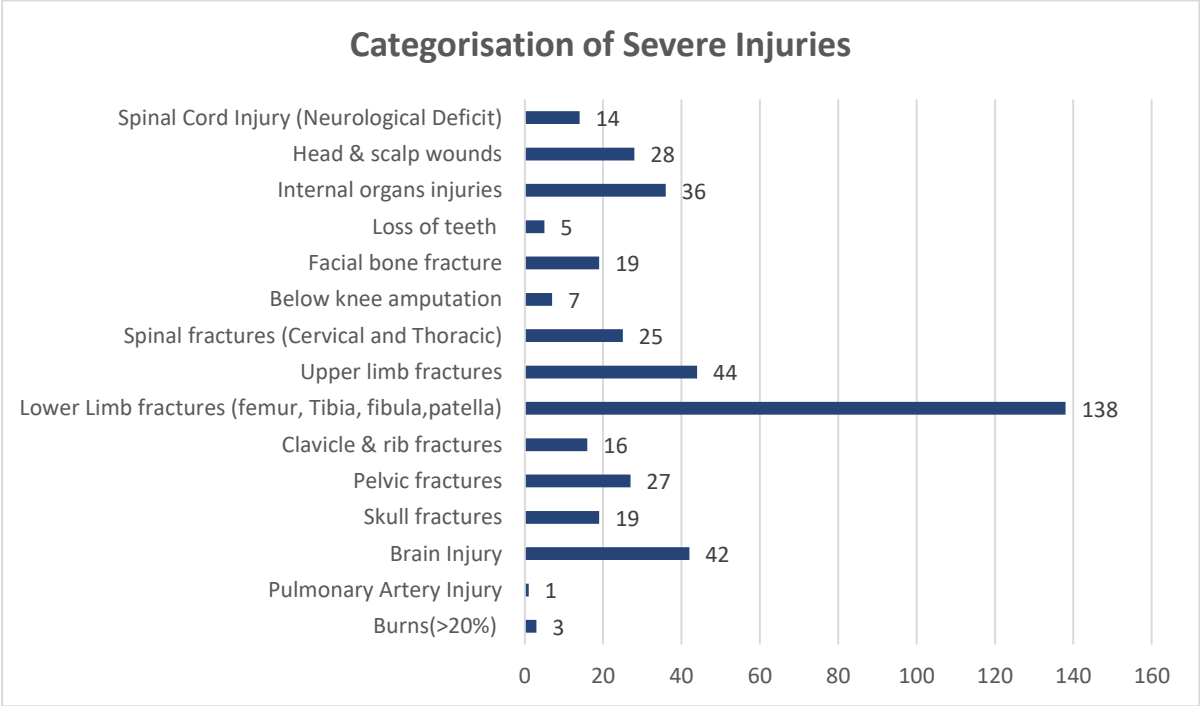


Figure 4.8: Categorisation of severe injuries

Source MVA (2019)

MINOR INJURIES

The frequency of minor injuries rose from 4528 in 2015 to a peak of 4994 in 2016, which is an increase of 10.3%. There was a downward fall in the total number of minor injuries recorded from 2016 (4994) to 2018 (4682), a 6.7% decrease.

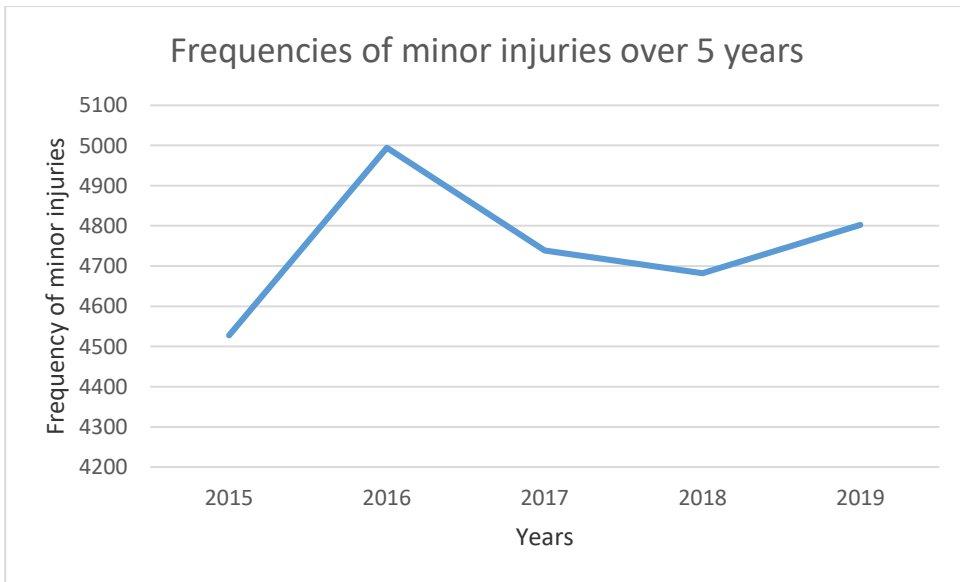


Figure 4.9: Frequency of minor injuries over five years

Throughout five years, passengers experienced mostly minor injuries, followed by drivers. Most minor injuries were recorded in 2016 among passengers (2277), and among drivers, most minor injuries were recorded in 2019 of 1875 (See Figure 4.10).

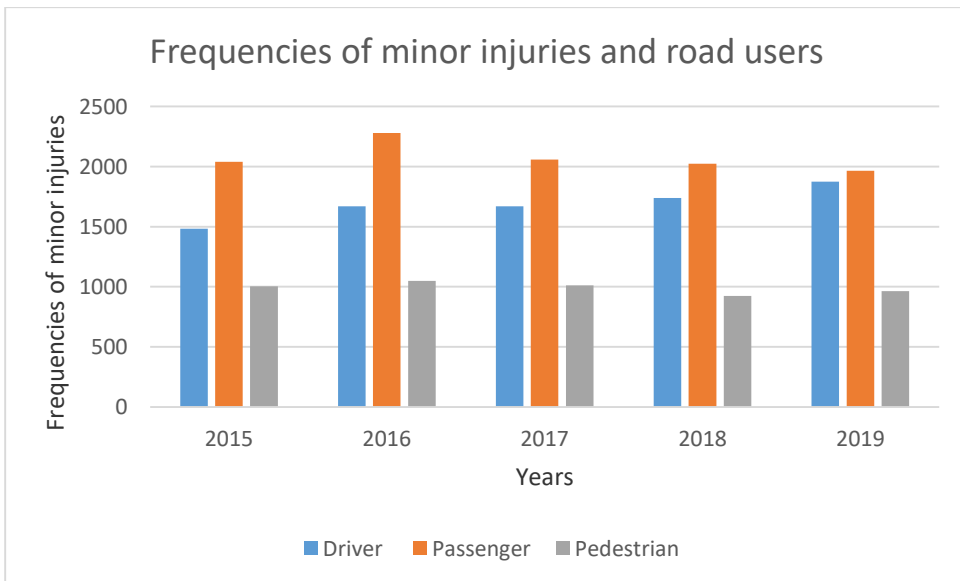


Figure 4.10: Frequencies of minor injuries and road users

CASUALTIES

Figure 4.11 shows road traffic accidents recorded over five years from 2015 to 2019 and the casualties. The highest recorded casualties occurred in 2016 (4994), then there was a decrease to 4682 in 2018 and another peak to 4802 in 2019.

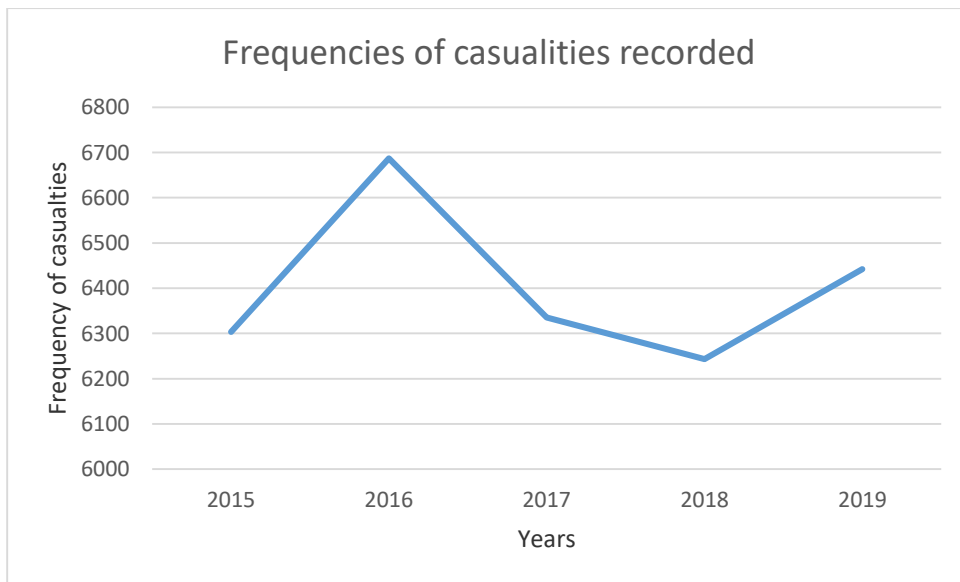


Figure 4.11: Frequencies of casualties recorded

Table 4.11 summarises fatalities and types of injuries resulting from road traffic accidents for the past five years.

Table 4.11 shows that fatalities per 10 000 vehicles ranged from 5.5 in 2019 to 6.9 per 10 000 in 2016. Fatalities per 100 000 population ranged from 18.8 in 2015 to 20.2 in 2016.

Table 4.11: Summary analysis of crash statistics for the past five years

YEAR	Crashes	Fatalities	Serious	Minor	Total Casualty	Claims Lodged	Registered Vehicles	Est. Pop	Crashes/1000 Vehicles	Casualty / 1000 Vehicles	Fatality/ 10 000 Vehicles	Fatality/ 100 000 Population
2015	17654	411	1364	4528	6303	2583	602822	2187477	29.3	10.5	6.8	18.8
2016	18373	450	1243	4994	6687	3019	648925	2226040	28.3	10.3	6.9	20.2
2017	17786	444	1152	4739	6335	2934	702128	2264993	25.3	9.0	6.3	19.6
2018	17341	462	1099	4682	6243	2850	757469	2304238	22.9	8.2	6.1	20.1
2019	18623	457	1183	4802	6442	2828	829284	2343649	22.5	7.8	5.5	19.5

Source: Road Accident Statistics Unit, Botswana Police Services

4.2.6 REVIEW AND ANALYSIS OF DATA ON ROAD TRAFFIC ACCIDENTS IN BOTSWANA FOR THE PAST TEN YEARS.

Table 4.12 shows a slight decrease (3%) in Gaborone's road traffic accidents from the 2011-2014 period from 9101 cases to 8801 cases. The accidents rose to 9461 (7.5%) in 2015, and the highest pick was recorded in 2019 of 9802 cases. Serowe District is the second leading village, with 1821 cases recorded in 2010. The cases went down to 1078 (40.8%) in 2019. Kutlwano district is in the third position with almost a steady prevalence of road traffic accidents ranging from 891 in 2011 to 1015 in 2019. Kanye District is in the fourth position. The prevalence of road traffic accidents went down from 985 in 2010 to 713 in 2015 (26.7%) then took an upward trend to 938 (36.6%) in 2019. The second-largest capital City, Francistown, is in the fourth position in the country on the prevalence of road traffic accidents. The highest cases were recorded in 2010 of 996 and went down to 685 (31.2 %) cases in 2019. Kasane district recorded the least accident cases across the country from 2010 to 2019. The cases ranged from 180 in 2010 with the pick of 237 (31.7%) in 2017, while in 2019, the cases went down to 200 (15.6%) cases. There were no police records for Mahalapye between the 2010-2011 period.

TABLE 4.12: ROAD TRAFFIC ACCIDENTS RECORDED IN THE PAST TEN (10) YEARS

Road traffic accidents statistics for the past ten years											
District	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Total
Kutlwano	930	891	924	905	990	1011	1007	926	879	1015	9478
Serowe	1821	1703	1117	993	935	1054	1094	1074	1150	1078	12019
Gaborone	9029	9101	8954	8848	8801	9461	9759	9312	9230	9802	92297
Lobatse	525	390	383	430	343	392	390	324	308	375	3860
Maun	756	748	834	869	950	761	775	751	686	794	7924

Ghanzi	273	225	211	195	204	217	263	235	223	207	2253
Kasane	180	150	146	172	93	119	195	237	217	200	1709
Letlhane	557	526	303	316	300	359	359	374	346	398	3838
Tsabong	279	258	237	184	190	220	208	250	214	247	2287
Selibe-Phikwe	830	785	635	462	491	574	479	425	373	402	5456
Molepolole	985	835	789	684	701	715	704	780	670	856	7719
Mochudi	849	822	563	508	451	562	590	596	660	720	6321
Kanye	985	781	788	782	740	713	898	886	849	938	8360
Francistown	996	814	844	850	749	792	827	756	657	685	7970
Mahalapye	0	0	799	864	703	704	825	860	879	906	6540
Total	18995	18029	17527	17062	16641	17654	18373	17786	17341	18623	178031

Source: Road Accident Statistics Unit, Botswana Police Services

The number of accidents per 1,000 vehicles decreased by 1.1 percent in 2019 after falling from 31.3 accidents in 2018 to 31.0 accidents in 2019. Accidents per 1,000 vehicles have been going down since 2010. On average, they declined by 8.4 percent annually. Accidents per 10,000 population increased by 5.6 percent, from 75.3 accidents in 2018 to 79.5 in 2019. Accidents per 10,000 population assumed a downward trend from 2010 to 2014, only to go up from 2015 to 2017. In 2018 accidents per 10,000 population declined and rose again in 2019. See **Table 4.13**.

TABLE 4.13: MOTOR VEHICLE ACCIDENT TRENDS, 2010 - 2019

Year	Number of Accidents	Registered Vehicles	Estimated Population ('000s)	Accidents Per '000 Vehicles	Accidents Per 10,000 Population
2010	18,978	344,719	1,800	55.1	105.4
2011	18,001	367,155	2,025	49.0	88.9
2012	17,527	400,873	2,066	43.7	86.6
2013	17,062	417,015	2,107	40.9	84.3
2014	16,641	435,750	2,147	38.2	82.2
2015	17,654	469,664	2,187	37.6	80.7
2016	18,373	500,316	2,226	36.7	82.5
2017	17,786	527,901	2,264	33.7	78.6
2018	17,341	553,648	2,303	31.3	75.3
2019	18,623	588,567	2,343	31.6	79.5
		Annual Percentage Change			
2010	(5.1)	22.8	1.4	(22.7)	(6.4)
2011	(5.1)	6.5	12.5	(10.9)	(15.7)

2012	(2.6)	9.2	2.0	(10.8)	(2.6)
2013	(2.7)	4.0	2.0	(6.4)	(2.7)
2014	(2.5)	4.5	1.9	(6.7)	(2.5)
2015	6.1	7.8	1.9	(1.6)	(1.8)
2016	4.1	6.5	1.8	(2.3)	2.2
2017	(5.6)	10.7	3.5	(14.7)	(8.7)
2018	(2.5)	4.9	1.7	(7.1)	(4.2)
2019	7.4	6.3	1.7	1.0	5.6

Source: Road Accident Statistics Unit, Botswana Police Services

Figure 4.13 shows the overall trend of road traffic accidents in all the 15 districts. From 2010 to 2014, road accidents assumed a downward trend. They declined by 12.4 percent over the five years. Road accidents started going up in 2015 and continued the upward trend in 2016. Figure 12 further shows that a significant decline in road accidents occurred in 2017, where accidents went down by 5.6 percent. In 2018, the number of road accidents recorded was 17,341, a decrease of 2.5 percent from 17,786 accidents recorded in 2017. In 2019, the number of road accidents recorded was 18 623, which increased by 7.4 %.

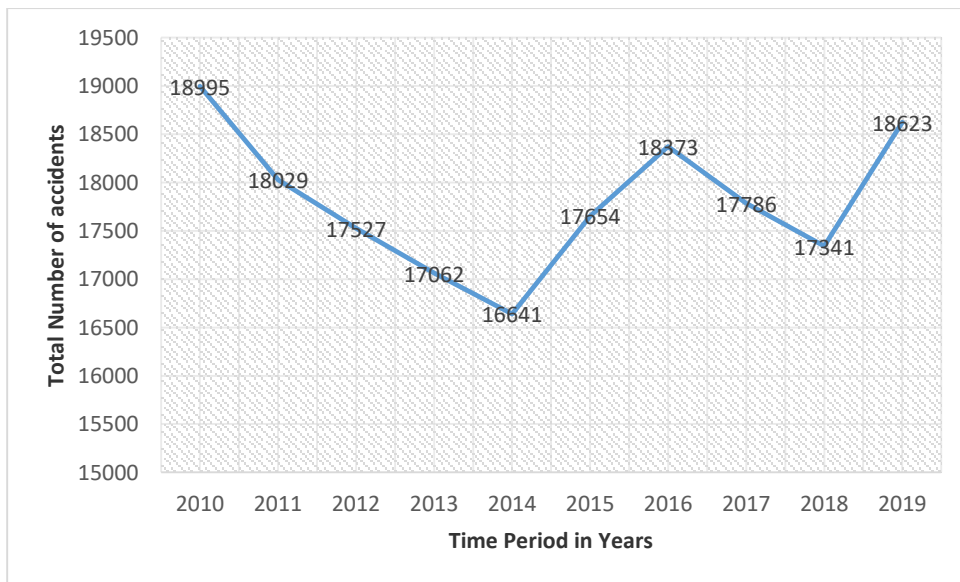


Figure 4.12: Total number of accidents recorded over ten years

Figure 4.14 shows that over ten years, the highest road traffic accidents were recorded in Gaborone (92297), which is 51.8% of all road traffic accidents recorded over ten years in Botswana, followed by Serowe (12019) 6.8% and Kutlwano (9478) 5.3%, respectively.

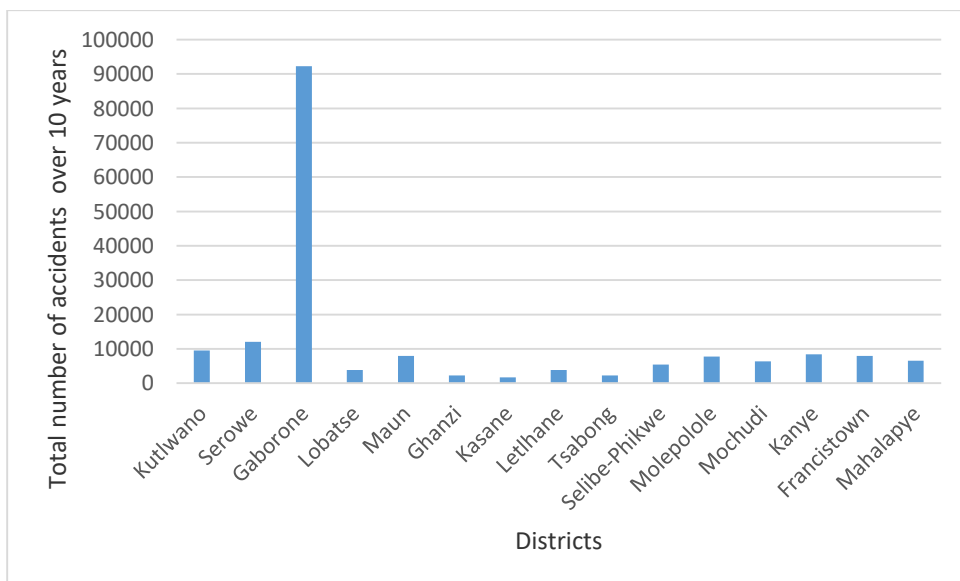


Figure 4.13: The number of accidents recorded by District

Accident Severity by Junction Control (2019)

There were 361 fatalities due to road traffic accidents in 2019, which is 1.9% of the total road accidents. Severe and minor accidents accounted for 3.8% and 15.6 % of the total accidents recorded in 2019, respectively (MVA, 2019). Most road accidents (75.2 %) occurred where there was no junction, resulting in 78.4 % of casualties and 8.1 percent being fatal. Accidents that happened at a stop sign accounted for 12.1 % of the total, resulting in 11.1 percent of casualties and 5.3 percent of fatalities. At working traffic lights, accidents constituted 8.2 percent of total crashes, while those that happened where traffic lights were not working contributed to 0.8 %. The least accidents occurred where the traffic police were present (0.3 %).

TABLE 4.14: ACCIDENT SEVERITY BY JUNCTION 2019

Junction Control	Casualties			Total	Crashers				Total	Total 2018
	Fatal Injuries	Serious Injuries	Minor Injuries		Fatal Crashes	Serious Crashes	Minor Crashes	Damage Only		
	Number									
Not Junction	408	991	3,650	5,049	322	577	2,266	10,832	13,997	13447
Signals (working)	21	60	407	488	15	31	215	1,272	1,533	1404
Signals (not working)	-	4	43	47	-	4	24	126	154	97
Stop sign	24	108	583	715	20	74	333	1,829	2,256	1706
Yield	3	13	68	84	3	10	38	440	491	413
Police	-	-	13	13	-	-	6	41	47	28
Uncontrolled	1	7	38	46	1	5	27	112	145	246
Total	457	1,183	4,802	6,442	361	701	2,909	14,652	18,623	17341
Percent of Total										
Not Junction	8.1	19.6	72.3	100	2.3	4.1	16.2	77.4	100	

Signals (working)	4.3	12.3	83.4	100	1.0	2.0	14.0	83.0	100
Signals (not working)	-	8.5	91.5	100	-	2.6	15.6	81.8	100
Stop sign	3.4	15.1	81.5	100	0.9	3.3	14.8	81.1	100
Yield	3.6	15.5	81.0	100	0.6	2.0	7.7	89.6	100
Police	-	-	100.0	100	-	-	12.8	87.2	100
Uncontrolled	2.2	15.2	82.6	100	0.7	3.4	18.6	77.2	100
Total	7.1	18.4	74.5	100	1.9	3.8	15.6	78.7	100

Source: Botswana Police Services (Road Traffic Accident Unit)

Accidents Severity by Junction Control (2018)

Three hundred and seventy-nine fatal accidents were documented in 2018, which increased by 3.6% from 2017 cases of 366. Severe and minor accidents accounted for 3.7 and 16.3 % of the total accidents. Most of the accidents (77.5 %) occurred where there was no junction resulting in 81.3 % of casualties and 90.5% fatalities, respectively. Accidents that happened at a stop sign accounted for 8.1 % of the total, resulting in 8.7% of casualties and 6.1 % of fatalities, respectively. At working traffic lights, accidents constituted 8.1% of total accidents while those that happened where traffic lights were not working contributed 0.6 %. The least recorded road traffic accidents occurred where the traffic police were present (0.2%).

TABLE 4.15: ACCIDENT SEVERITY BY JUNCTION 2018

Junction Control	Accident Severity									
	Casualties				Crashers				Damage Only	Total
	Fatal Injuries	Serious Injuries	Minor Injuries	Total	Fatal Crashes	Serious Crashes	Minor Crashes			
	Number									
Not Junction	418	992	3,667	5,077	339	564	2,257	10,887	13,447	
Signals (working)	14	29	391	434	13	18	203	1,170	1404	
Signals (not working)	-	1	31	32	-	1	13	83	97	

Stop sign	28	58	460	546	25	37	284	1,360	1706
Yield	1	4	60	65	1	4	34	374	413
Police	-	-	8	8	-	-	5	23	28
Uncontrolled	1	15	65	81	1	12	39	194	246
Total	462	1,099	4,682	6,243	379	636	2,835	13,491	17 341
				Percent of Total					
Not Junction	8.2	19.5	72.2	100	2.5	4.2	16.8	76.5	100
Signals (working)	3.2	6.7	90.1	100	0.9	1.3	14.5	83.3	100
Signals (not working)	-	3.1	96.9	100	-	1.0	13.4	85.6	100
Stop sign	5.1	10.6	84.2	100	1.5	2.2	16.6	79.7	100
Yield	1.5	6.2	92.3	100	0.2	1.0	8.2	90.6	100
Police	-	-	100.0	100	-	-	17.9	82.1	100
Uncontrolled	1.2	18.5	80.2	100	0.4	4.9	15.9	78.9	100
Total	7.1	18.4	74.5	100	1.9	3.8	15.6	78.7	100

Source: Botswana Police Services (Road Traffic Accident Unit)

Accidents Severity by Junction Control (2017)

There were 366 fatalities due to road traffic accidents in 2017, a rise of 5.2 % from 2016 recorded cases of 348. Severe and minor accidents accounted for 4.0% and 15.3 % of the total accidents. Most of the accidents (75.1 %) occurred where there was no junction resulting in 78.5 % of casualties and 89.6 % fatalities, respectively. Accidents that happened at a stop sign accounted for 10.2 % of the total, resulting in 8.7% of casualties and 4.3 % of fatalities, respectively. At working traffic lights, accidents constituted 8.1% of total accidents while those that happened where traffic lights were not working contributed 0.4 %. The least recorded road traffic accidents occurred where the traffic police were present (0.2%).

TABLE 4.16: ACCIDENT SEVERITY BY JUNCTION 2017

Junction Control	Casualties			Total	Accident Severity				Total
	Fatal Injuries	Serious Injuries	Minor Injuries		Crashers				
					Fatal Crashes	Serious Crashes	Minor Crashes	Damage Only	
Number									
Not Junction	398	997	3575	4970	327	601	2111	10 310	13 349
Signals (working)	15	55	505	575	12	36	236	1459	1743
Signals (not working)	1	4	30	35	1	1	10	63	75
Stop sign	19	66	464	549	17	50	268	1484	1819
Yield	3	15	70	88	3	11	44	427	485
Police	-	-	7	7	-	-	5	26	31
Uncontrolled	8	15	88	111	6	11	53	214	284
Total	444	1152	4739	6335	366	710	2727	13983	17786
Percent of Total									
Not Junction	8.0	20.1	71.9	100	2.4	4.5	15.8	77.2	100
Signals (working)	2.6	9.6	87.8	100	0.7	2.1	13.5	83.7	100
Signals (not working)	2.9	11.4	85.7	100	1.3	1.3	13.3	84.0	100
Stop sign	3.5	12.0	84.5	100	0.9	2.7	14.7	81.6	100
Yield	3.4	17.0	79.5	100	0.6	2.3	9.1	88.0	100
Police	-	-	100.0	100	-	-	16.1	83.9	100
Uncontrolled	7.2	13.5	79.3	100	2.1	3.9	18.7	75.4	100
Total	7.0	18.2	74.8	100	2.1	4.0	15.3	78.6	100

Source: Botswana Police Services (Road Traffic Accident Unit)

Accidents Severity by Junction Control (2016)

There was a 5.8 % increase in fatal crashes in 2016 (348) from 329 recorded cases in 2015. Severe and minor accidents accounted for 4.0 and 15.6 % of total crashes, respectively. Four hundred and fifty fatalities and 1,243 serious injuries were recorded in 2016. Most of the accidents (73.6%) occurred when there was no junction resulting in 91.3% of fatalities and 83.8% of serious injuries. Ten percent of road accidents occurred at stop signs resulting in 4.4% of fatalities and 9.5% serious injuries. Working traffic lights had 10.2 accidents, while non-functioning traffic lights recorded 0.5% accidents. The least traffic accidents (0.2%) were recorded where the traffic police were present.

TABLE 4.17: ACCIDENT SEVERITY BY JUNCTION 2016

Junction Control	Accident Severity									
	Casualties				Crashers			Damage Only	Total	Total 2018
	Fatal Injuries	Serious Injuries	Minor Injuries	Total	Fatal Crashes	Serious Crashes	Minor Crashes			
numbers										
Not Junction	411	1,042	3,736	5,189		313	622	2,183	10,412	13,530
Signals (working)	14	60	500	574		13	34	243	1,587	1,877
Signals (not working)	-	2	40	42		-	1	21	64	86
Stop sign	20	118	537	675		17	64	301	1,583	1,965
Yield	3	11	55	69		3	9	32	391	435
Police	-	-	18	18		-	-	9	30	39
Uncontrolled	2	10	108	120		2	9	72	358	441
Total	450	1,243	4,994	6,687		348	739	2,861	14,425	18,373
Percent of Junction Control										
Not Junction	7.9	20.1	72.0	100		2.3	4.6	16.1	77.0	100
Signals (working)	2.4	10.5	87.1	100		0.7	1.8	12.9	84.5	100
Signals (not working)	0.0	4.8	95.2	100		0.0	1.2	24.4	74.4	100
Stop sign	3.0	17.5	79.6	100		0.9	3.3	15.3	80.6	100
Yield	4.3	15.9	79.7	100		0.7	2.1	7.4	89.9	100
Police	0.0	0.0	100.0	100		0.0	0.0	23.1	76.9	100
Uncontrolled	1.7	8.3	90.0	100		0.5	2.0	16.3	81.2	100
Total	6.7	18.6	74.7	100		1.9	4.0	15.6	78.5	100

Source: Botswana Police Services (Road Traffic Accident Unit)

Accidents Severity by Junction Control (2015)

Three hundred and twenty-nine fatal accidents occurred in 2015, an increase of 14.2 percent from the 288 accidents in 2014. This also accounted for 1.9 % of total accidents. Four hundred and eleven fatalities were recorded, while 1,364 serious injuries were recorded. The highest casualties (75.0%) occurred, where there were no junctions resulting in 7.1 % of the fatalities and 23.4 % serious injuries. The second highest accidents were recorded at stop signs resulting in 16 % of the casualties and 4.3 % of the fatalities. Roads where signals were working recorded more casualties, 8.5 % compared to roads with malfunctioning signals (1.3%).

TABLE 4.18: ACCIDENT SEVERITY BY JUNCTION CONTROL (2015)

Accident Severity										
Junction Control	Casualties			Total Number	Crashes		Total	Damage Only	Total	
	Fatal Injuries	Serious Injuries	Minor Injuries		Fatal Crashes	Serious Crashes				
Not Junction	356	1,179	3,509	5,044	284	660	2,053	10,239	13,236	
Signals (working)	19	61	311	391	15	31	164	1,299	1,509	
Signals (not working)	1	10	75	86	1	5	37	195	238	
Stop sign	25	92	458	575	22	57	256	1,426	1,761	
Yield	7	10	87	104	4	4	46	458	512	
Police	-	1	8	9	-	1	6	30	37	
Uncontrolled	3	11	80	94	3	10	44	304	361	
Total	411	1,364	4,528	6,303	329	768	2,606	13,951	17,654	
			Percent Total							
Not Junction	7.1	23.4	69.6	100	2.1	5.0	15.5	77.4	100	
Signals (working)	4.9	15.6	79.5	100	1.0	2.1	10.9	86.1	100	
Signals (not working)	1.2	11.6	87.2	100	0.4	2.1	15.5	81.9	100	

Stop sign	4.3	16.0	79.7	100		1.2	3.2	14.5	81.0	100
Yield	6.7	9.6	83.7	100		0.8	0.8	9.0	89.5	100
Police	0.0	11.1	88.9	100		0.0	2.7	16.2	81.1	100
Uncontrolled	3.2	11.7	85.1	100		0.8	2.8	12.2	84.2	100
Total	6.5	21.6	71.8	100		1.9	4.4	14.8	79.0	100

Source: Botswana Police Services (Road Traffic Accident Unit)

Road traffic accidents according to the day of the week

Across all the years, most road traffic accidents occurred on Saturday, followed by Fridays and Sundays. Accidents that occurred during the weekends accounted for 49% of the total accidents. Accidents that happened on Fridays accounted for 17%, Saturdays 18%, and Sundays 14% of the total accidents.

TABLE 4.19: TOTAL NUMBER OF ACCIDENTS RECORDED ACCORDING TO THE DAY OF THE WEEK

	Accidents according to the day of the week (years)				
Time	2015	2016	2017	2018	2019
Sunday	2405	2425	2581	2554	2715
Monday	2289	2483	2282	2199	2421
Tuesday	2182	2231	2195	2095	2291
Wednesday	2233	2231	2085	2125	2313
Thursday	2348	2457	2265	2253	2448
Friday	2947	3221	3011	2917	3052
Saturday	3250	3325	3367	3198	3383
Total	17 654	18 373	17787	17 341	18623

Focus group

The quantitative phase of the study focused primarily on identifying the frequencies and risk factors of road traffic accidents. Predictive. The results were used to refine the interview guide for the focus group discussions and inform the selection of respondents of the second phase. Frequencies, trends and associations derived from the quantitative phase were explored through focus group interviews. Thus, the role of the qualitative phase was to collect descriptive information and further interpret the statistical results obtained in the quantitative phase.

The University of Botswana hosted the first focus group discussion in a classroom on 10 November 2020 and lasted two hours. The six (6) participants were one (1) police officer from the Traffic Head office, one (1) Trauma nurse specialist from Princess Marina Hospital, nurses, two (2) officers from the Ministry of Transport and Communication department of road transport and safety and two (2) officers from a private Society of Road Safety Ambassadors (SORSA) a private NGO that deals with road safety issues. The second focus group discussion was also hosted at the University of Botswana in a classroom on 15 November 2020 and lasted for 1 hour 20 minutes. The six (6) participants who attended were one (1) representative from the Motor Vehicle Accident Fund, the other five (5) participants were from Francistown, who included two (2) fire officers, (1) Emergency Medical officer, one nurse (1) and one (1) member of the public.

After a data analysis of focus groups, eight themes with twenty categories emerged. The table presentation underneath represents these themes and categories.

TABLE 4.20 THEMES AND CATEGORIES OF FOCUS GROUP 1 DISCUSSION

Theme	Category
4.5.1 Botswana road safety	4.5.1.1 Safety on roads
4.5.2 Dealing with people involved in road traffic accidents	4.5.2.1 Causes of accidents. 4.5.2.2 Consequences of the accident.
4.5.3 At-risk group of road users	4.5.3.1 Passengers 4.5.3.2 Pedestrians
4.5.4 Main reasons for road traffic accidents	4.5.4.1 Human factors 4.5.4.2 Vehicle factors 4.5.4.3 Road factors

	4.5.4.4 Environmental factors 4.5.4.5 Social factors
4.5.5 Recommendations on reducing road traffic accidents	4.5.5.1 Prevention of Human factors 4.5.5.2 Prevention of Vehicle factors 4.5.5.3 Prevention of Road factors 4.5.5.4 Prevention of Environmental factors 4.5.5.5 Social factors
4.5.6 Problems with implementing traffic safety measures	4.5.6.1 Human attitudes 4.5.6.2 Political will
4.5.7 Views regarding law enforcement	4.5.7.1 Law enforcement 4.5.7.1 Resources
4.5.8 Trends in road traffic accident statistics for the past ten (10) years	4.5.8.1 Accidents trends

4.3 Theme 1: Botswana road safety

The first theme relates to Botswana’s road safety. This theme and its category have been discussed, and direct quotations from the participants presented. This theme had only one category, which is focusing on safety on the roads. The literature will also be cited as a control measure. The respondents believed that people are not safe at all on the roads. One respondent had ready statistics which revealed that Botswana has an average of 420 deaths per year, which translates to ten deaths per week due to road traffic accidents. It was revealed that per year the country has 17000 reported cases of road accidents and compared this to a small population of two million people, there is a need to worry.

“One dead person due to road accidents is one too many because life can never be bought back,” reiterated one of the participants when they were asked about road safety in Botswana. The participant reiterated a statement inspired by the Swedish government on zero vision on preventing road traffic accidents. All the participants were quick to unanimously agree that people are far from safe on the roads as shown by the glaring statistics with the police and all the stakeholders who work with such information.

Theme 2: Dealing with people involved in road accidents

The second theme involves dealing with people involved in road accidents. The theme consists of two categories, namely: Causes of accidents and consequences of accidents. All respondents had one way or the other dealt with victims of road traffic accidents, and one of them had this to say, *“I deal with these victims daily, but most of them do not admit to their errors.”* Most respondents said those victims have dealt with the leading causes

of the accidents were drunk driving, fatigue, incompetence, and speeding. "I once interacted with a victim, a soldier who is now using a wheelchair, and he said that they were a group of friends and had spent the night drinking and in the wee hours got behind the wheel. That is when he met his fate," retorted one of the respondents.

Causes of accidents and consequences of the accidents

All respondents have dealt with road traffic accidents, and the accidents were attributed to fatigue, driver rage, drinking and driving, negligence, and overexcitement on roads. One respondent was still visibly shaking when he said, *"In my family, we lost two people at once due to driver rage because the driver was angry over the discussion he was having with his mother on the phone."* This, therefore, led to the death of two victims as well as the driver. The other respondent had her relative to blame when she said, *"As for me, I lost my relative to a road accident due to fatigue. We strongly believe that he drove while he was tired because he was coming from afar"*.

Theme 3: At-risk group of road users

This theme highlighted at-risk groups of road users and only consisted of two categories. These categories included passengers and pedestrians as at-risk groups. Mixed feelings were coming from the respondents when they were asked which group of people were at risk while using the road. While they agreed that everyone was at risk, they disagreed on the degree of vulnerability. One of them said, *"The passengers are the most vulnerable group, especially when we look at accidents that involve public transport like buses where several people are being ferried."* Although the group also went to emphasise that everyone is at risk, they quickly pointed out that the passengers' vulnerability was further mentioned. *"Passengers, especially those using public transport, are the most vulnerable since they will not be having any safety belts,"* observed one respondent. Closely following passengers were the pedestrians whom they said were equally vulnerable on the roads. Cyclists were also said to be vulnerable mostly when the roads were not made with them in mind.

The discussion revealed that 70% of the road accidents were caused by males, especially those between 18 and 45 years of age, while women caused the remaining 30%. It was also reiterated that the sedans are the cars that are mostly involved in accidents and the reason being that they are the ones with the highest population on the roads. The affordability of cars has made the roads to be densely populated and hence a high rate of accidents. Some respondents were adamant that they felt everyone was equally at risk. On pedestrians, young adolescents were at more significant risks because most walk while putting on headphones listening to music, and even taking selfies. This becomes a distraction that might result in accidents. It was noted that small cars like the sedans are the ones that are mostly involved in car accidents, while males (young males, to be specific) are most likely to be involved in road traffic accidents.

Theme 4: Main reasons for road traffic accidents

Theme four reflected that there are main reasons for road traffic accidents with five categories. The respondents grouped the causes of road traffic accidents into five groups, which are as follows; human factors, vehicle factors, road factors, environmental factors, and social factors.

The respondents attributed most of the accidents to human factors when one of them vehemently said, *“Everything else goes back to the human factors, if we talk of drinking and driving it is a human factor, if we talk of drinking and driving again it’s a human factor, and even when we talk of the state of the road again it goes back to humans”*.

The group attributed 85% of accidents to human factors, ranging from drunk driving, fatigue, and incompetence to speeding. The group observed that many people can now afford a car but affording and maintaining are two different things and the cars end up being worn out, leading to accidents. Bad weather conditions like excessive heat were said to lead to worn tires and hence accidents. *“People need to check their tire pressure when it is hot, and they should avoid driving since they will be drowsy,”* said one respondent. The group also attributed accidents to bad road engineering.

The participants were quick to note that the significant road factor which leads to road traffic accidents was the state of the road. One of them had the following to say, *“The way our roads are engineered is very dangerous since it does not cater for other road users. We do not have strips for cyclists, and the roads are too narrow for a motorist to negotiate through them safely”*. The way roads are constructed can determine their safety.

Stray animals on the road and wild animals on highways were some of the reasons that were noted as causing road traffic accidents. *“We have animals in town, and outside town, it is even worse with many animals roaming in the roads. You are only safe if you travel at 60km/hr because anything above that is suicidal”*, said one of the respondents.

Extreme weather conditions like rain and fog were noted as falling under the environmental factors that lead to road traffic accidents. One of the respondents reported having been shocked by some driver who had the guts to overtake in the fog. Stress and stereotypes were the only factors that were attributed to social factors.

Theme 5: Recommendations on reducing road traffic accidents

The respondents came up with many recommendations that ranged from strict law enforcement down to behaviour change. The recommendations were presented according to the main factors responsible for road accidents. These categories include: prevention of human factors; prevention of vehicle factors; prevention of road factors; prevention of environmental factors, and prevention of social factors.

One of the respondents was quick to note that, *“Unless we are approaching a big holiday like Christmas, you do not hear much about road safety measures. The police only become active when we are nearing holidays, yet this should be an ongoing exercise where people are made aware of the dangers of being negligent on the road”*. This observation led to the recommendation that awareness campaigns should be ongoing so that road safety messages are inculcated continuously in the people’s minds.

It was also recommended that there is a need for behaviour and attitude change from all the road users. This can only be achieved through education and hence the need for a task force mandated to educate the whole populace on road safety measures. *“Everything goes back to education,” said one female respondent.*

While the media should play a pivotal role in sending road safety information to the whole populace, parents should act as role models to their children by always sticking to the safe road using rules and regulations/ leading by example.

It was also noted that there is a great need to include road safety awareness in the national school curriculum to teach the children at a tender age. There is a need for citizens to have toll free numbers where they can report stray animals or unsafe behaviour on the roads.

One respondent suggested that the domestic animal owners should put ear reflectors on domestic animals so at least one or two animals are spared, especially during night driving. They also reiterated that any tag that can be used should not contradict the animal cruelty law.

New roads should be constructed with safety in mind while the old ones should be revamped. There is a need to teach people the basics of motor vehicles before awarding them with a driver's license. Above that, basic defensive driving skills such as how to drive at night and in harsh weather conditions should be taught to all drivers.

“The politicians are the ones that make the laws, so we need to involve them,” said one of the participants; in the end, they all recommended that there is a great need to involve those with the political muscles so that they advocate for sound laws in parliament. They also recommended that money be available for thorough training of those that will educate the people on road safety awareness.

“I have been to America, and I have noted that those that break the road laws frequently are banned from driving. Why don't we adopt that here?” asked one of the participants. They agree that they should recommend punitive laws where drivers who continuously break the law end up not being allowed to drive. The respondents were also of the opinion

that statistics on road traffic accidents should be available to everyone so that people know the intensity of the problem.

Theme 6: Problems with implementing traffic safety measures

One of the major problems that were noted was that of people's attitude towards the police on the roads. This theme consists of two categories: human attitudes and political will identified as problems with implementing safe traffic measures.

One of the respondents had this observation to share, "I have noted that if you go around bars and public drinking places, you see many cars parked and the drivers will be drinking. How about if a law is passed that prohibits cars to be taken to such places so that when people go for drinking, they use taxis?"

They also suggested that all people should have defensive driving skills. The laws were also observed to be very lenient, and hence they recommended that penalties be stiffer so that drivers are discouraged from committing a crime and hence become more careful on the roads.

Since road factors caused some accidents, the respondents suggested that there be the introduction of toll gates so that road users pay, and the money be channelled to the revamping of roads. *"I think the taxpayer's money is not adequate, and I suggest that this can be beefed by takings from toll gates as they do in South Africa with the South Africa National Roads Association (SNRA) which means the toll gates taken for the betterment of their roads.*

The group also said that it is expensive to take the lowest bidder when it comes to construction, and they cited certain roads that have been recently constructed but are found wanting. Therefore, they suggested that it is better to take those who can do the job well even when paying more because, in the long run, it pays. *"At times cheap is expensive, and roads will kill you for making construction mistakes,"* rightfully said one of the respondents.

They also suggested that there should be compulsory vehicle testing to ensure safety. It was also suggested that there should be a ban of importing cars that are five years and older so that the country is assured that those cars that get into the country are sound. *“What if we stop importing and just manufacture our own?” asked the other respondent.*

As a recommendation, the group also said that there is a need for both education and enforcement. People should be educated on safe road behaviour. Education should target social media because most young people (18-45 years of age) use it a lot nowadays.

The group also noted that learner drivers are not tested during rain seasons, yet they will go and drive in those harsh conditions. It is therefore imperative that learner drivers be tested under harsh weather conditions.

The group also noted that there is a need to change the way the Batswana socialise. People should not allow their drivers to drink because it is their life at risk. *“There is a need for behaviour change. If you are tired or drunk, do not go behind the wheel, and this can only be achieved through education”, said one of the respondents.* It was suggested that it would be helpful if politicians were involved. *One respondent suggested that there be automated law enforcement by use of speed cameras, especially on black spots.*

It was shocking to hear one of the respondents who are in law enforcement saying, *“I once stopped a very young man for speeding, and he told me that his father had died in a road accident and therefore he did not mind dying that way as well”* such kind of attitude makes it difficult to implement traffic safety measures since it endangers the other innocent road users.

The other major problem noted was that of the police themselves taking bribes from crime perpetrators. Existing laws that are very loose were another challenge in implementing road safety measures. In many cases, the perpetrators would walk scot-free after their lawyers manipulated the loopholes in the law.

It was also noted that most parents do not control their children, making it hard to implement road safety measures. There is also a lack of education/ knowledge of road

safety measures. One of the laws enforcing respondents had this to say about lack of education, *“I have been to several schools where I teach learners the safe ways of crossing the road. I tell them not to run, but contrary to my teaching, I have observed so many parents taking their children to school and standing at the end of the road, having instructed their children to run as they cross the road. This contradicting information brings confusion to the children”*.

It was also noted that a lack of resources hinders the implementation of road safety measures. There are no adequate human resources, and as if that is not enough, there are no adequate vehicles to use when manning the roads.

One major problem cited was that the police are overwhelmed by the work. The ratio of police to the population of drivers does not tally, and that becomes a challenge. There is a need for more police to be deployed on roads.

The law was also said to be very loose, thereby rendering implementation of a mammoth task. It was noted that many stakeholders were researching safe ways on the traffic, but there was no data sharing, and this poses as a hindrance. Although funding is there, the group noted that there is a lack of implementation. There are many talks and less of a walk.

There is much ignorance in the populace, and this lack of knowledge hinders implementation. *“We do not want people to go to jail. We want people to change because if they go to jail, they again become a burden to the government”*, said one of the respondents. To avoid this, there is a need to educate people on proper and safe ways of using the road.

Theme 7: Views regarding law enforcement

The theme, namely views regarding law enforcement, consists of two categories. The respondents felt that there should be laws to support efforts to implement road safety measures and hence the need to work hand in glove with the politicians to consider this when making laws in parliament.

Respondents indicated that there is a need for proper documentation on the first contact with the perpetrators to later act as solid evidence. There are many loopholes in the existing laws that lawyers can play around with, and the culprits can go scot-free.

There is a need for both the police and the judiciary system to work hand in glove so that there are no delays in handing down judgment on the culprits. It was noted that many delays would be encountered after the case was handed over to the judiciary. Thus, there was a need to revamp the whole police/ judiciary to work as one unit. It was also seen as noble for every vehicle owner to pay insurance to cover costs if accidents happen.

Theme 8: Trends in road traffic accident situation for the past ten years

This theme had only one category. The respondents noted a drastic increase in road accidents in the past ten years, which is worrisome and attributed to more vehicle users. Many people can now afford to buy cars. However, the year 2020 had a drastic decrease that can be attributed to the corona induced lockdowns and restrictions on alcohol. They also noted that there are many financial implications involved after road traffic accidents, and hence caution should be executed on roads. According to the Botswana Police Service documents on road traffic accidents from 2010 to 2019, there are few variations in road traffic accidents from the past ten years.

One of the participants had ready statistics to show that there has not been any sharp increase in the past ten years, but the figures have maintained a flat curve. However, there was a need to take down the figures because all life matters.

4.4. CONCLUSION

The current chapter has presented both quantitative and qualitative results. The next chapter will focus on the discussion of the research findings.

CHAPTER FIVE

DISCUSSION OF RESEARCH FINDINGS

5.1 INTRODUCTION

Chapter four presented two phases of (quantitative and qualitative) data analysis and the study's findings. Chapter 5 discusses the results of the study in two sections. Section A discusses the quantitative part, and section B discusses the qualitative part.

SECTION A: QUANTITATIVE RESULTS

5.2 FACTORS CONTRIBUTING TO ROAD TRAFFIC ACCIDENTS AMONGST AUTOMOBILE DRIVERS IN BOTSWANA.

In this study, factors contributing to road accidents were identified. Amongst those were sociodemographic information related to road accidents, two of those found to have an impact was the age and gender of the automobile drivers. The information has been presented underneath, supported by the literature. Other factors were also discussed, as outlined below.

5.2.1 SOCIO-DEMOGRAPHIC CHARACTERISTICS

Age

The age group mainly involved in road traffic accidents in this study is between 26-45 years of age. The study findings resonate well with other study findings in which the age group most involved in road traffic accidents was 21-50 years of age (De Silva et al., 2018; Gebresenbet & Aliyu, 2019; Seid et al., 2015). This is consistent with a study done in Norway in which increasing age was significantly associated with a lower risk of being

involved in road traffic crashes (Jørgenrud et al., 2018). In contrast with these findings, a study done in Maryland, Baltimore, showed that road traffic accidents were directly proportional to age increase (Dezman et al., 2016).

Gender

In this study, most road traffic accident victims were males. This is consistent with studies which were done in Sri Lanka, Guinea, Ethiopia, and Kenya, which show that most road traffic accident victims were males (Bon de Sousa et al., 2016; Gebresenbet & Aliyu, 2019; Kourouma et al., 2019; Seid et al., 2015; Sisimwo et al., 2014). In contrast to the findings stated earlier, a study from Egypt on road traffic crashes showed that females were at higher risk than their male counterparts in road traffic accidents (Arafa et al., 2019).

Possession of a driver's licence

Among those driving without a valid driver's licence, 6 (27.3%) were involved in road traffic accidents resulting in injuries. A literature review shows that drivers without valid licences are at an increased risk of serious road traffic accidents (Sagberg, 2018).

5.2.2 DRIVER UNDER THE INFLUENCE OF DRUGS OR ALCOHOL

A significant number of drivers involved in road traffic accidents in this study were under the influence of alcohol (6 %). Drivers under the influence of alcohol are less likely to use seat belts, drove faster, and were more likely to be distracted than others (Shyhalla, 2014).

5.2.3 OTHER DRIVER DISTRACTIONS

Other causes of road traffic accidents in this study are stray animals and wild animals. This could be because some drivers are not aware of protecting themselves when they have encountered animals when driving. Similar findings were documented in Canada, which established that many drivers are unaware of the safest method of preventing

animal collisions. Those who know how to slow down and hit straight directly in the animal's path may not be practicing the behaviour (Vanlaar, Barrett, Hing, Brown, & Robertson, 2019).

Carelessness was the leading cause of road traffic accidents in this study. Carelessness is driving without due care and attention. It is also driving without rational consideration for other persons. This study's results are similar to those found ten years ago by Maeletso (2009:84), who attributed most accidents to human/ driver behaviour and, to a lesser degree, vehicle factors and the roadway environment. Also, in most studies, careless driving was the leading cause of road traffic accidents in Ghana, Bhutani, the Democratic Republic of Congo, and Uganda (Damsere-Derry, Palk, & King, 2017; Pebalo et al., 2012; Severin et al., 2016; Wangdi et al., 2018). In Botswana's context, there is a need to re-strategize and benchmark with countries that have successfully implemented policies that changed driver behaviours.

5.2.4 THE EFFECTS OF ROAD TRAFFIC ACCIDENTS ON THE HEALTH OF THE DRIVERS AND COMMUNITY MEMBERS

The fatalities showed different types of injuries that have been caused by road accidents. Severe injuries from road traffic accidents resulted in the lower limb, upper limb fractures, and brain injuries. These injuries were the common cause of morbidity and mortality. These are also common causes of Qatar's mortality and morbidity (Abdulbari Bener, Rahman, & Mitra, 2009). In most sub-Saharan countries, most post-traumatic disabilities are due to injuries to the extremities or the spine from road traffic accidents (Mock, Boland, Acheampong, & Adjei, 2003). In this study, data on disability caused by road traffic accidents is not captured by any stakeholders. A USA study found that pedestrian accidents are more common among young males and result in head injuries (Mazurek, 1994). Botswana needs to borrow a leaf from Chile's road traffic accident interventions between 2000 and 2012, resulting in a significant reduction of road traffic injuries and fatalities. Chile implemented traffic law reform, police enforcement, and road infrastructure investment (Nazif-Muñoz et al., 2014). The traffic law reforms implemented in Chile positively impacted both traffic fatality and injury rate because of police enforcement practices (Nazif-Munoz et al., 2015).

The highest prevalence of road traffic accidents occurred in Gaborone city. This is because in the capital city there is a large population which is highly mobile. During the five years from 2015 to 2019, the highest casualties occurred, where there were no junctions and at stop signs. More casualties were also, where signals were functioning compared to roads with malfunctioning signals.

Statistics on accidents and fatalities over the last decade showed few variations from year to year. This shows that interventions and programmes that are currently being implemented are not yielding the needed benefits. There is a need to evaluate the current programmes and benchmark with countries that have successfully reduced road traffic mortalities. Fatalities remain high proportional to the country's population. The period under review has recorded minimum and maximum annual road fatalities of 411 in 2015 and 462 in 2018, respectively. The rate of 19.5 road fatalities per 100 000 recorded in 2019 showed minor progress since 2015 when 18.8 road fatalities per 100 000 was recorded. This is slightly higher than the global average of 18.0 deaths per 100,000. Botswana's fatality rates are below African countries like Kenya, Nigeria, and South Africa, which has an estimated road fatality rate of 20.9, 33.7, and 31.9 per 100,000 population per year respectively (WHO, 2016). All the mentioned African countries have higher road fatalities than that of the European region (10.3 per 100,000 population) (WHO, 2019). Road traffic accident burden can be prevented if the government implements evidence-based policy interventions. Despite the high prevalence of road traffic accidents, they can be reduced by emulating countries like Australia. Australia implemented a raft of measures that decreased the RTI mortality rate from 30 per 100,000 people in 1970 to 5 by 2010. All OECD countries have successfully implemented policy measures that have resulted in decreased RTI mortality from 22 to 8 per 100 000 people between 1990 and 2015 (World Bank, 2020).

The country is far from achieving the WHO Decade of Action goals for Road Safety 2011–2020 to cut fatalities in half by 2020. Botswana's road accident fatality rates are higher than the average member nations of the Organisation for Economic Co-operation and Development (OECD), of 8 per 100 000 people (World Bank, 2017:12).

There is a need for a wholesome and robust system of capturing road traffic accident statistics on fatalities because they capture mortality at the site of an accident or on accident spot. However, some people will die upon arrival at the hospital, and such cases are missed. There must be a system that follows accident cases beyond the accident scene so that the case can be recorded if there is any death caused by a road traffic accident.

SECTION B: QUALITATIVE RESULTS

This section discusses the findings from the qualitative design obtained after conducting the two focus groups with different stakeholders. Eight themes have been presented, discussed, and supported by the literature.

5.3 DISCUSSION OF DIFFERENT THEMES

5.3.1 Theme 1: Botswana road safety

The first theme relates to Botswana's road safety. This theme and its category have been discussed, and direct quotations from the participants presented. This theme had only one category, which is focusing on safety on the roads. The literature was also cited as a control measure. The respondents believed that people are not safe at all on the roads. One respondent had ready statistics which revealed that Botswana has an average of 420 deaths per year, which translates to ten deaths per week due to road traffic accidents. It also came out that per year the country has 17000 reported cases of road accidents and compared this to a small population of two million people, there is a need to worry.

The participants reiterated a statement inspired by the Swedish government on zero vision on preventing road traffic accidents 'Every accident is one too many' (Danish Ministry of Transport, 2012). All the participants were quick to unanimously agree that people are far from safe on the roads as glaring statistics with the police and all the stakeholders who work with such information.

These findings were supported by the report from WHO (2020) which had indicated that road safety is crucial in dealing with road injuries. Amongst the issues responsible for

aggravating road injuries the following was included such as design of roads because the road designers should design roads while keeping in mind the safety of all road 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 among these road users.

5.3.2 Theme 2: Dealing with people involved in road accidents

The second theme involves dealing with people involved in road accidents. The theme consists of two categories, namely: Causes of accidents and consequences of accidents. All respondents had one way or the other dealt with victims of road traffic accidents, and the following was highlighted as causes of road accidents.

Causes of accidents and consequences of the accidents

All respondents have dealt with road traffic accidents, and the accidents were attributed to fatigue, driver under the influence of rage, drinking and driving negligence, and overexcitement on roads. This study's findings were supported by the Department of Transport report in India, which has reflected that road accidents are the most unwanted thing to happen to a road user, though they happen quite often. This department indicated that the most unfortunate thing is that people do not learn from other people's mistakes on the road. The main cause of accidents and crashes presented by this department was due to human errors, and the following was included in the list: over speeding, drunken driving, distractions to driver, red light jumping and avoiding safety gears like seat belts and helmets (Department of transport 2020:1).

5.3.3 Theme 3: At-risk group of road users

This theme highlighted at-risk groups of road users and only consisted of two categories. These categories included passengers and pedestrians as at-risk groups. Mixed feelings were coming from the respondents when they were asked which group of people were at

risk while using the road. While they agreed that everyone was at risk, they disagreed on the degree of vulnerability. Although the group also emphasised that everyone is at risk, they quickly pointed out that the passengers' vulnerability was rather high. Closely following passengers were the pedestrians whom they said were equally vulnerable on the roads. Cyclists were also said to be vulnerable, mostly when the roads were not made with them in mind.

The discussion revealed that 70% of the road accidents were caused by males, especially those between 18 and 45 years of age, while women caused the remaining 30%. It was also reiterated that the sedans are the cars that are mostly involved in accidents and the reason being that they are the ones with the highest population on the roads. The affordability of cars has made the roads to be densely populated and hence a high rate of accidents.

Second to that group are the pedestrians', this concurs with the findings of a study done in the USA in which thousands of fatalities occur among the young pedestrians, mainly boys, every year due to road traffic accidents (Mazurek, 1994).

Some respondents were adamant that they felt everyone was equally at risk. On pedestrians, young adolescents were at more significant risks because most walk while putting on headphones listening to music, and even taking selfies. This becomes a distraction that might result in accidents. This concurs with a review study that showed that using a smartphone while walking can be a risk factor for being involved in a road traffic accident (Flaherty & Choi, 2016).

It was noted that small cars like the sedans are the ones that are mostly involved in car accidents, while males (young males, to be specific) are most likely to be involved in road traffic accidents.

5.3.4 Theme 4: Main reasons for road traffic accidents

Theme four reflected that there are main reasons for road traffic accidents with five categories. The respondents grouped the causes of road traffic accidents into five groups to; human factors, vehicle factors, road factors, environmental factors, and social factors.

They then listed the following causes attributed to the human factors that lead to road accidents: drinking and driving, human error, incompetent driving, fatigue, negligence, over excitement, rage, stereotypes, and competitions on the road. Human factors as causes of road traffic accidents have been widely verified and documented in various studies (Anebonam et al., 2019; Howard, Cori, & Horrey, 2019; Hsiao, Chang, & Simeonov, 2018).

The group attributed 85% of accidents to human factors, ranging from drunk driving, fatigue, and incompetence to speeding. The group observed that many people can now afford a car but affording and maintaining are two different things and the cars end up being worn out, leading to accidents. Bad weather conditions like excessive heat were said to lead to worn tires and hence accidents. The group also attributed accidents to bad road engineering.

The participants were quick to note that the significant road factor which leads to road traffic accidents was the state of the road. The way roads are constructed can determine their safety. In countries like Romania, most road crashes were caused by road alignment (Deac & Tarnu, 2019).

Stray animals on the road and wild animals on highways were some of the reasons that were noted as causing road traffic accidents. According to literature, most animal-vehicle collisions involved domestic animals, particularly dogs, while in other countries, collisions are mostly caused by game species (Canal, Martín, de Lucas, & Ferrer, 2018).

Extreme weather conditions like rain and fog were noted as falling under the environmental factors that lead to road traffic accidents. One of the respondents reported having been shocked by some driver who had the guts to overtake in the fog! Stress and stereotypes were the only factors that were attributed to social factors. The same assertion was found to be true in a review study of the effect of traffic and weather

characteristics on road safety. Precipitation was found to increase road traffic accidents (Theofilatos & Yannis, 2014).

5.3.5 Theme 5: Recommendations on reducing road traffic accidents

The respondents came up with many recommendations that ranged from strict law enforcement down to behaviour change. The recommendations were presented according to the main factors responsible for road accidents. These categories include: prevention of human factors; prevention of vehicle factors; prevention of road factors; prevention of environmental factors, and prevention of social factors.

Several studies show that strict law enforcement has a positive effect on reducing road traffic accidents. This suggestion was successfully implemented in Chile and resulted in a reduction in road traffic accidents (Nazif-Muñoz et al., 2014). This observation led to the recommendation that awareness campaigns should be ongoing so that road safety messages are inculcated continuously in the people's minds.

It was also recommended that there is a need for behaviour and attitude change in all the road users. This can only be achieved through education and hence the need for a task force mandated to educate the whole populace on road safety measures.

While the media should play a pivotal role in sending road safety information to the whole populace, parents should act as role models to their children by always sticking to the safe road using rules and regulations/leading by example.

It was also noted that there is a great need to include road safety awareness in the national school curriculum to teach the children at a tender age. There is a need for citizens to have toll free numbers where they can report stray animals or unsafe behaviour on the roads. According to a study by Zampetti et al. (2013) in Italy, awareness campaigns are essential, but they should be supplemented with complementary activities to be effective.

One respondent suggested that the domestic animal owners should put ear reflectors on domestic animals so at least one or two animals are spared, especially during night driving. They also reiterated that any tag that can be used should not contradict the animal cruelty law. Although the participants recommended this, German research does not recommend using wildlife warning reflectors as a tool for mitigating wildlife-vehicle collisions on roads as they are not effective (Benten, Hothorn, Vor, & Ammer, 2018).

New roads should be constructed with safety in mind while the old ones should be revamped. There is a need to teach people the basics of motor vehicles before awarding them with a driver's license. Above that, basic defensive driving skills such as how to drive at night and in harsh weather conditions should be taught to all drivers.

Participants recommended a great need to involve those with the political muscles to advocate for sound laws in parliament. They also recommended that money be available for thorough training of those that will educate the people on road safety awareness. Political will is needed to develop public policies that will support various interventions and changes to transport regulations (Bonnet, Lechat, & Ridde, 2018). The respondents were also of the opinion that statistics on road traffic accidents should be available to everyone so that people know the intensity of the problem.

5.3.6 Theme 6: Problems with implementing traffic safety measures

One of the major problems noted was that of people's attitude towards the police on the roads. This theme consists of two categories: human attitudes and political will identified as problems with implementing safe traffic measures.

They also suggested that all people should have defensive driving skills. The laws were also observed to be very lenient, and hence they recommended that penalties be stiffer so that drivers are discouraged from committing a crime and hence become more careful on the roads.

Since road factors caused some accidents, the respondents suggested that there be the introduction of toll gates so that road users pay, and the money be channelled to the revamping of roads.

The group also said that it is expensive to take the lowest bidder when it comes to construction, and they cited certain roads that have been recently constructed but are found wanting. Therefore, they suggested that it is better to take those who can do the job well even when paying more because, in the long run, it pays.

They also suggested that there should be compulsory vehicle testing to ensure safety. It was also suggested that there should be a ban of importing cars that are five years and older so that the country is assured that those cars that get into the country are sound.

As a recommendation, the group also said that there is a need for both education and enforcement. People should be educated on safe road behaviour. Education should target social media because most young people (18-45 year olds) utilise it extensively nowadays.

The group also noted that learner drivers are not tested during rain seasons, yet they will drive in those harsh conditions. It is therefore imperative that learner drivers be tested under harsh weather conditions. The group also noted that there is a need to change the way the Batswana socialize. People should not allow their drivers to drink because it is their life at risk.

It was shocking to hear one of the respondents in law enforcement indicating that other drivers speed because of the challenges they went through, such as losing a loved one on the road. This puts the lives of other road users at risk. This statement is supported by the findings of a study done in France, which showed that drivers who practice risky behaviours on the roads were more likely to have negative traffic safety attitudes (Nabi et al., 2007).

The other major problem noted was that of the police themselves taking bribes from crime perpetrators. Existing laws that are very loose were another challenge in implementing road safety measures. In many cases, the perpetrators would walk scot-free after their lawyers manipulated the loopholes in the law.

It was also noted that most parents do not control their children, making it hard to implement road safety measures. There is also a lack of education/ knowledge of road safety measures. One of the laws enforcing respondents had this to say about lack of education, "I have been to several schools where I teach learners the safe ways of crossing the road. I tell them not to run, but contrary to my teaching, I have observed so many parents taking their children to school and standing at the end of the road, having instructed their children to run as they cross the road. This contradicting information brings confusion to the children.

It was also noted that a lack of resources hinders the implementation of road safety measures. There are no adequate human resources, and as if that is not enough, there are no adequate vehicles to use when manning the roads.

One major problem cited was that the police are overwhelmed by the work. The ratio of police to the population of drivers does not tally, and that becomes a challenge. There is a need for more police to be deployed on roads.

The law was also said to be very loose, thereby rendering implementation of a mammoth task. It was noted that many stakeholders were researching safe ways on the traffic, but there was no data sharing, and this pauses as a hindrance. Although funding is there, the group noted that there is a lack of implementation. There are many talks and less of a walk. There is much ignorance in the populace, and this lack of knowledge hinders implementation. To avoid this, there is a need to educate people on proper and safe ways of using the road.

5.3.7 Theme 7: Views regarding law enforcement

The theme, namely views regarding law enforcement, consist of two categories. The respondents felt that there should be laws to support efforts to implement road safety measures and hence the need to work hand in glove with the politicians to consider this when making laws in parliament.

Respondents indicated a need for proper documentation on the first contact with the perpetrators to later act as solid evidence. There are many loopholes in the existing laws

that lawyers can play around with, and the culprits can go scot-free. There is a need for both the police and the judiciary system to work hand in glove so that there are no delays in handing down judgment on the culprits. It was noted that many delays would be encountered after the case was handed over to the judiciary. Thus, there was a need to revamp the whole police/ judiciary system to work as one unit. It was also seen as noble for every vehicle owner to pay insurance to cover costs if accidents happen.

The study conducted by Rolison, Regev, Moutari, and Feeney (2018) had the following results in relation to factors and law enforcement. Potential underreporting of factors in existing accident records, identifying possible inadequacies in law enforcement practices for investigating driver distraction, drug and alcohol impairment, and uncorrected or defective eyesight. Their study also highlighted that there is a need for accident report forms to be continuously reviewed and updated to ensure that contributing factor lists reflect the full range of factors that contribute to road accidents. And lastly, their study also showed that the views held by police officers and the public on accident causation influenced their memory recall of factors involved in hypothetical scenarios and that the delay in completing accident report forms should be minimized, possibly by use of mobile reporting devices at the accident scene (Rolison, Regev, Moutari and Feeney 2018).

5.3.8 Theme 8: Trends in road traffic accident situation for the past ten years

This theme had only one category. The respondents noted a drastic increase in road accidents in the past ten years, which is worrisome and attributed to more vehicle users. Many people can now afford to buy cars. However, the year 2020 had a drastic decrease that can be attributed to the corona induced lockdowns and restrictions on alcohol. They also noted that there are many financial implications involved after road traffic accidents, and hence caution should be executed on roads. According to the Botswana Police Service documents on road traffic accidents from 2010 to 2019, there are few variations in road traffic accidents from the past ten years. WHO (2020) indicated that more than 90% of road traffic deaths occur in low- and middle-income countries and Botswana falls in that category. WHO (2020) went on to state that these road traffic injury death rates are highest in the African region and this also occurs in high-income countries, where people who are more likely to be involved in road traffic crashes are seen to be from lower socioeconomic.

One of the participants had ready statistics to show that there has not been any sharp increase in the past ten years, but the figures have maintained a flat curve. However, there was a need to take down the figures because everyone's life matters. WHO (2020) showed a need for prevention of road traffic injuries by ensuring that Governments take action to address road safety in a holistic manner. And this requires involvement of multiple sectors such as transport, police, health, education, and actions that address the safety of roads, vehicles, and road users. Therefore, the guidelines developed by this study will help in ensuring that multiple stakeholders will be involved in addressing road traffic injuries.

5.3.4 CONCLUSION

In the current chapter, quantitative results were discussed in section A. Factors contributing to road traffic accidents, effects of road traffic accidents on the health of the victims, and accident trends were discussed and compared with the literature review. Qualitative results were discussed in section B. The discussion focused on the themes and the categories that emerged from qualitative data analysis. The literature review was incorporated for comparison purposes. The next chapter will focus on the guidelines for the Botswana community on reducing road traffic accidents.

CHAPTER SIX

GUIDELINES FOR BOTSWANA COMMUNITY ON REDUCING ROAD TRAFFIC ACCIDENTS.

6.1 INTRODUCTION

This chapter presents evidence-based guidelines on reducing road traffic accidents among Botswana community members. Road traffic accident prevention is a multifaceted activity requiring every individual's prompt action and involvement in their respective responsibility. The guidelines were developed following Phase 1 and Phase 2 of the current study, relevant aspects of the reviewed literature, and the researcher's insights.

These guidelines complement and support government and policymakers in reducing road traffic accidents by providing essential information that helps develop successful road safety interventions. The quantitative and qualitative findings have informed this report. They arose because of the conclusions drawn and the recommendations made. The findings were validated and corroborated using Haddon's theory (Table 1) and validated with other researchers' results in the reviewed literature. Each evidence statement stands alone as accessible. Essential information was used to support the recommendations based on the study's conclusions (National Institute for Health and Care Excellence (NICE, 2014:108).

Furthermore, NICE (2014:108) explains that guidelines should ensure that the relationship between the recommendations and the evidence of findings is clear. The guidelines are clear without cross-references to other supporting matters. Guidelines should be based on the validity of the evidence in the study of drivers' practices.

The guidelines will be shared with all stakeholders through the UNISA website. Hard copies will be presented to the Ministry of Health and Wellness, Police Service under the Ministry of Defence, Justice, and Security, and Motor Vehicle Accident Fund.

Road Traffic Accidents' top 4 risk factors will be categorized into Human factors, Vehicle factors, Equipment factors, and Environmental factors.

Table 6.2: Guidelines for Botswana community on reducing road traffic accidents.

RISKS FACTORS	GUIDELINES ON:	RECOMMENDATIONS
<p>6.2 HUMAN FACTORS</p> <p>The leading cause of road traffic accidents in Botswana was found to be the following human factors:</p> <ul style="list-style-type: none"> - Speeding - Alcohol and drug use - Fatigue and night driving - Distracted-driving and negligent driving - Police enforcement - Seat belt use 	<p>Speeding</p> <p>Literature shows that over speeding is a significant risk factor for road traffic accidents. In a study done in Lubumbashi, DRC in 2015, Qatar in 2012, Saudi Arabia in 2000, Ghana in 2003 and Kenya in 2012, over-speeding was one of the contributors to road traffic accidents (Afukaar, 2003; Ansari et al., 2000; Bachani et al., 2012; Bener, 2012; Severin et al., 2016). In a study on road traffic accidents causes in Dubai from 2002-2008, RTAs were more frequent on roads with high-speed limits and with the presence of trucks (Marzooqi et al., 2010).</p>	<ul style="list-style-type: none"> - The government must introduce a penalty point system to be put on driver records for violating speed limits. The driver will be disqualified from driving if s/he accumulates specific penalty points at a specific period. - Drivers must be aware of the importance of speed limits irrespective of how the road might look in their own eyes. - The Department of Roads must construct roundabouts at T

<p>Literature and the study results suggest that practical approaches to road traffic accidents caused by human factors should focus on the following themes.</p>	<p>In the current study, speeding is also the leading cause of road traffic accidents in Botswana. To reduce speeding and failure to observe priority rules. The following measures must be implemented by authorities responsible for safety on roads.</p>	<p>junctions and crossroads to reduce speed and conflict points.</p> <ul style="list-style-type: none"> - There must be stop signs at intersections without traffic lights. - Traffic lights with longer pauses, more visible lights must be installed. - There must be speed reductions at intersections. - Speeding enforcement using speed monitoring cameras must be enforced. - There should be financial rewards for citizens who report traffic violations. - Police must check on dangerous driving, overloaded vehicles, and drivers' possession of a driving licence.
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	<p>Alcohol and drug use</p> <p>Literature shows that alcohol and illicit drug use in sub-Saharan Africa is common among those who are injured due to road traffic accidents (Derakhshanfar, Meibodi, Kariman, Arhamidolatabadi, & Safari, 2012; Domingo-Salvany et al., 2017; Legrand, Houwing, Hagenzieker, & Verstraete, 2012). The current study also shows that alcohol is one of the main risk factors for road traffic accidents.</p>	<ul style="list-style-type: none"> - The government must introduce a penalty point system to be put on driver records when caught driving under the influence of alcohol and drugs. The driver will be disqualified from driving if s/he accumulates specific penalty points at a specific period. - Implement the legal limit of zero alcohol in the blood and penalties for having alcohol in the bloodstream. - There must be political will from all stakeholders, including the judiciary. The police must be allowed to extract blood for alcohol tests within 3 hours of accident occurrence without any hindrance.
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		<ul style="list-style-type: none"> - Specialists are needed to concretise and implement behavioural change programs to curb drunk driving. - High-risk excess alcohol offenders to retake the driving test.
	<p>Fatigue and night driving</p> <p>Fatigue is an acknowledged road safety hazard of a similar magnitude to alcohol while driving (Jackson et al., 2011; Sadeghi-Bazargani et al., 2016). Fatigued driving is a significant risk factor for traffic accidents, although the public remains not aware of its potential harmfulness (Zhang et al., 2016). A study done in Ghana showed that the risk of death in a night traffic crash was higher than during the daytime (Ackaah, Apuseyine & Afukaar, 2020).</p>	<ul style="list-style-type: none"> - Encourage drivers to get plenty of sleep and take regular breaks to avoid fatigue on long trips. - Emphasis must be directed towards educating drivers about the importance of avoiding circadian performance troughs. - Drivers must not ignore early warning signs such as yawning, low concentration, tired eyes, restlessness, slow reaction, boredom, and over speeding.

	<p>The current study also shows that fatigue and night driving are risk factors for road traffic accidents as confirmed in the focus group discussions.</p>	<ul style="list-style-type: none">- Power naps of only 20 minutes can boost energy levels.- Drivers must drink water, eat fruits, and healthy snacks instead of caffeine and smoking.- Rumble strips on highways have to be installed to alert tired, distracted, or otherwise inattentive drivers that they are about to go off the road. These rumble strips are effective at reducing certain types of crashes.- Making advanced driving assistance systems (ADAS), which help track drivers' eyes and gazes available to most vehicles, will help curb accidents caused by fatigue.- If someone's visibility is compromised at night, avoid
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		<p>driving after dusk, especially when there are storms or heavy rains.</p>
	<p>Distracted and negligence driving</p> <p>Distracted driving is any activity that competes for their attention while driving (Koppel et al., 2011). Literature shows that distracted driving from secondary task engagement is one of the main risk factors to teenage road traffic accidents (Gershon et al., 2019; Severin et al., 2016) and inattention (Sundfør et al., 2019). In this study, carelessness (using cell phones while driving) was the leading cause of most casualties.</p>	<ul style="list-style-type: none"> - The government must introduce a penalty point system to be put on driver records if caught driving while using a cell phone. The driver will be disqualified from driving if s/he accumulates specific penalty points at a specific period. <p>Responsibility of drivers</p> <ul style="list-style-type: none"> - Drivers are discouraged from multi-tasking while driving. <p>Responsibility of passengers</p> <ul style="list-style-type: none"> - When a driver is distracted while driving, remind the driver immediately to concentrate on driving.

		<ul style="list-style-type: none"> - Assist the driver with other tasks that may distract him/her. <p>Messages by parents to young adult drivers</p> <ul style="list-style-type: none"> - Give them examples and statistics of young adult drivers involved in road traffic accidents due to distracted driving. - Underscore that texts and phone calls can wait until arriving at a destination. <p>Messages by the police to drivers</p> <ul style="list-style-type: none"> - Encourage drivers never to use a cell phone behind the wheel, even hands-free, and enforce laws that prohibit cell phone use while driving. <p>Seat belt enforcement.</p>
	<p>Police enforcement of traffic regulations</p> <p>Literature shows that police enforcement of traffic regulations can improve traffic and driver safety by reducing speeding,</p>	<ul style="list-style-type: none"> - Police must be empowered with human resources and vehicles to make patrols and maintain sanity on the roads.

	<p>speed variability, and undesirable driving behaviours such as tailgating and unsafe lane change. This study shows that unlicensed drivers under the influence of alcohol are involved in accidents that could have been prevented.</p>	<ul style="list-style-type: none">- Traffic police should help control pedestrian and vehicle traffic during peak traffic times, special events, and accident sights.- Surveillance by the police must be increased during weekends and Fridays.- Individuals must allow traffic police to enforce laws by remaining calm, polite and provide all necessary information requested by the police.- Traffic police enforcement can be divided into the following categories:<ul style="list-style-type: none">a. Speed enforcement by stationary methods, patrolling along the roads to check for speed compliance and checking for other traffic violations.
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		<ul style="list-style-type: none">- Traffic police must have spontaneous surveillance sites as permanent drivers tend to observe speed limits only towards those sites but soon after passing the sites, they start breaking the rules.b. Unlicensed drivers<ul style="list-style-type: none">- Random checks on the roads must be intensified, and strict measures must be taken against those driving without license.c. Drinking and driving enforcement<ul style="list-style-type: none">- The traffic police should be empowered to be mobile and carry out random breath testing using pocket-size Alcolmeter breath analysers.d. Seat Belt enforcement
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		<ul style="list-style-type: none"> - Police must continuously hold campaigns to warn and advise drivers and passengers on seat belt use. - Enforce the usage of both front and rear seatbelts by drivers and passengers. e. Install speed cameras
	<p>Seat belt use</p> <p>Literature shows that laws requiring mandatory seatbelt use increase seat belt usage and reduce fatalities and injuries (Mäkinen & Zaidel, 2003). Seat belts are instrumental in protecting drivers and passengers from being ejected during a road traffic accident. Drivers and passengers not putting on seat belts are 30 times more likely to be ejected from a vehicle during an accident than those with</p>	<ul style="list-style-type: none"> - The government must introduce a penalty point system to be put on driver records when caught driving without putting on seat belts, including the passengers. The driver will be disqualified from driving if s/he accumulates specific penalty points at a specific period.

	<p>seat belts. Out of those who are ejected, more than 75 percent die from injuries (Kahane, 1986).</p>	<ul style="list-style-type: none"> - The media should play a pivotal role in sending road safety information to the whole populace obeying road traffic rules. - Parents should act as role models to their children by always sticking to the safe road using rules and regulations/ leading by example. - Hold frequent campaigns to educate people on the benefits of putting on seat belts and the penalties for not putting on seat belts. - There must be enforcement of existing seat belt laws.
	<p>Education and Safety Awareness Promotion</p> <p>In Botswana, aggressive policies and other activities such as (education and enforcement) were implemented to</p>	<ul style="list-style-type: none"> - Communication campaigns to warn and raise awareness of dangerous driving through the media.

	<p>minimise alcohol consumption from 2004-2011 and resulted in a significant reduction in road traffic accidents (Sebego et al., 2014). There is a need to continue with education and safety awareness and create enabling factors that make people practice safe driving.</p>	<ul style="list-style-type: none"> - Awareness campaigns must be done by trained people in the field of road traffic accidents and human behaviours. - Awareness campaigns must target children to catch them young so that when they grow, they will exhibit desirable behaviours on the roads. - Training medical personnel on Advanced Trauma Life Support. - Personal safety and safety of others. - Licence renewal.
<p>6.3 VEHICLES AND EQUIPMENT FACTORS</p> <p>Lack of maintenance, consequently resulting in worn-out vehicles, was</p>	<p>Vehicle conditions and other equipment</p> <p>Vehicle and equipment factors play a crucial role in preventing road crashes</p>	<ul style="list-style-type: none"> - The driving school curriculum must include the basics of car

<p>identified as one of the causes of road traffic accidents in this study. Cars or Vans were the mode of transport mainly involved in road traffic accidents. Literature and the study results suggest that practical approaches to road traffic accidents caused by vehicle and equipment factors should focus on the following vehicle conditions and safety equipment on the vehicles.</p>	<p>(WHO, 2018). Vehicle safety features such as roadworthiness, braking, speed management, lighting and electronic stability control are vital in reducing road accidents, fatalities, and injuries (WHO, 2018). In a study done in India, vehicle conditions contributed to 8 % of the accidents recorded (Agarwal et al., 2020).</p>	<p>maintenance so that everyone who attains a driver's licence must check their vehicles' basic fitness.</p> <ul style="list-style-type: none"> - Only vehicles not older than five (5) years must be imported into the country. - Vehicle safety enhancement can also be achieved by reducing the power of the vehicle. - Drivers must check tyre conditions, pressure and must observe the wear rate. - Under flattered tyres, OR over flattered tyres are the leading causes of tyre failure. - Vehicles with properly inflated tyres will benefit from reduced tyre wear, prolonged usage, and better fuel consumption.
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		<ul style="list-style-type: none"> - The Department of Transport and Communication should also do a spot check on vehicles to weed out. <ul style="list-style-type: none"> a. Vehicles that are not appropriately maintained. b. Vehicles without modern safety features (such as lane assist, brake assist, electronic stability control) - Drivers must be encouraged to learn about their vehicle's safety systems and how to use them, such as cruise control, automatic emergency braking, blind-spot warning systems, and backup cameras.
<p>6.4 ENVIRONMENTAL FACTORS</p>	<p>Weather conditions</p>	<ul style="list-style-type: none"> - Driving schools must teach learners even during the rainy

<p>The study results and literature show that environmental factors play a crucial role in road traffic accidents in Botswana. Roadway environmental factors involve light in the scene of the crash (daytime, night time, sunrise and sunset), weather conditions such as clear, foggy, rainy, stormy, cloudy, and dusty, place of a crash (motorway, road shoulder, middle lane, roadside, outside of road limit and unknown), roadway conditions (good, damaged, defective traffic signs, road narrowing, bumps, unstable shoulders or lack of shoulders, absence of standard road guard, partial road collapse, defective pavements, acute angle, non-standard grading, faulty lighting, slippery and potholes), roadway geometrics (straight and flat, straight with uphill/downhill orientations, winding and flat road, winding and uphill/downhill road)</p>	<p>Literature suggests that weather conditions such as fog, rainfall, temperature are risk factors for road traffic accidents (Hammad et al., 2019). Therefore, drivers need to respond accordingly to different weather conditions, so that road carnages are prevented.</p>	<p>season to have experience and know-how to approach wet conditions.</p> <ul style="list-style-type: none"> - Drivers must be urged to switch on their lights to increase visibility and, where possible, to stop driving when visibility is affected. - Drivers must be diligent and use their turning signals to avoid crashes with other cars during the rainy season. - Drivers must be urged to drive slowly and avoid cruise control during the rainy season. - Drivers must be urged to take their time when driving in the rainy season, remain calm, and not to worry about other drivers who will be giving them pressure to speed up.
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and roadway surface (dry, wet, freezing and snowy, sandy, muddy, and oily). The following practical approaches will reduce road traffic accidents caused by environmental factors:

Roads engineering measures

The way roads are constructed can determine their safety. In countries like Romania, most road crashes were caused by road alignment (Deac & Tarnu, 2019). The same study discovered that sidewalks' construction, expanding the number of lanes in certain road sections, and elevating pedestrian crossings reduced road traffic accidents. In Iran, it was found that road engineering had a significant influence on single-vehicle truck crashes (Rahimi, Shamshiripour, Samimi, & Mohammadian, 2020).

- Before roads are constructed in any area, all stakeholders must be involved in the planning, including the community, as they might advise on black spots.
- Road construction tenders must be awarded to constructors who are well experienced, reputable, and understand Botswana's climate.
- Roads must have a provision for pedestrians, cyclist lanes, and a proper drainage system.
- Roads must be enhanced by having roads with two lanes in one direction, and median guardrails avoid head-on collisions.
- All roads with a speed limit of 100km/h must have a median barrier. If barriers are not installed,

		<p>the speed limit has to be reduced to 80 km/h.</p> <ul style="list-style-type: none">- Roads must be frequently serviced and timely repair of potholes.- Those responsible for maintaining roads must erect guardrails to minimise the damage resulting from cars veering off the road. Trees and boulders must be cleared away from roadside areas.- Roundabouts must be expected at intersections, T-Junctions, and crossroads to avoid collisions' consequences due to different impact angles and lower speeds.- Improvements on roads, lighting, signs, and crossing, which help motorists drive safely, must be supplemented with humps and chicanes.
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		<ul style="list-style-type: none"> - Broken traffic signs and lights must be attended to. - Speed humps should be increased in residential areas to reduce over-speeding vehicles. - Install speed camera on highways and near black spots. - There must be traffic lights with longer pauses, more visible lights, and refuge islands for pedestrians. - Systematically identify and treat black spots.
	<p>Stray animals</p> <p>According to the literature, most animal-vehicle collisions involved domestic animals (>95%), particularly dogs (>80%), while in other countries, collisions are mostly caused by game species (Canal et al., 2018). However, according to this</p>	<ul style="list-style-type: none"> - Botswana must benchmark with countries like the Czech Republic, which has successfully used odour repellents where animal-vehicle collision is very common.

	<p>study, in Botswana, collisions are mainly due to stray dogs, goats, and cattle.</p>	<ul style="list-style-type: none"> - Drivers must always be advised to be on the lookout for animals that often stray into the roads. - All those people with livestock must tag each of their livestock (goats, sheep, donkeys, and cows) with light-reflecting devices to alert traffic to animals when crossing roads during the night. However, there is a need for further research on the effectiveness of the method. - There is a need for citizens to have toll free numbers where they can report stray animals or unsafe behaviour on the roads.
	<p>Road traffic accident surveillance system</p>	<ul style="list-style-type: none"> - Therefore, there is a need to develop a system based on the use of smartphones by police officers

	<p>The use of incomplete police road crash fatalities and injuries data misguides transport professionals during the critical stage of prioritizing road safety interventions. Transport experts draw incomplete conclusions on road crash causal factors leading to the selection of ineffective road safety interventions. The lack of a surveillance system that picks essential variables to inform targeted interventions was the main limitation.</p>	<p>who will use an app to enter information about the accident. Once relevant data is entered, it will be sent to a server for consultation via a web interface access to the database. The system will make it possible to account for all the relevant data. This intervention aims to provide road safety agents with a monitoring system that would enable them to act faster in an accident (to improve first aid responses) with a system for investigating and recording the events. This system would also allow all the actors to consult the road data and reduce accidents.</p> <ul style="list-style-type: none"> - The following monitoring variables will be collected: type of collision, injuries, date of the accident, cause
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		<p>of the accident. The surveillance is needed for entering road crash data.</p> <ul style="list-style-type: none">- All stakeholders must work together in harmony and share data for the benefit of the populace.
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6.5 CONCLUSION

In this chapter, guidelines for reducing road traffic accidents among Botswana community members were framed. The guidelines were developed following Phase 1 and Phase 2 of the study, relevant aspects of the reviewed literature, and the researcher's insights. The subsequent chapter deals with the summary of the research findings, recommendations, limitations, and conclusion.

CHAPTER SEVEN

SUMMARY OF RESEARCH FINDINGS, RECOMMENDATIONS, LIMITATIONS & CONCLUSION

7.1 INTRODUCTION

This chapter is summarising the research findings, recommendations, limitations, and conclusions of the study.

7.2 SUMMARY OF RESEARCH FINDINGS

Botswana loses an average of 420 lives from road traffic accidents each year. Road accidents represent a leading and increasing contributor to regional and global disease burden causing death and disability. Road accidents take an enormous toll on individuals and communities as well as on national economies. The purpose of the study was to develop guidelines for stakeholders to reduce road accidents among Botswana communities. In order to achieve this purpose, the objectives were to:

- Explore and describe the factors contributing to road traffic accidents amongst automobile drivers in Botswana.
- Explore and describe the effects of road traffic accidents on the health of the drivers and community members
- Review and analyse data on road traffic accidents in Botswana for the past five years.
- Develop guidelines for stakeholders to reduce road traffic accidents.

The study wished to answer the following questions:

- What are the factors contributing to road traffic accidents in Gaborone, Botswana?

- What are the effects of road accidents on the health of a driver and community members?
- How are the patterns of road traffic statistics for the past five years?
- How can the guidelines for stakeholders to reduce road traffic accidents be developed?

The study was conceptualised using Haddon's theory. Haddon (1983:32) described road transport as an ill-designed "man-machine" system needing comprehensive systemic treatment (Haddon 1983:32). These descriptions led to the production of what is now known as the Haddon Matrix, illustrating the interaction of three factors, human, vehicle, and environment. There are three phases of a crash event: pre-crash, crash, and post-crash. The researcher did a literature review to familiarise himself with existing research and answer research questions. The study was conducted by following the mixed-method sequential explanatory design. Data were collected over some time in two consecutive phases using a checklist and focus group discussions. This approach allowed the researcher to ensure confirmation and completeness of the results.

Results

The study found that most accidents are caused by driver carelessness followed by animals, both domestic and wild. The accidents had an impact on the health of drivers, passengers, and pedestrians. The accidents resulted in fatalities and lower limb fractures, upper limb fractures, and brain injuries. Over the past five years, Gaborone and Serowe recorded the highest cases of road traffic accidents. Most of the accidents occurred where there was no junction.

Conclusion

It is envisioned that the guidelines informed by research and literature will ensure a decrease in road traffic accidents and consequently fatalities and injuries among Botswana communities.

7.3 RECOMMENDATIONS

Human factors

- The government must introduce a penalty point system to be put on driver records when violating. The driver will be disqualified from driving if s/he accumulates specific penalty points at a specific period.
- Targeted road traffic accident interventions for at-risk groups like gender (males) and the young age groups must be rolled out to reduce the accidents. This study shows that accident dynamics alter as these factors change, considering the driver groups' varying personalities. There must be pre and post evaluations efficacy of the interventions. The interventions must include sensitization and enforcement of safe road ethics.
- The results revealed that road traffic accidents with severe injuries or fatality are affected by the week's days, with the highest vulnerability during weekends and Fridays. Therefore, this study suggests implementing strategies to prioritize road users' traffic safety. Awareness campaigns should be ongoing, so that road safety messages are inculcated continuously in the people's minds. The awareness must be heightened during the accident-prone weekends and Fridays. The study's findings highlighted the need to take urgent steps for people's safety, especially drivers and passengers, to prevent the top three injuries causing mortality and morbidity.
- There is a great need to involve those with the political muscles to advocate for parliament's sound laws. The government must provide funds for thorough training of those that will educate the people on road safety awareness.
- Strict punitive measures must be in effect to punish people who drive without a valid driver's license. This study shows that the unlicensed drivers were at risk of being involved in accidents resulting in injuries. There must be strict law enforcement to punish errant behaviours on the roads.

- There is a need for behaviour and attitude change in all the road users. This can only be achieved through education and hence the need for a task force mandated to educate the whole populace on road safety measures.
- While the media should play a pivotal role in sending road safety information to the whole populace, parents should act as role models to their children by always sticking to the safe road using rules and regulations/ leading by example.

Environmental Factors

- There is a great need to include road safety awareness in the national school curriculum to teach the children at a tender age. There is a need for citizens to have toll free numbers where they can report stray animals or unsafe behaviour on the roads.
- Domestic animal owners should put ear reflectors on domestic animals so at least one or two animals are spared, especially during night driving. Any tag that can be used should not contradict the animal cruelty law.
- New roads should be constructed with safety in mind while the old ones should be revamped. It is recommended that the government introduce toll gates to limit unnecessary travel and raise funds to repair roads and construct a safe state of the art road. When roads are being constructed, the government must not always choose the lowest bidders but must look into the reputation and experience of constructors who understand our climate.

Vehicle and equipment factors

- Vehicles must be inspected on an annual basis to check for road fitness. Importation of vehicles must be restricted to cars that are not beyond five (5) years old.
- There is a need to teach people the basics of motor vehicles before awarding them with a driver's license. Above that, basic defensive driving skills such as how to drive at night and in harsh weather conditions should be taught to all drivers. Driving schools must be regularised and registered by Botswana Qualification

Authority and must train learners even in the rainy season and during the night to practice in all weather conditions. Currently, driving schools do not train during the rainy season.

- It must be mandatory for every vehicle owner to pay insurance to cover costs if accidents happen. Insurance payments can be paired with licence renewal fees that are paid every year.

Road traffic accident surveillance system

- The statistics on road traffic accidents should be availed to everyone so that people know the intensity of the problem.
- The available data has limitations, and there is a need for strengthening the surveillance system for road traffic accidents to have reliable, accurate, and adequate data on road traffic accidents. These will be the foundation for planning evidence-based interventions to improve road safety.

7.4 LIMITATIONS

The available data from police records was not comprehensive enough to establish attitudes, driver experience, and the number of accidents recorded per individual. However, the researcher used the mixed-method sequential explanatory design in order to ensure confirmation and completeness of the results. Data on disability were missing from the police, Ministry of Health and Wellness, and MVA documents. There is a need to follow up with road traffic victims to document essential outcomes such as disability.

7.5 CONCLUSIONS

'Every accident is one too many' (Danish Ministry of Transport, 2012). This study developed guidelines for stakeholders to reduce road traffic accidents using evidence gathered from the literature, Botswana Police document analysis, and from different stakeholders involved in road traffic accident prevention. The study was an insightful tour for the researcher and the study participants in road traffic accident prevention.

BIBLIOGRAPHY

- Ackaah, W., Apuseyine, B. A & Afukaar, F. K. (2020). Road traffic crashes at night-time: characteristics and risk factors. *International journal of injury control and safety promotion*, 27(3), 392–399. <https://doi.org/10.1080/17457300.2020.1785508>
- Adeloye, D., Thompson, J. Y., Akanbi, M. A., Azuh, D., Samuel, V., Omoregbe, N & Ayo, C. K. (2016). The burden of road traffic crashes, injuries and deaths in Africa: a systematic review and meta-analysis. *Bulletin of the World Health Organization*, 94(7), 510-521A. <https://doi.org/10.2471/blt.15.163121>
- African Development Bank. (2013). *African Development Bank Mortality in Africa: The Share of Road Traffic Fatalities*.
- Afukaar, F. K. (2003). Speed control in developing countries: issues, challenges and opportunities in reducing road traffic injuries. *International Journal of Injury Control and Safety Promotion*, 10(1–2), 77–81. <https://doi.org/10.1076/icsp.10.1.77.14113>
- Agarwal, P. K., Kumar, P & Singh, H. (2020). Causes and factors in road traffic accidents at a tertiary care center of western Uttar Pradesh. *Medico-Legal Update*, 20(1), 23–25. <https://doi.org/10.37506/v20/il/2020/mlu/194290>
- Aguilera, S. L. V. U., Moysés, S. T & Moysés, S. J. (2014). Road safety measures and their effects on traffic injuries: A systematic review. *Revista Panamericana de Salud Publica/Pan American Journal of Public Health*, 36(4), 257–265.
- Ahlner, J & Holmgren, A. (2014). Prevalence of alcohol and other drugs and the concentrations in blood of drivers killed in road traffic crashes in Sweden. *Scandinavian Journal of Public Health*, 42(2), 177–183. <https://doi.org/10.1177/1403494813510792>
- Al-Abdallat, I. M., Ali, R. Al, Hudaib, A. A., Salameh, G. A. M., Salameh, R. J. M & Idhair, A. K. F. (2016). The Prevalence of Alcohol and Psychotropic Drugs in Fatalities of Road-Traffic Accidents in Jordan During 2008-2014. *Journal of Forensic and Legal Medicine*. <https://doi.org/10.1016/j.jflm.2016.01.018>
- Albert, D. A., Ouimet, M. C., Jarret, J., Cloutier, M. S., Paquette, M., Badeau, N & Brown, T. G. (2018). Linking mind wandering tendency to risky driving in young male drivers. *Accident Analysis and Prevention*. <https://doi.org/10.1016/j.aap.2017.11.019>
- Albertyn, Z., Mathews, S., Coetzee, D & Bastiaan Van As, A. (2019). Morbidity and

- mortality from road traffic crashes in children in Metro West, City of Cape Town–2014. *International Journal of Injury Control and Safety Promotion*, 26(1), 115–123. <https://doi.org/10.1080/17457300.2018.1508165>
- Alghnam, S., Towhari, J., Alkelya, M., Alsaif, A., Alrowaily, M., Alrabeeah, F & Albabtain, I. (2019). The Association between Mobile Phone Use and Severe Traffic Injuries: A Case-Control Study from Saudi Arabia. *Int. J. Environ. Res. Public Health*, 16(15).
- Al Marzooqi, A. H., Badi, M & El Jack, A. (2010). Road traffic accidents in Dubai, 2002-2008. *Asia-Pacific journal of public health*, 22(3 Suppl), 31S–39S. <https://doi.org/10.1177/1010539510372834>[Accessed on: 06 December 2019]
- Al-Thaifani, Abdulhameed Ali, Nabil Ahmed Al-Rabeei, and Abdulsalam Mohammed Dallak. 2016. “Study of the Injured Persons and the Injury Pattern in Road Traffic Accident in Sana’a City, Yemen.” *Advances in Public Health* 2016:1–5. doi: [org/10.1155/2016/4138163](https://doi.org/10.1155/2016/4138163).
- American Automobile Association Foundation for Traffic Safety. (2010). *2010 Traffic Safety Culture Index (Technical Report)*. <https://aaafoundation.org/2019-traffic-safety-culture-index/>
- Anebonam, U., Okoli, C., Ossai, P., Ilesanmi, O., Nguku, P., Nsubuga, P., ... Oyemakinde, A. (2019). Trends in road traffic accidents in Anambra State, South Eastern Nigeria: need for targeted sensitization on safe roads. *The Pan African Medical Journal*, 32(Supp 1), 12. <https://doi.org/10.11604/pamj.supp.2019.32.1.13285>
- Ansari, S., Akhdar, F., Mandoorah, M & Moutaery, K. (2000). Causes and effects of road traffic accidents in Saudi Arabia. *Public Health*, 114(1), 37–39. <https://doi.org/10.1038/sj.ph.1900610>
- Arafa, A., El-Setouhy, M & Hirshon, J. M. (2019). Driving behavior and road traffic crashes among professional and nonprofessional drivers in South Egypt. *International Journal of Injury Control and Safety Promotion*, 26(4), 372–378. <https://doi.org/10.1080/17457300.2019.1638419>
- Asefa, F., Assefa, D & Tesfaye, G. (2014). Magnitude of, trends in, and associated factors of road traffic collision in central Ethiopia. *BMC Public Health*, 14(1), 1072. <https://doi.org/10.1186/1471-2458-14-1072>

- Assari, S., Moghani Lankarani, M., Dejman, M., Farnia, M., Alasvand, R., Sehat, M., ... Ahmadi, K. (2014). Drug Use among Iranian Drivers Involved in Fatal Car Accidents. *Frontiers in Psychiatry*, 5(August), 1–6.
<https://doi.org/10.3389/fpsy.2014.00069>
- Avuglah, R.K & Harris, E., 2014. Application of ARIMA Models to Road Traffic Accident Cases in Ghana., 4(5), pp.233–239.
- Azami-Aghdash, S., Sadeghi-Bazargani, H., Saadati, M., Mohseni, M & Gharaee, H. (2020). Experts' perspectives on the application of public-private partnership policy in prevention of road traffic injuries. *Chinese Journal of Traumatology - English Edition*, 23(3), 152–158. <https://doi.org/10.1016/j.cjtee.2020.03.001>
- Bachani, A. M., Koradia, P., Herbert, H. K., Mogere, S., Akungah, D., Nyamari, J., ... Stevens, K. A. (2012). Road Traffic Injuries in Kenya: The Health Burden and Risk Factors in Two Districts. *Traffic Injury Prevention*, 13(SUPPL. 1), 24–30.
<https://doi.org/10.1080/15389588.2011.633136>
- Bahadorimonfared, A. Soori, H. Mehrabi, Y. Delpisheh, A. Esmaili, A. Salehi, M & Bakhtiyari, M., 2013. Trends of Fatal Road Traffic Injuries in Iran (2004-2011). *PLoS ONE*, 8(5), pp.1–5.
- Bahadorimonfared, A., Soori, H., Mehrabi, Y., Delpisheh, A., Esmaili, A., Salehi, M & Bakhtiyari, M. (2013). Trends of Fatal Road Traffic Injuries in Iran (2004-2011). *PLoS ONE*, 8(5), 1–5. <https://doi.org/10.1371/journal.pone.0065198>
- Bakhtari Aghdam, F., Sadeghi-Bazargani, H., Azami-Aghdash, S., Esmaeili, A., Panahi, H., Khazae-Pool, M & Golestani, M. (2020). Developing a national road traffic safety education program in Iran. *BMC public health*, 20(1), 1064.
<https://doi.org/10.1186/s12889-020-09142-1>
- Banstola, A & Mytton, J. (2017). Cost-effectiveness of interventions to prevent road traffic injuries in low- and middle-income countries: A literature review. *Traffic Injury Prevention*, 18(4), 357–362. <https://doi.org/10.1080/15389588.2016.1212165>
- Basagaña, X., Escalera-Antezana, J. P., Dadvand, P., Llatje, Ó., Barrera-Gómez, J., Cunillera, J., ... Pérez, K. (2015). High ambient temperatures and risk of motor vehicle crashes in Catalonia, Spain (2000–2011): A time-series analysis. *Environmental Health Perspectives*, 123(12), 1309–1316.
<https://doi.org/10.1289/ehp.1409223>
- Bendak, S. (2005). Seat belt utilization in Saudi Arabia and its impact on road accident

- injuries. *Accident Analysis and Prevention*, 37(2), 367–371.
<https://doi.org/10.1016/j.aap.2004.10.007>
- Bener, A. (2012). A study on road traffic crashes and injuries in Qatar as reported by drivers. *J Egypt Public Health Assoc*, 87(5), 85–89.
<https://doi.org/1097/01.EPX.0000421566.38407.94>.
- Bener, Abdulbari, Rahman, Y. S. A & Mitra, B. (2009). Incidence and severity of head and neck injuries in victims of road traffic crashes: In an economically developed country. *International Emergency Nursing*, 17(1), 52–59.
<https://doi.org/10.1016/j.ienj.2008.07.007>
- Benten, A., Hothorn, T., Vor, T & Ammer, C. (2018). Wildlife warning reflectors do not mitigate wildlife vehicle collisions on roads. *Accident Analysis and Prevention*, 120, 64–73. <https://doi.org/10.1016/j.aap.2018.08.003>
- Bhalla, K., Li, Q., Duan, L., Wang, Y., Bishai, D & Hyder, A. A. (2013). The prevalence of speeding and drink driving in two cities in China: A mid project evaluation of ongoing road safety interventions. *Injury*, 44(SUPPL. 4).
[https://doi.org/10.1016/S0020-1383\(13\)70213-4](https://doi.org/10.1016/S0020-1383(13)70213-4)
- Bon de Sousa, T., Santos, C., Mateus, C., Areal, A., Trigo, J. & Nunes, C. (2016). Road traffic accidents and self-reported Portuguese car driver's attitudes, behaviors, and opinions: Are they related? *Traffic Injury Prevention*, 17(7), 705–711. <https://doi.org/10.1080/15389588.2016.1150591>
- Bonnet, E., Lechat, L & Ridde, V. (2018). What interventions are required to reduce road traffic injuries in Africa? A scoping review of the literature. *PLoS ONE*, 13(11).
<https://doi.org/10.1371/journal.pone.0208195>
- Boswell, C & Cannon, S. (2011). *Introduction to Nursing Research: Incorporating Evidence Based Practice: Jones and Bartlett Publisher*. (Second Edition). Johns and Bartlett Publishers.
- Brink, H., Walt, C. Van der & Rensburg, G. H. Van. (2012). *Fundamentals of research methodology for health care professionals*. Juta.
- Botma, Y., Greeff, M., Mulaudzi, F & Wright, S. (2010). *Research in health sciences*. Cape Town: Clyson Printers.
- Brož, J., Kriváňová, L., Fedáková, Z., Petrosyan, L., Kvapil, M & Polák, J. (2016). Motor vehicle driving and diabetes mellitus - medical aspects. *Vnitr Lek*, 3, 223–225.

<https://doi.org/10.1016/j.trf.2006.03.003>

- Bryant, B., Mayou, R., Wiggs, L., Ehlers, A & Stores, G. (2004). Psychological consequences of road traffic accidents for children and their mothers. *Psychological Medicine*, 34(2), 335–346.
<https://doi.org/10.1017/S0033291703001053>
- Bryant, Bridget, Duthie, R & Mayou, R. (1993). Psychiatric consequences of road traffic accidents. *British Medical Journal*, 307(6905), 647–651. Retrieved from <http://ovidsp.ovid.com/ovidweb.cgi?T=JS&PAGE=reference&D=emed6&NEWS=N&AN=23264896>
- Burns, N & Grove, S. (2009). *The practice of nursing research: Appraisal, synthesis, and generation of evidence* (6th editio). St. Louis.: Saunders Elsevier.
- Canal, D., Martín, B., de Lucas, M & Ferrer, M. (2018). Dogs are the main species involved in animal-vehicle collisions in southern Spain: Daily, seasonal and spatial analyses of collisions. *Plos One*, 13(9), e0203693.
<https://doi.org/10.1371/journal.pone.0203693.s002>
- Carfora, A., Campobasso, C. Pietro, Cassandro, P., Petrella, R & Borriello, R. (2018). Alcohol and drugs use among drivers injured in road accidents in Campania (Italy): A 8-years retrospective analysis. *Forensic Science International*, 288, 291–296.
<https://doi.org/10.1016/j.forsciint.2018.05.003>
- Centre For Road Safety Transport for NSW. (2011). *Road Traffic Crashes in New South Wales: Statistical statement for the year ended 31 December 2011* (Issue December).
- Chandran, A., Kahn, G., Sousa, T., Pechansky, F., Bishai, D. M & Hyder, A. A. (2013). Impact of Road Traffic Deaths on Expected Years of Life Lost and Reduction in Life Expectancy in Brazil. *Demography*, 50(1), 229–236.
<https://doi.org/10.1007/s13524-012-0135-7>
- Chang, F. R., Huang, H. L., Schwebel, D. C., Chan, A. H. S & Hu, G. Q. (2020). Global road traffic injury statistics: Challenges, mechanisms and solutions. *Chinese Journal of Traumatology - English Edition*, 23(4), 216–218.
<https://doi.org/10.1016/j.cjtee.2020.06.001>
- Chen HY, Ivers RQ, Martiniuk AL, Boufous S, Senserrick TM, Woodward M, et al. Socio-economic status and risk of car crash injury, independent of the place of residence and driving exposure: Results from the DRIVE Study. *J Epidemiol*

- Community Health*. 2010; 64:998–1003. doi: 10.1136/jech.2009.091496. [PubMed]
- Chen HY, Senserrick TM, Martiniuk A, Ivers RQ, Boufous S, Chang HY, et al. Fatal crash trends for Australian young drivers 1997-2007: Geographic and socio-economic differentials. *J Safety Res*. 2010; 41:123–8. doi: 10.1016/j.jsr.2009.12.006. [PubMed]
- Chichester, B. M., Gregan, J. A., Anderson, D. P & Kerr, J. M. (1998). Associations between road traffic accidents and socio-economic deprivation on Scotland's West Coast. *Scottish Medical Journal*. <https://doi.org/10.1177/003693309804300503>
- Choudhary, P & Velaga, N. (2017). Mobile phone use during driving: Effects on speed and effectiveness of driver compensatory behaviour. *Accident Analysis & Prevention*, 106, 370–378.
- Collarile, P., Gobbino, I., Tripani, N., Zeriali, L., Dimai, M & Valent, F. (2014). Burden of disease attributable to road traffic accidents in the Friuli Venezia Giulia Region (Northeastern Italy). *Epidemiologia e Prevenzione*, 38(1), 29–37.
- Creswell, J. W. (2014). *Research design: Qualitative, quantitative, and mixed methods approaches*. London:Sage.
- Creswell, J. W & Creswell, D. J. (2018). *Research design: qualitative, quantitative and mixed methods approaches*. (Fifth). Los Angeles: Los Angeles, CA:Sage.
- Creswell, J. W & Plano Clark, V. L. (2011). *Designing and Conducting Mixed Methods Research*, 457.
- Creswell, J. W & Poth, C. N. (2018). *Qualitative Inquiry and Research Design: Choosing among five approaches*. (Fourth). Sage Publications, Inc., Thousand Oaks. Retrieved from <https://us.sagepub.com/en-us/nam/qualitative-inquiry-and-research-design/book246896%0Ahttps://uk.sagepub.com/en-gb/afr/qualitative-inquiry-and-research-design/book246896>
- Creswell, JW. 2014. *Research design: Qualitative, quantitative, and mixed methods approach*. London: Sage.
- Damsere-Derry, J., Palk, G & King, M. (2017). Motorists' knowledge, attitudes and practices toward alcohol-impaired driving/riding in Ghana. *Traffic Injury Prevention*, 18(1), 28–34. <https://doi.org/10.1080/15389588.2016.1193172>
- Danish Ministry of Transport. (2012). Every Accident is One Too Many: road safety starts with you. *Danish Road Safety Commission*. Danish Ministry of Transport.

- De Castro, J. R., Gallo, J & Loureiro, H. (2004). Tiredness and sleepiness in bus drivers and road accidents in Peru: A quantitative study. *Revista Panamericana de Salud Publica/Pan American Journal of Public Health*, 16(1), 11–18. <https://doi.org/10.1590/S1020-49892004000700002>
- De Silva, V., Tharindra, H., Vissoci, J. R. N., Andrade, L., Mallawaarachchi, B. C., Østbye, T & Staton, C. A. (2018). Road traffic crashes and built environment analysis of crash hotspots based on local police data in Galle, Sri Lanka. *International Journal of Injury Control and Safety Promotion*, 25(3), 311–318. <https://doi.org/10.1080/17457300.2018.1431932>
- De Vos, A. S., Strydom, H., Fouche, C & Delport, C. (2011). *Research at grass roots* (Fourth). Van Schaik.
- Deac, C & Tarnu, L. (2019). Considerations on the role of modernizing the road infrastructure in the prevention of road accidents. *MATEC Web of Conferences*, 290, 06004. <https://doi.org/10.1051/mateconf/201929006004>
- Debela, D. (2019). Review on Factors Causes Road Traffic Accident in Africa. *Journal of Architecture and Construction*, 2(3), 41-49.
- Derakhshanfar, H., Meibodi, M. K., Kariman, H., Arhamidolatabadi, A & Safari, S. (2012). Substance abuse among drivers of motor vehicle collisions. *Trauma Monthly*, 17(1), 236–238. <https://doi.org/10.5812/traumamon.4182>
- Desapriya, E., Harjee, R., Brubacher, J., Chan, H., Hewapathirane, D. S., Subzwari, S & Pike, I. (2014). Vision screening of older drivers for preventing road traffic injuries and fatalities. *Cochrane Database of Systematic Reviews*, 2014(2). <https://doi.org/10.1002/14651858.CD006252.pub4>
- Dezman, Z., de Andrade, L., Vissoci, J. R., El-Gabri, D., Johnson, A., Hirshon, J. M & Staton, C. A. (2016). Hotspots and causes of motor vehicle crashes in Baltimore, Maryland: A geospatial analysis of five years of police crash and census data. *Injury*, 47(11), 2450–2458. <https://doi.org/10.1016/j.injury.2016.09.002>
- Di Gallo, A., Barton, J & Parry-Jones, W. L. (1997). Road traffic accidents: Early psychological consequences in children and adolescents. *British Journal of Psychiatry*, 170(APR.), 358–362. <https://doi.org/10.1192/bjp.170.4.358>
- Dindi, K., Bachani, D., Singhal, M & Singh, A. R. (2019). Road traffic injuries: Epidemiology, challenges and initiatives in India. *National Medical Journal of India*, 32(2), 113–117. <https://doi.org/10.4103/0970-258X.275355>

- Domingo-Salvany, A., Herrero, M. J., Fernandez, B., Perez, J., del Real, P., González-Luque, J. C & de la Torre, R. (2017). Prevalence of psychoactive substances, alcohol and illicit drugs, in Spanish drivers: A roadside study in 2015. *Forensic Science International*, 278, 253–259. <https://doi.org/10.1016/j.forsciint.2017.07.005>
- Eid, H. O & Abu-zidan, F. M. (2017). Distraction-related road traffic collisions. *African Health Sciences*, 17(2), 491–499.
- Elliott, S., Woolacott, H & Braithwaite, R. (2009). The prevalence of drugs and alcohol found in road traffic fatalities: A comparative study of victims. *Science and Justice*, 49(1), 19–23. <https://doi.org/10.1016/j.scijus.2008.06.001>
- Elvik, R., Mysen, A & Vaa, T. (1997). *Trafi kksikkerhetshåndbok, tredje utgave [Handbook of traffic safety]* (3rd editio). Oslo: Institute of Transport Economics.
- European Transport Safety Council. (2007). *Social and Economic Consequences of Road Traffic Injury in Europe*. Brussels.
- Ezilon. (2020). Map of Botswana road networks. <https://www.ezilon.com/maps/africa/botswana-road-maps.html>
- Ferrari, D., Manca, M., Banfi, G & Locatelli, M. (2018). Alcohol and illicit drugs in drivers involved in road traffic crashes in the Milan area. *Forensic Science International*, 282, 127–131. Retrieved from <https://doi.org/10.1016/j.forsciint.2017.11.005>
- Flaherty, G. T & Choi, J. (2016). The “selfie” phenomenon: reducing the risk of harm while using smartphones during international travel. *Journal of Travel Medicine*, 23(2), tav026. <https://doi.org/10.1093/jtm/tav026>
- Garbarino, S., Magnavita, N., Guglielmi, O., Maestri, M., Dini, G., Bersi, F. M., ... Durando, P. (2017). Insomnia is associated with road accidents. Further evidence from a study on truck drivers. *PLoS ONE*, 12(10), 1–10. <https://doi.org/10.1371/journal.pone.0187256>
- Gariazzo, C., Stafoggia, M., Bruzzone, S., Pelliccioni, A & Forastiere, F. (2018). Association between mobile phone traffic volume and road crash fatalities: A population-based case-crossover study. *Accident Analysis and Prevention*, 115, 25–33. <https://doi.org/10.1016/j.aap.2018.03.008>
- Gebresenbet, R. F & Aliyu, A. D. (2019). Injury severity level and associated factors among road traffic accident victims attending emergency department of Tirunesh Beijing Hospital, Addis Ababa, Ethiopia: A cross sectional hospital-based study.

PLoS ONE. <https://doi.org/10.1371/journal.pone.0222793>

Gebru, M. K., 2017. Road traffic accident: Human security perspective. *International Journal of Peace and Development Studies*, 8(2), 15-24.

Gershon, P., Shinar, D., Oron-Gilad, T., Parmet, Y & Ronen, A. (2011). Usage and perceived effectiveness of fatigue countermeasures for professional and nonprofessional drivers. *Accident Analysis and Prevention*, 43(3), 797–803. <https://doi.org/10.1016/j.aap.2010.10.027>

Gershon, P., Sita, K. R., Zhu, C., Ehsani, J. P., Klauer, S. G., Dingus, T. A & Simons-Morton, B. G. (2019). Distracted Driving, Visual Inattention, and Crash Risk Among Teenage Drivers. *American Journal of Preventive Medicine*, 56(4), 494–500. <https://doi.org/10.1016/j.amepre.2018.11.024>

Gil-Jardiné, C., Née, M., Lagarde, E., Schooler, J., Contrand, B., Orriols, L & Galera, C. (2017). The distracted mind on the wheel: Overall propensity to mind wandering is associated with road crash responsibility. *PLoS ONE*, 12(8), 1–10. <https://doi.org/10.1371/journal.pone.0181327>

Gjerde, H., Normann, P. T., Christophersen, A. S., Samuelsen, S. O & Mørland, J. (2011). Norway Alcohol, Psychoactive Drugs and Fatal Road Traffic Accidents in Norway: A Case-Control Study - PubMed. *Accident Analysis & Prevention*, 43(3), 1197–1203.

Goniewicz, K., Goniewicz, M., Pawłowski, W & Fiedor, P. (2016). Road accident rates: strategies and programmes for improving road traffic safety. *European Journal of Trauma and Emergency Surgery*, 42(4), 433–438. <https://doi.org/10.1007/s00068-015-0544-6>

Government of Botswana. Road Traffic Act, Pub. L. No. Part 1 Section 2 (1996). Botswana.

Graham, D. J., Naik, C., McCoy, E. J & Li, H. (2019). Do speed cameras reduce road traffic collisions? *PLoS ONE*, 14(9). <https://doi.org/10.1371/journal.pone.0221267>

Greene, W. R & Smith, R. (2019). Driving in the Geriatric Population. *Clinical Geriatrics Medicine*, 35(1), 127–131. <https://doi.org/10.1016/j.cger.2018.08.011>

Gururaj, G., Uthkarsh, PS., Rao, GN., Jayaram, AN & Panduranganath, V. 2014. Burden, pattern, and outcomes of road traffic injuries in a rural district of India. *International Journal of Injury Control and Safety Promotion*, pp.1–8. Available at:

<https://www.tandfonline.com/doi/abs/10.1080/17457300.2014.945465>.(accessed on 26 July 2015).

- Haddon, W. (1983). *Approches to Preventing Injuries*. Retrieved from <http://www.iihs.org/frontend/iihs/documents/masterfiledocs.ashx?id=692>
- Haghpanahan, H., Lewsey, J., Mackay, D. F., McIntosh, E., Pell, J., Jones, A., ... Robinson, M. (2019). An evaluation of the effects of lowering blood alcohol concentration limits for drivers on the rates of road traffic accidents and alcohol consumption: a natural experiment. *The Lancet*, 393(10169), 321–329. [https://doi.org/10.1016/S0140-6736\(18\)32850-2](https://doi.org/10.1016/S0140-6736(18)32850-2)
- Hammad, H. M., Ashraf, M., Abbas, F., Bakhat, H. F., Qaisrani, S. A., Mubeen, M., ... Awais, M. (2019). Environmental factors affecting the frequency of road traffic accidents: a case study of sub-urban area of Pakistan. *Environmental Science and Pollution Research*, 11674–11685. <https://doi.org/10.1007/s11356-019-04752-8>
- Hasselberg, M & Laflamme, L. (2003). Socioeconomic background and road traffic injuries: A study of young car drivers in Sweden. *Traffic Injury Prevention*, 4(3), 249–254. <https://doi.org/10.1080/15389580309882>
- Haworth, N. L. (2000). Alcohol in motorcycle crashes. In *Proceedings of the 15th International Conference on Alcohol, Drugs and Traffic c Safety, Stockholm*. Stockholm: Swedish National Road Administration.
- Higgins, J. S., Michael, J., Austin, R., Åkerstedt, T & Hans, P. (2017). Asleep at the Wheel — The Road to Addressing Drowsy Driving. *SLEEP*, 40(2).
- Hostiuc, S., Negoii, I & Hostiuc, M. (2016). Diabetes and collision risk. A meta-analysis and meta-regression. *International Journal of Clinical Practice*, 70(July), 554–568. <https://doi.org/10.1111/ijcp.12832>
- Howard, M. E., Cori, J. M & Horrey, W. J. (2019). Vehicle and Highway Adaptations to Compensate for Sleepy Drivers. *Sleep Medicine Clinics*, 14(4), 479–489. <https://doi.org/10.1016/j.jsmc.2019.08.005>
- Hsiao, H., Chang, J & Simeonov, P. (2018). Preventing Emergency Vehicle Crashes: Status and Challenges of Human Factors Issues. *Human Factors*, 60(7), 1048–1072. <https://doi.org/10.1177/0018720818786132>
- Hu, W & McCartt, A. T. (2016). Effects of automated speed enforcement in Montgomery County, Maryland, on vehicle speeds, public opinion, and crashes. *Traffic Injury*

Prevention, 17, 53–58. <https://doi.org/10.1080/15389588.2016.1189076>

Huang, C. M., Lunnen, J. C., Miranda, J. J & Hyder, A. A. (2010). Road traffic injuries in developing countries: Research and action agenda. *Revista Peruana de Medicina Experimental y Salud Publica*. <https://doi.org/10.1590/S1726-46342010000200013>

Jackson, P., Hilditch, C., Holmes, A., Reed, N., Merat, N & Smith, L. (2011). Fatigue and Road Safety_A Critical Analysis of Recent Evidence. *Road Safety Observatory*, (December).

Johnson, B & Christensen, L. (2012). *Educational Research: Quantitative, Qualitative, and Mixed Approaches* (Fourth). Los Angeles: SAGE Publications.

Jones, A. W., Kugelberg, F. C., Holmgren, A & Ahlner, J. (2009). Five-year update on the occurrence of alcohol and other drugs in blood samples from drivers killed in road-traffic crashes in Sweden. *Forensic Science International*, 186(1–3), 56–62. <https://doi.org/10.1016/j.forsciint.2009.01.014>

Jørgenrud, B., Bogstrand, S. T., Furuhaugen, H., Jamt, R. E. G., Vindenes, V & Gjerde, H. (2018). Association between speeding and use of alcohol and medicinal and illegal drugs and involvement in road traffic crashes among motor vehicle drivers. *Traffic Injury Prevention*, 19(8), 779–785. <https://doi.org/10.1080/15389588.2018.1518577>

Kahane, C. (1986). *An evaluation of child passenger safety: The effectiveness and benefits of safety seats*. Washington,DC: US Department of Transport, National Highway Traffic Safety Administration;

Kalsi, J., Tervo, T., Bachour, A & Partinen, M. (2018). Sleep versus non sleep related fatal road accidents. *Sleep Medicine*, 51, 148–152. <https://doi.org/10.1016/j.sleep.2018.04.017>

Khan, A. A & Fatmi, Z. (2014). Strategies for prevention of road traffic injuries (RTIs) in pakistan: Situational analysis. *Journal of the College of Physicians and Surgeons Pakistan*, 24(5), 356–360. <https://doi.org/04.2014/JCPSP.356360>

Khan, M. Q & Lee, S. (2019). Gaze and eye tracking: Techniques and applications in ADAS. *Sensors (Switzerland)*, 19(24). <https://doi.org/10.3390/s19245540>

Kharya, P., Gupta, A & Solanki, H. (2013). Road Traffic Accidents So Easy To Occur So Difficult To Prevent: A Review. *International Journal of Current Research*, 5(January 2014), 858–860.

- Klauer, S. G., Guo, F., Simons-Morton, B. G., Ouimet, M. C., Lee, S. E & Dingus, T. A. (2014). Distracted driving and risk of road crashes among novice and experienced drivers. *New England Journal of Medicine*, 370(1), 54–59. <https://doi.org/10.1056/NEJMsa1204142>
- Koppel, S., Charlton, J., Kopinathan, C & Taranto, D. (2011). Are child occupants a significant source of driving distraction? *Accident Analysis and Prevention*, 43(3), 1236–1244. <https://doi.org/10.1016/j.aap.2011.01.005>
- Kourouma, K., Delamou, A., Lamah, L., Camara, B. S., Kolie, D., Sidibé, S., ... Harries, A. D. (2019). Frequency, characteristics and hospital outcomes of road traffic accidents and their victims in Guinea: a three-year retrospective study from 2015 to 2017. *BMC Public Health*, 19(1), 1022. <https://doi.org/10.1186/s12889-019-7341-9>
- Krueger, RA & Casey, MA. 2015. Focus groups. *A practical Guide for Applied Research*. 5th Edition. Sage Publications. London.
- Kuppa, S., Wang, J., Haffner, M & Eppinger, R. (2001). In: Proceedings of the 17th international technical conference on the enhanced safety of vehicles, Paper no. 457. *Lower Extremity Injuries and Associated Injury Criteria*. <http://library1.nida.ac.th/termpaper6/sd/2554/19755.pdf>
- Lefio, Á., Bachelet, V. C., Jiménez-Paneque, R., Gomolán, P & Rivas, K. (2018). A systematic review of the effectiveness of interventions to reduce motor vehicle crashes and their injuries among the general and working populations. *Revista Panamericana de Salud Publica/Pan American Journal of Public Health*, 42. <https://doi.org/10.26633/rpsp.2018.60>
- Legrand, S. A., Houwing, S., Hagenzieker, M & Verstraete, A. G. (2012). Prevalence of alcohol and other psychoactive substances in injured drivers: Comparison between Belgium and the Netherlands. *Forensic Science International*, 220(1–3), 224–231. <https://doi.org/10.1016/j.forsciint.2012.03.006>
- Lenguerrand, E., Martin, J. L., Chiron, M., Lagarde, E & Laumon, B. (2008). Road crash involvement and professional status: A prospective study using the French Gazel cohort. *Accident Analysis and Prevention*. <https://doi.org/10.1016/j.aap.2007.04.009>
- Llerena, L., Aronow, K., Macleod, J., Bard, M., Salzman, S., Greene, W., ... Schupper, A. (2015). An evidence-based review: Distracted driver. *Journal of Trauma and Acute Care Surgery*, 78(1), 147–152. <https://doi.org/10.1097/TA.0000000000000487>

- MacLean, A. W., Davies, D. R. T & Thiele, K. (2003). The hazards and prevention of driving while sleepy. *Sleep Medicine Reviews*, 7(6), 507–521.
[https://doi.org/10.1016/S1087-0792\(03\)90004-9](https://doi.org/10.1016/S1087-0792(03)90004-9)
- Maeletso, P. (2009). *Analysis of Traffic Accidents in Gaborone, Botswana*. Stellenbosch. Retrieved from <http://scholar.sun.ac.za/handle/10019.1/2395>
 [Accessed on: 21 June 2018]
- Mahfoud, Z. R., Cheema, S., Alrouh, H., Al-Thani, M. H., Al-Thani, A. A. M & Mamtani, R. (2015). Seat belt and mobile phone use among vehicle drivers in the city of Doha, Qatar: An observational study. *BMC Public Health*, 15(1).
<https://doi.org/10.1186/s12889-015-2283-3>
- Mäkinen, T & Zaidel, D. (2003). Traffic enforcement in Europe: effects, measures, needs and future. *European Union*, (April 2003), 50. Retrieved from http://virtual.vtt.fi/virtual/proj6/escape/escape_d10.pdf [Accessed on: 11 May 2020]
- Males MA. Poverty as a determinant of young drivers' fatal crash risks. *J Safety Res.* 2009; 40:443–8. doi: 10.1016/j.jsr.2009.10.001. [PubMed] [CrossRef]
- Malin, F., Norros, I & Innamaa, S. (2019). Accident risk of road and weather conditions on different road types. *Accident Analysis and Prevention*, 122(October 2018), 181–188. <https://doi.org/10.1016/j.aap.2018.10.014>
- Mangiaracina, G & Palumbo, L. (2007). Smoking while driving and its consequences on road safety. *Annali Di Igiene : Medicina Preventiva e Di Comunita*, 19(3), 253–267. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/17658112> [Accessed on: 13 October 2019]
- Martin, A., Lagarde, E & Salmi, L. R. (2018). Burden of road traffic injuries related to delays in implementing safety belt laws in low- and lower-middle-income countries. *Traffic Injury Prevention*, 19, S1–S6.
<https://doi.org/10.1080/15389588.2017.1344354>
- Matthews, R. W., Ferguson, S. A., Zhou, X., Kosmadopoulos, A., Kennaway, D. J & Roach, G. D. (2012). Simulated driving under the influence of extended wake, time of day and sleep restriction. *Accident Analysis and Prevention*, 45(SUPPL.), 55–61.
<https://doi.org/10.1016/j.aap.2011.09.027>
- Mayou, R & Bryant, B. (2003). Consequences of road traffic accidents for different types

of road user. *Injury*, 34(3), 197–202. [https://doi.org/10.1016/S0020-1383\(02\)00285-1](https://doi.org/10.1016/S0020-1383(02)00285-1)

Mazurek, A. J. (1994). Epidemiology of paediatric injury. *Journal of Accident and Emergency Medicine*, 11(1), 9–16. <https://doi.org/10.1136/emj.11.1.9>

Mclean, J & Kloeden, C. (2002). Travelling Speed and the Risk of Crash Involvement. *Transportation Research Record*, 1(61), 73-79. Retrieved from http://www.infrastructure.gov.au/roads/safety/publications/2001/Rural_Speed_1.aspx [Accessed on: 27 April 2020]

Merat, N & Jamson, A. H. (2013). The effect of three low-cost engineering treatments on driver fatigue: A driving simulator study. *Accident Analysis and Prevention*, 50, 8–15. <https://doi.org/10.1016/j.aap.2012.09.017>

Merriam, S. B & Tisdell, E. J. (2016). *Qualitative: a guide to design and implementation* (Fourth). San Francisco: Jossey Bass.

Mock, C. N., Boland, E., Acheampong, F & Adjei, S. (2003). Long-term injury related disability in Ghana. *Disability and Rehabilitation*, 25(13), 732–741. <https://doi.org/10.1080/0963828031000090524>

Moore-Ede, M., Heitmann, A., Guttkuhn, R., Trutschel, U., Aguirre, A & Croke, D. (2004). Circadian alertness simulator for fatigue risk assessment in transportation: application to reduce frequency and severity of truck accidents. *Aviation, space, and environmental medicine*, 75(3 Suppl), A107–A118 [Accessed on: 11 July 2019]

Mphela, T. (2011). The impact of traffic law enforcement on road accident fatalities in Botswana. *Journal of Transport and Supply Chain Management*, 5(1), 264–277. Doi:[10.4102/JTSCM.V5I1.77](https://doi.org/10.4102/JTSCM.V5I1.77)

Museru, L., Leshabari, M. T & Mbembati, N. A. A. (2002). Patterns of road traffic injuries and associated factors among school-aged children in Dar es Salaam, Tanzania: Short research article. *African Safety Promotion*, 1(1), 37–41.

MVA Fund. (2012). *Annual Road Crash & Claims Report 2012*. Gaborone.

MVA Fund. (2013). *Motor Vehicle and Accident Fund Annual Road Crash Claims Report*. Gaborone.

MVA. (2016). *Road crush and claims report 2016*.

MVA Fund. (2019). Annual report. Gaborone

MVA Fund. (2019). *Motor Vehicle and Accident Fund Annual Road Crash Claims*

Report. Gaborone.

- Nabi, H., Salmi, L. R., Lafont, S., Chiron, M., Zins, M & Lagarde, E. (2007). Attitudes associated with behavioral predictors of serious road traffic crashes: Results from the GAZEL cohort. *Injury Prevention*, 13(1), 26–31.
<https://doi.org/10.1136/ip.2006.013342>
- Nantulya, V. M., & Reich, M. R. (2002). The neglected epidemic: road traffic injuries in developing countries. *BMJ: British Medical Journal*, 324(7346), 1139.
<https://doi.org/10.1136/bmj.324.7346.1139>
- Naqvi, N. K., Quddus, M. A & Enoch, M. P. (2020). Do higher fuel prices help reduce road traffic accidents? *Accident Analysis and Prevention*, 135.
<https://doi.org/10.1016/j.aap.2019.105353>
- National Sleep Foundation. (2008). State of The States Report on Drowsy Driving. *The National Sleep Foundation*, (November 2007),
<http://www.drowsydriving.org/stateofthestatesrepor>. [Accessed on: 18 July 2019]
- Nazif-Munoz, J. I., Quesnel-Vallée, A & Van Den Berg, A. (2015). Did Chile's traffic law reform push police enforcement? Understanding Chile's traffic fatalities and injuries reduction. *Injury Prevention*, 21(3), 159–165. <https://doi.org/10.1136/injuryprev-2014-041358>
- Nazif-Muñoz, J. I., Quesnel-Vallée, A & Van den Berg, A. (2014). Explaining Chile's Traffic Fatality and Injury Reduction for 2000–2012. *Traffic Injury Prevention*, 15, S56–S63. <https://doi.org/10.1080/15389588.2014.939270>
- Née, M., Contrand, B., Orriols, L., Gil-Jardiné, C., Galéra, C & Lagarde, E. (2019). Road safety and distraction, results from a responsibility case-control study among a sample of road users interviewed at the emergency room - ScienceDirect. *Accid Anal Prev.*, 122, 19–24. <https://doi.org/10.1016/j.aap.2018.09.032>
- Ngunde, P. J., Akongnwi, A. C. N., Mefire, C. A., Puis, F., Gounou, E., Nkfusai, N. C., ... Cumber, S. N. (2019). Prevalence and pattern of lower extremity injuries due to road traffic crashes in fako division, Cameroon. *Pan African Medical Journal*, 32. <https://doi.org/10.11604/pamj.2019.32.53.17514>
- NICE. (2014). Quality standards process guide. Available online:
<http://www.nice.org.uk/standards-and-indicators> (accessed September 2020).
- Nogueira, X. R & Mennis, J. (2019). The effect of brick and granite block paving

- materials on traffic speed. *International Journal of Environmental Research and Public Health*, 16(19). <https://doi.org/10.3390/ijerph16193704>
- Orriols, L., Delorme, B., Gadegbeku, B., Tricotel, A., Contrand, B., Laumon, B., ... Lagarde, E. (2010). Prescription medicines and the risk of road traffic crashes: A French registry-based study. *PLoS Medicine*, 7(11), 5–14. <https://doi.org/10.1371/journal.pmed.1000366>
- Oviedo-Trespalacios, O., Haque, M. M., King, M. & Washington, S. (2017). Effects of road infrastructure and traffic complexity in speed adaptation behaviour of distracted drivers. *Accident Analysis and Prevention*. <https://doi.org/10.1016/j.aap.2017.01.018>
- Oxford English Dictionary. (2012). Paperback Oxford English dictionary. Oxford: Oxford University Press. <https://doi.org/10.1093/nq/s8-IX.229.384-f>
- Papalimperi, A. H., Athanaselis, S. A., Mina, A. D., Papoutsis, I. I., Spiliopoulou, C. A & Papadodima, S. A. (2019). Athens Incidence of Fatalities of Road Traffic Accidents Associated with Alcohol Consumption and the Use of Psychoactive Drugs: A 7-year Survey (2011-2017). *Experimental and Therapeutic*, 18(3), 2299–2306.
- Parahoo, K. (2014). *Nursing Research: Principles, Process and Issues*. (Third). London: Palgrave Macmillan.
- Parvareh, M., Karimi, A., Rezaei, S., Woldemichael, A., Nili, S., Nouri, B & Nasab, N. E. (2018). Assessment and prediction of road accident injuries trend using time-series models in Kurdistan. *Burns & Trauma*, 6(1), 1–8. <https://doi.org/10.1186/s41038-018-0111-6>
- Pawłowski, W., Goniewicz, K., Schwebel, D. C., Shen, J & Goniewicz, M. (2019). Road traffic injuries in Poland: magnitude and risk factors. *European Journal of Trauma and Emergency Surgery*, 45(5), 815–820. <https://doi.org/10.1007/s00068-019-01093-6>
- Pebalo, F., Kwikiriza, N., Kiyita, C., Mahaba, T., Muwanga, E., Tinka, A., ... Odongo-Aginya, E. (2012). Risk factors for road traffic accidents in Gulu municipality, Uganda. *East Afr Med J.*, 89(10), 345–350.
- Peltzer, K. & Renner, W. (2004). Psychosocial correlates of the impact of road traffic accidents among South African drivers and passengers. *Accident Analysis and Prevention*, 36(3), 367–374. [https://doi.org/10.1016/S0001-4575\(03\)00017-4](https://doi.org/10.1016/S0001-4575(03)00017-4)

- Perrels, A., Votsis, A., Nurmi, V. & Pilli-Sihvola, K. (2015). Weather conditions, weather information and car crashes. *ISPRS International Journal of Geo-Information*, 4(4), 2681–2703. <https://doi.org/10.3390/ijgi4042681>
- Pilkington, P & Kinra, S. (2005). Effectiveness of speed cameras in preventing road traffic collisions and related casualties: Systematic review. *British Medical Journal*, 330(7487), 331–334. <https://doi.org/10.1136/bmj.38324.646574.AE>
- Polit, D.F & Beck, C. T. (2012). *Nursing research: Generating and assessing evidence for nursing practice*. (9th Edition). Philadelphia, PA: Wolters Kluwer.
- Polit, D. F & Beck, C. T. (2017). *Nursing Research: Generating and Assessing Evidence for Nursing Practice*. Philadelphia:Wolters Kluwer Health (Tenth). Philadelphia: Wolters Kluwer Health. <https://doi.org/10.1016/j.nepr.2013.04.001>
- Rahimi, E., Shamshiripour, A., Samimi, A & Mohammadian, A. (Kouros). (2020). Investigating the injury severity of single-vehicle truck crashes in a developing country. *Accident Analysis and Prevention*, 137. <https://doi.org/10.1016/j.aap.2020.105444>
- Qaseem, A., Forland, F., Macbeth, F., Ollenschläger, G., Phillips, S., van der Wees, P & Board of Trustees of the Guidelines International Network (2012). Guidelines International Network: toward international standards for clinical practice guidelines. *Annals of internal medicine*, 156(7), 525–531. <https://doi.org/10.7326/0003-4819-156-7-201204030-00009>
- Rhodes, N & Pivik, K., 2011. Age and gender differences in risky driving: The roles of positive affect and risk perception. *Accident Analysis and Prevention*, 43(3), pp.923–931. Available at: <http://dx.doi.org/10.1016/j.aap.2010.11.015>.(accessed on 24 June 2015). of Injury Control and Safety Promotion, 12, 85-91. <http://dx.doi.org/10.1080/15660970500086130>
- Rolison, J. J., Regev, S., Moutari, S & Feeney, A. (2018a). What are the factors that contribute to road accidents? An assessment of law enforcement views, ordinary drivers' opinions, and road accident records. *Accident Analysis and Prevention*, 115(August 2017), 11–24. <https://doi.org/10.1016/j.aap.2018.02.025>
- Rolison, J. J., Regev, S., Moutari, S & Feeney, A. (2018b). What are the factors that contribute to road accidents? An assessment of law enforcement views, ordinary drivers' opinions, and road accident records. *Accident Analysis and Prevention*, 115, 11–24. <https://doi.org/10.1016/j.aap.2018.02.025>

- Ross-Kerr, J., & Wood, M. J. (2011). Basic Steps in Planning Nursing Research: From Question to Proposal. *The American Journal of Nursing*, 209.
<https://doi.org/10.2307/3462174>
- Rosso, G., Candura, S., Perotto, M., Caramella, M & Montomoli, C. (2018). Falling asleep at the wheel and distracted driving. *Med Lav*, 109(3), 190–200.
<https://doi.org/10.23749/mdl.v109i3.6731>
- Sadeghi-Bazargani, H., Ayubi, E., Azami-Aghdash, S., Abedi, L., Zemestani, A., Amanati, L., ... Safiri, S. (2016). Epidemiological patterns of road traffic crashes during the last two decades in Iran: A review of the literature from 1996 to 2014. *Archives of Trauma Research*, 5(3). <https://doi.org/10.5812/atr.32985>
- Sadeghnejad, F., Niknami, S., Hydarnia, A. & Montazeri, A. (2014). Seat-belt use among drivers and front passengers: An observational study from the Islamic Republic of Iran. *Eastern Mediterranean Health Journal*, 20(8), 491–497.
<https://doi.org/10.26719/2014.20.8.491>
- Sagberg, F. (2018). Characteristics of fatal road crashes involving unlicensed drivers or riders: Implications for countermeasures. *Accident Analysis and Prevention*, 117, 270–275. <https://doi.org/10.1016/j.aap.2018.04.025>
- Schoonenboom, J & Johnson, R. B. (2017). How to Construct a Mixed Methods Research Design. *Köln Z Soziol*, 69(2), 107–131. <https://doi.org/10.1007/s11577-017-0454-1>
- Sebego, M., Naumann, R. B., Rudd, R. A., Voetsch, K., Dellinger, A. M & Ndlovu, C. (2014). The impact of alcohol and road traffic policies on crash rates in Botswana, 2004-2011: A time-series analysis. *Accident Analysis and Prevention*, 70, 33–39.
<https://doi.org/10.1016/j.aap.2014.02.017>
- Seid, M., Azazh, A., Enquesselassie, F & Yisma, E. (2015). Injury characteristics and outcome of road traffic accident among victims at Adult Emergency Department of Tikur Anbessa specialized hospital, Addis Ababa, Ethiopia: A prospective hospital-based study. *BMC Emergency Medicine*, 15(1). <https://doi.org/10.1186/s12873-015-0035-4>
- Severin, L., Ben, N., Nlandu, M & Ngatu, R. (2016). Frequency causes and human impact of motor vehicle-related road traffic accident (RTA) in Lubumbashi , Democratic Republic of Congo. *Environmental Health and Preventive Medicine*, 21(5), 350–355. <https://doi.org/10.1007/s12199-016-0536-0>

- Schünemann, H. J., Wiercioch, W., Etxeandia, I., Falavigna, M., Santesso, N., Mustafa, R., Ventresca, M., Brignardello-Petersen, R., Laisaar, K. T., Kowalski, S., Baldeh, T., Zhang, Y., Raid, U., Neumann, I., Norris, S. L., Thornton, J., Harbour, R., Treweek, S., Guyatt, G., Alonso-Coello, P., ... Akl, E. A. (2014). Guidelines 2.0: systematic development of a comprehensive checklist for a successful guideline enterprise. *CMAJ : Canadian Medical Association journal = journal de l'Association medicale canadienne*, 186(3), E123–E142. <https://doi.org/10.1503/cmaj.131237>
- Shahbazi, F., Saeed, S., Nazari, H., Soori, H & Khodakarim, S. (2019). Socioeconomic Inequality in Mortality from Road Traffic Accident in Iran ARTICLE INFORMATION ABSTRACT. *JRHS Journal of Research in Health Sciences Mortality from Road Traffic Accident in Iran. J Res Health Sci*, 19(1), 437. Retrieved from www.umsha.ac.ir/jrhs [Accessed on: 26 July 2019]
- Sheng, R., Zhong, S., Barnett, A. G., Weiner, B. J., Xu, J., Li, H., ... Huang, C. (2018). Effect of traffic legislation on road traffic deaths in Ningbo, China. *Annals of Epidemiology*, 28(8), 576–581. <https://doi.org/10.1016/j.annepidem.2018.04.004>
- Shyhalla, K. (2014). Alcohol Involvement and Other Risky Driver Behaviors: Effects on Crash Initiation and Crash Severity. *Traffic Injury Prevention*, 15(4), 325–334. <https://doi.org/10.1080/15389588.2013.822491>
- Singh, J., Sahni, M., Bilquees, S., Khan, S., & Haq, I. (2016). Reasons for road traffic accidents;victims' perspective. *International Journal of Medical Science and Public Health*, 5(4), 814. <https://doi.org/10.5455/ijmsph.2016.07112015357>
- Sisimwo, P. K., Mwaniki, P. K & Bii, C. (2014). Crash characteristics and injury patterns among commercial motorcycle users attending Kitale level IV district hospital, Kenya. *Pan African Medical Journal*, 19. <https://doi.org/10.11604/pamj.2014.19.296.4885>
- Soole, D. W., Watson, B. C & Fleiter, J. J. (2013). Effects of average speed enforcement on speed compliance and crashes: A review of the literature. *Accident Analysis and Prevention*, 54, 46–56. <https://doi.org/10.1016/j.aap.2013.01.018>
- Soori, H., & Khorasani-zavareh, D. (2019). Road traffic injuries measures in the Eastern Mediterranean Region: findings from the Global Status Report on Road Safety – 2015. *Journal of Injury and Violence Research*, 11(2), 149–158. <https://doi.org/10.5249/jivr.v11i2.1122>

- Statistics Botswana. (2016). *Transport & Infrastructure Statistics Report*.
- Staton, C., Vissoci, J., Gong, E., Toomey, N., Wafula, R., Abdelgadir, J., ... Hocker, M. (2016). Road traffic injury prevention initiatives: A systematic review and metasummary of effectiveness in low and middle-income countries. *PLoS ONE*, *11*(1). <https://doi.org/10.1371/journal.pone.0144971>
- Steels, S., Van der Zande, M., & van Staa, T. P. (2019). The role of real-world data in the development of treatment guidelines: a case study on guideline developers' opinions about using observational data on antibiotic prescribing in primary care. *BMC health services research*, *19*(1), 942. <https://doi.org/10.1186/s12913-019-4787-5>
- Stevens, S. E., Schreck, C. J., Saha, S., Bell, J. E & Kunkel, K. E. (2019). Precipitation and fatal motor vehicle crashes: Continental analysis with high-resolution radar data. *Bulletin of the American Meteorological Society*, *100*(8), 1453–1461. <https://doi.org/10.1175/BAMS-D-18-0001.1>
- Stevenson, M & Thompson, J. (2014). On the road to prevention: Road injury and health promotion. *Health Promotion Journal of Australia*, *25*(1), 4–7. <https://doi.org/10.1071/HE13075>
- Stewart, M., Negin, J., Farrell, P., Houasia, P & Munamua, A.. (2015). Extent causes and impact of road traffic crashes in the Solomon Islands 1993-2012: data from the orthopaedic department at the National Referral Hospital, Honiara. *Rural and Remote Health*, *15*(3), 2945. Retrieved from <http://ovidsp.ovid.com/ovidweb.cgi?T=JS&PAGE=reference&D=emed16&NEWS=N&AN=615697941>
- Sundfør, H., Sagberg, F & Høye, A. (2019). Inattention and distraction in fatal road crashes - Results from in-depth crash investigations in Norway. *Accid Anal Prev.*, *125*, 152–157. <https://doi.org/10.1016/j.aap.2019.02.004>.
- Suriyawongpaisal, P & Kanchanasut, S. (2003). Road traffic injuries in Thailand: trends, selected underlying determinants and status of intervention. *Injury Control and Safety Promotion*, *10*(1–2), 95–104. <https://doi.org/10.1076/icsp.10.1.95.14110>
- Szklo, M & Nieto, F. J. (2014). *Epidemiology: Beyond the basics*. Jones and Bartlett learning (Third Edit). Jones and Bartlett learning. Retrieved from www.jblearning.com. [Accessed on: 08 July 2019]

- Tavakol, M., & Dennick, R. (2011). Making sense of Cronbach's alpha. *International Journal of Medical Medication*, 2, 53–55. <https://doi.org/10.5116/ijme.4dfb.8dfd>
- Teufer, B., Nußbaumer-Streit, B., Ebenberger, A., Titscher, V., Conrad, S., Langer, G., Töws, I & Gartlehner, G. (2019). GRADE-Leitlinien zu Gerechtigkeit 1. Berücksichtigung der Gerechtigkeit im Gesundheitswesen bei der Entwicklung von GRADE-Leitlinien: Einführung und Hintergründe [GRADE equity guidelines 1: Considering health equity in GRADE guideline development - introduction and rationale]. *Zeitschrift für Evidenz, Fortbildung und Qualität im Gesundheitswesen*, 146, 53–59. <https://doi.org/10.1016/j.zefq.2019.08.002>
- Theofilatos, A & Yannis, G. (2014). A review of the effect of traffic and weather characteristics on road safety. *Accident Analysis and Prevention*, 72, 244–256. <https://doi.org/10.1016/j.aap.2014.06.017>
- Theofilatos, A., Ziakopoulos, A., Papadimitriou, E & Yannis, G. (2018). How many crashes are caused by driver interaction with passengers? A meta-analysis approach; *Journal of Safety Research*, 65, 11–20. <https://doi.org/doi.org/10.1016/j.jsr.2018.02.001>
- Thomas, P & Frampton, R. (1999). 43rd Stapp Car Crash Conference, P-350, 99SC02. *Injury Patterns In Side Collisions - A New Look With Reference To Current Test Methods And Injury Criteria*, 99, 1–12. <https://doi.org/10.4271/99sc01>
- Trochim, W. (2020). Positivism & Post-Positivism | Research Methods Knowledge Base. Retrieved July 5, 2020, from <https://conjointly.com/kb/positivism-and-post-positivism/%0Ahttps://socialresearchmethods.net/kb/positivism-and-post-positivism/>
- Unrau, Y. A., Gabor, P & Grinnell, R. M. (2007). *Evaluation in Social Work: The Art and Science of Practice*. (4th Edition). New York: Oxford University Press.
- Urie, Y., Velaga, N. R & Maji, A. (2016). Cross-sectional study of road accidents and related law enforcement efficiency for 10 countries: A gap coherence analysis. *Traffic Injury Prevention*, 17(7), 686–691. <https://doi.org/10.1080/15389588.2016.1146823>
- Valen, A., Bogstrand, S. T., Vindenes, V., Frost, J., Larsson, M., Holtan, A & Gjerde, H. (2019). Driver-related risk factors of fatal road traffic crashes associated with alcohol or drug impairment. *Accident Analysis and Prevention*, 131, 191–199. <https://doi.org/10.1016/j.aap.2019.06.014>
- Vanlaar, W. G. M., Barrett, H., Hing, M. M., Brown, S. W & Robertson, R. D. (2019).

- Canadian wildlife-vehicle collisions: An examination of knowledge and behavior for collision prevention. *Journal of Safety Research*, 68, 181–186.
<https://doi.org/10.1016/j.jsr.2018.12.003>
- Verster, J. C., Veldhuijzen, D. S & Volkerts, E. R. (2004). Residual effects of sleep medication on driving ability. *Sleep Medicine Reviews*, 8(4), 309–325.
<https://doi.org/10.1016/j.smr.2004.02.001>
- Vissoci, J. R. N., Shogilev, D. J., Krebs, E., Andrade, L. de, Vieira, I. F., Toomey, N., ... Staton, C. A. (2017). Road traffic injury in sub-Saharan African countries: A systematic review and summary of observational studies. *Traffic Injury Prevention*, 18(7), 767–773. <https://doi.org/10.1080/15389588.2017.1314470>
- Wangdi, C., Gurung, M. S., Duba, T., Wilkinson, E., Tun, Z. M & Tripathy, J. P. (2018). Burden, pattern and causes of road traffic accidents in Bhutan, 2013–2014: a police record review. *International Journal of Injury Control and Safety Promotion*, 25(1), 65–69. <https://doi.org/10.1080/17457300.2017.1341930>
- Whitelegg, J. (1987). A geography of road traffic accidents. *Transactions - Institute of British Geographers*, 12(2), 161–176. <https://doi.org/10.2307/622525>
- WHO. (2011). *Global plan for the Decade of Action for Road Safety 2011–2020*. Geneva: WHO. Gene. Retrieved from <http://scholar.google.com/scholar?hl=en&btnG=Search&q=intitle:Global+Plan+for+the+Decade+of+Action+for+Road+Safety+2011-2020#0> [Accessed on: 17 July 2019]
- WHO. (2018). *Global status report on road safety 2018*. Geneva. Retrieved from https://www.who.int/violence_injury_prevention/road_safety_status/2018/en/ [Accessed on: 08 September 2019]
- WHO. (2020). Fact sheets: Road Traffic Injuries. World Health Organization. <https://doi.org/10.1016/B978-0-12-803678-5.00391-X>
- Williamson, A., Friswell, R., Olivier, J & Grzebieta, R. (2014). Are drivers aware of sleepiness and increasing crash risk while driving? *Accident Analysis and Prevention*, 70, 225–234. <https://doi.org/10.1016/j.aap.2014.04.007>
- Wilson, C., Willis, C., Hendrikz, J. K., Le Brocque, R & Bellamy, N. (2010). Speed cameras for the prevention of road traffic injuries and deaths. *Cochrane Database of Systematic Reviews*. <https://doi.org/10.1002/14651858.cd004607.pub4>

- Wismans, J., Skogsmo, I., Nilsson-Ehle, A., Lie, A., Thynell, M & Lindberg, G. (2016). Commentary: Status of road safety in Asia. *Traffic Injury Prevention*, 17(3), 217–225. <https://doi.org/10.1080/15389588.2015.1066498>
- World Bank. (2009). *Confronting “Death on Wheels”: Making Roads Safe in Europe and Central Asia*. Washington,DC. Retrieved from <http://web.worldbank.org/WBSITE/EXTERNAL/COUNTRIES/ECAEXT/0,,contentMDK:22438328~pagePK:146736~piPK:226340~theSitePK:258599,00.html>
- World Bank. (2017). *The high toll of Traffic Injuries: Unacceptable and preventable*. Washington. Retrieved from <https://openknowledge.worldbank.org/bitstream/handle/10986/29129/HighTollofTrafficInjuries.pdf?sequence=5&isAllowed=y>
- World Bank. (2020). *Guide for road safety opportunities and challenges: Low and Middle-income country profiles*. Washington,DC. Retrieved from <http://documents1.worldbank.org/curated/en/447031581489115544/pdf/Guide-for-Road-Safety-Opportunities-and-Challenges-Low-and-Middle-Income-Country-Profiles.pdf> [Accessed on: 10 November 2020]
- World Health Organisation. 2021. “Health Topics/Road Traffic Injuries.” *WHO*. https://www.who.int/health-topics/road-safety#tab=tab_1 (February 17, 2021).
- World Health Organization. (2016). Decade of Action for Road Safety 2011-2020. Retrieved July 3, 2020, from http://www.who.int/roadsafety/decade_of_action/en/
- World Health Organisation. (2013). Global Status Report on Road Safety Supporting A Decade of Action. https://doi.org/http://www.who.int/violence_injury_prevention/road_safety_status/2013/en/index.html
- World Health Organisation. (2015). Global status report on road safety 2015. In *WHO Library Cataloguing-in-Publication Data* (Vol. 19, Issue 2). <https://doi.org/10.1136/injuryprev-2013-040775>
- World Health Organisation. (2009). Global Status Report on road safety:time for action. In *WHO Library Cataloguing-in-Publication Data* (Vol. 13, Issue 5). <http://ra.ocls.ca/ra/login.aspx?url=http://search.ebscohost.com/login.aspx?direct=true&db=enr&AN=56097888&site=ehost-live>
- Wu, C. Y. H., Zaitchik, B. F & Gohlke, J. M. (2018). Heat waves and fatal traffic crashes in the continental United States. *Accident Analysis and Prevention*, 119, 195–201.

<https://doi.org/10.1016/j.aap.2018.07.025>

Yamane, T. (1967). *Statistics, an introductory analysis*. New York: Harper and Row.

Yang, B. M & Kim, J. (2003). Road traffic accidents and policy interventions in Korea. *Injury Control and Safety Promotion*, 10(1–2), 89–94.

<https://doi.org/10.1076/icsp.10.1.89.14120>

Young, K & Salmon, P. (2015). Sharing the responsibility for driver distraction across road transport systems: A systems approach to the management of distracted driving. *Accident Analysis & Prevention*, 74, 350–359.

Zampetti, R. Messina, G., Quercioli, C., Vencia, F., Genco, L., Bartolomeo, L. Di & Nante, N. (2013). Nonfatal Road Traffic Injuries: Can Road Safety Campaigns Prevent Hazardous Behavior? An Italian Experience. *Traffic Injury Prevention*, 14(3), 261–266. <https://doi.org/10.1080/15389588.2012.705189>

Zhang, G., Yau, K. K., Zhang, X & Li, Y. (2016). Traffic accidents involving fatigue driving and tier extent of casualties. *Accident Analysis & Prevention*, 87, 3442. <https://doi.org/10.1016/j.aap.2015.10.033>

Zhang, L., Cui, B., Yang, M., Guo, F & Wang, J. (2019). Effect of using mobile phones on driver's control behavior based on naturalistic driving data. *International Journal of Environmental Research and Public Health*, 16(8), 1–13.

<https://doi.org/10.3390/ijerph16081464>

Zheng, H., Qin, Y., Guo, F., Xiong, J., Xu, B & Chen, Y. (2018). Speed and reaction behavior in different highway landscapes: A driving simulator study. *Traffic Injury Prevention*, 19(8), 880–884. <https://doi.org/10.1080/15389588.2018.1511897>

Annexures

Annexure A

DEVELOPMENT OF GUIDELINES TO REDUCE ROAD ACCIDENTS AMONGST AUTOMOBILE DRIVERS

CHECKLIST FOR DOCUMENT ANALYSIS

Student number 4 2 2 0 7 7 5 4

Name Roy Tapera

Date of Survey Administration: (Date/Month/Year)

HUMAN FACTORS CONTRIBUTING TO ROAD TRAFFIC ACCIDENTS			
1	Involved in a car crash whilst driving?	Yes	1
		No	0
2	If yes, when was it?	Last 3 months	1
		Last year	2
		Last 3 years	3
		More than 3 years	4
3	Number of times involved in the road accidents	Once	1
		Twice	2
		Three times or more	3
4	Age of the person involved in an accident.	<input type="text"/> <input type="text"/>	
5	Gender	Male	1
		Female	2
6	a. Employment status employed/self-employed?	Yes	1
		No	0
	b. Occupation	Specify.....	
7	Level of education status	Primary	1
		Secondary	2
		Tertiary	3
		Non-formal	4
		Other (please specify)	5

8	The driver had a driver's licence.	Yes	1
		No	0
9	If yes, when did he/she get the driver's licence?	_ / _ (month/year)	
10	Driver under the influence of drugs or alcohol.	Yes	1
		No	0

DRIVER DISTRACTIONS

11	The cause of accident	Cell phone use	1
		Careless driving	2
		Pedestrian error	3
		Over speeding	4
		Vehicle defect	5
		Fail to give priority	6
		Road defect	7

VEHICLE AND EQUIPMENT FACTORS

12	Mode of transport	Car/van –as driver	1
		Car/van – as a passenger	2
		Motorcycle	3
		Taxi/Minicab	4
		Bicycle	5
		Bus	6
		Plane (domestic/internal planes)	7
13	Condition of the vehicle	Roadworthy	1
		Not roadworthy	2
14	The brakes in good conditions	No	0
		Yes	1
15	If during the night were the lightening of the car working properly	No	0
		Yes	1
16	Speed management	Normal	1
		Above speed limit	2
		Below speed limit	3

17	Special conditions at the site just before the accident .		Pedestrian on the way								1
			An object on the way								2
			Vehicle on the way								3
			Overtaking								4
			Animal stray								5
			Other								6
18	Impact of road traffic accidents on the health of victims										
	Mortality (death was recorded)		No								0
			Yes								1
	Morbidity (Injuries recorded)		No								0
			Yes								1
19	Road traffic accidents statistics for the past 10 years										
	District	2019	2018	2017	2016	2015	2014	2013	2012	2011	2010

Annexure B 1

DEVELOPMENT OF GUIDELINES TO REDUCE ROAD ACCIDENTS AMONGST AUTOMOBILE DRIVERS IN BOTSWANA.

INTERVIEW GUIDE

Interview guide for focus group discussion with stakeholders (Police, traffic officers, lawyers, third party claims officers, MVA officers, emergency department nurses/doctors).

All information herewith provided will be treated confidentially. It is not necessary to indicate your name or personal information on this interview guide

INSTRUCTIONS

1. Answer all questions
2. Answer all questions as honestly, objectively as possible
3. Answer according to your personal opinion, knowledge, and experience

<p>Introduction Key Components Thank you Your Name Purpose Confidentiality Duration How discussion will be conducted Opportunity for questions Signature of consent</p>	<p>I want to thank you for taking the time to meet with me today. My name is Roy Tapera, and I would like to talk to you about your views on the causes of road traffic accidents. My intention is to use that information to develop a guideline to prevent Road traffic accidents. The discussion should take less than an hour. I will be recording the tape recorder session because I do not want to miss your comments. Although I will be taking some notes during the session, I cannot possibly write fast enough to get it all down. Because we're on tape, please be sure to speak up so that we do not miss your comments. All responses will be kept confidential. This means that your interview responses will only be shared with research team members. We will ensure that any information we include in our report does not identify you as the participant. Remember, you don't have to talk about anything you don't want to, and you may end the discussion at any time.</p> <p>Are there any questions about what I have just explained? Are you willing to participate in this focus group discussion?</p> <p>_____ Interviewee Witness _____ Date _____</p>
<p>Questions</p>	<ol style="list-style-type: none"> 1. How safe do you think people are using the roads in Botswana? Why do you say so? 2. Have you dealt with people who have been involved in a road traffic accident in Botswana? <ol style="list-style-type: none"> a. If so, can you tell me what happened? 3. Which road are user groups most at risk in Botswana to get involved in road traffic accidents? (Probe for passengers, drivers, pedestrians - age and gender groups, vehicle types-bicycles, motorcycles, motor cars, minibus-taxis, trucks, buses). 4. What do you think are the main reasons for road traffic accidents on Botswana roads? (Probe for Human factors, Vehicle factors, Road factors, Environmental factors, Social Factors, etc.)

	<p>5. What do you think should be done in the future to reduce road accidents on Botswana roads? (Probe for Human factors, Vehicle factors, Road factors, Environmental factors, Social Factors, etc.)</p> <p>6. Are there any problems with implementing traffic safety measures?</p> <p>7. What are your views regarding law enforcement related to road traffic accidents?</p> <p>8. Do you think there have been any changes in road traffic accident statistics for the last ten years?</p> <p>More probes will also be guided by the participants' response</p>
<p>Closing Components:</p> <ul style="list-style-type: none"> •Additional comments • Next steps • Thank you 	<p>Key</p> <p>Is there anything more you would like to add?</p> <p>Thank you for your time.</p>

Annexure B 2

FOCUS GROUP 2 DISCUSSION TRANSCRIPTION

TIME: 74 minutes

I: Interviewer

P: Participant

I: I would like to thank you for taking the time to meet me today. My name is Roy Tapera, and I would like to talk about your views on the causes of road traffic accidents in Botswana. I intend to use that information to develop a guideline to prevent road traffic accidents. The discussion should take less than an hour, and I will be recording because I do not want to miss any of your comments. I will, however, be taking notes during the session. You are on tape, and you are therefore encouraged to speak up. All responses will be kept confidential, which means that your responses will only be shared with research members. We will make sure that the information we record does not identify you as a participant. Remember, you do not have to talk about anything that you do not want to, and you may end the discussion at any time. Are there any questions from what I have just explained? Are you willing to participate in the focus group discussion? Any questions?

All: No questions

I: Ok, no questions? Thank you, so I will go directly to the first question; How safe do you think the people using roads in Botswana are? And you must support your answer to why you think so.

R1: Ok, I think the roads are not safe.

I: Umm ok why

R1: I am saying so because I am basing my claim on the standing statistics of the number of people dying due to road accidents. On a yearly average rate, we have around 420 people dying because of road accidents, which translates to ten people per week. We have an annual record of 17000 recorded road accidents. I am talking of those reported to the police and documented, meaning that there could be more. We have a very small

population of around two million people, and if we look at these statistics, I can safely say our roads are not safe at all.

I: Thank you very much. You all heard R1 saying that our roads are not safe because we lose around 400 people per year. The loss of one person is one too many. We cannot afford to lose a life. Is there anyone who wants to add to the first question?

R2: Yes, our road ...

I: if you may speak up, please

R2: Yes, our roads are not safe at all. When you look in the highly populated areas of Botswana where most accidents occur and look at the less populated areas, you can still testify that our roads are not safe. This is caused mainly by either the drivers' incompetence or the drivers' behaviour, so no one is safe on the roads.

I: Ok, thank you for that. Now that we have agreed that our roads are not safe, we can go to the next question. Have you dealt with people who have been involved in a road traffic accident before? If so, can you tell me what had happened?

R2: To answer this question...

I: Aaaam

R2: You want us to mane the people who have been injured?

I: No, the question wants you to state if you have helped someone involved in the road traffic accident either at work or at home or if you have been in an emergency or you deal with these people every day. Tell us if you had the opportunity to ask them what would have happened and they told you.

R3: I have dealt with several victims, and I can say that it's a very unfortunate situation for them. Most of them will be traumatised. However, in most cases, the situation will not be that severe.

R1: What could have caused that accident? Was it a head-on or what could have happened?

R3: Mostly collisions and the most affected are the passengers compared to the drivers. The drivers, in most cases, walk scot-free. I have noticed that what causes most of these accidents is drunk driving and also nowadays a lot of people can afford to have cars yet not all of them are competent drivers

I: Ok, so you are saying that the scenes that you have attended

are caused by, let us say, one car coming from the right and the other coming from sort of a T junction?

R3: Yes

I: So the accident will be caused by not giving each other way or passing a red robot?

R3 Yes, they do not give each other way

R4: I have also interacted with a victim. I work for an NGO which gives aid to these victims. It was a combination of drunk driving, fatigue and speeding, and it was during the festive season.

I: Which is a dangerous combination. I mean fatigue and drunk driving.

R4: Yes, so they had spent a night at the bar, and they had to leave early, they were tired and fell asleep along the way while driving, and that is how they were involved in the accident. Unfortunately, the victim, a young man, is now in a wheelchair.

I: Oh, thank you very much for the testimonies, now. Let us move on to our next question. Which road user group are most at risk in Botswana to get involved in road traffic accidents. Are they the passengers, drivers or pedestrians? And their age groups and gender as well as the type of cars involved. Maybe we can start with the road users who are most at risk.

R1: The passengers are the most at risk. When we look at, for example, Gaborone on a busy day from 6 am to 8;30 am the majority of the population will be using public transport and others will be hitch hiking and because of this, I can say the passengers are the most affected. Drivers don't normally get hurt. In cases of mini buses used by the public, the passengers again are affected the most.

R2: I think passengers and pedestrians are the most vulnerable, and I am saying this from a statistical point of view. Drivers are the ones in control, and in most cases, they do not get hurt. Passengers are not in control, and at times, they are thrown out of the vehicle and die. Pedestrians are also vulnerable when they do not use designated areas to cross the road or when they wear dark clothes during the night. When it comes to age groups, I think the age between 18 and 45 is the most at risk because they are still young and are highly mobile.

I: How about the gender

R2: The males are the most affected. 70% of those who die or sustain injuries are males, while 30% are females. The males behave more reckless compared to females. They think they understand the world better, and they are more daring. If we look at vehicles, I think the small cars maybe because of their high population.

I: By small cars, you mean sedans?

R2: Yes, sedans

I: What could be the reasons? Is it because they are the most common?

R2: I think because they are the ones that young people own.

I: Ok, anything to add?

R3: Yes, when we look at the age of our youth between 18 and 45 years, we can see that they are still very active, they can afford to buy a car with just 1000pula and buy a car without a car licence, so all this leads to accidents. If it was made compulsory that if you do not have a licence, you cannot buy a car, maybe that would lessen the accidents. We appreciate the japans and Singapore second-hand cars, but these have contributed to road deaths. Another factor is that of reckless driving and consumption of alcohol.

I: ok, thank you for that contribution

R4: I also want to add that cyclists are also at risk, although we do not have many of them.

I: Ok because other drivers will not take heed of them and brush them aside?

R4: Yes, the way our roads are constructed is not made with the cyclists in mind. There are no strips for them where they can safely cycle.

I: They are not designed for cyclists?

R4: Yes

I: Ok, that's interesting; let us move on. What do you think are the main reasons for road traffic accidents on Botswana roads? Are they human factors, vehicle factors, road factors, social factors or environmental factors? You know the way the roads are made can cause accidents. I have been to Jwaneng road, and that road can make your car roll even when you are alone on the road.

R1: it has been fixed

I: Oh, ok. The last time I used that road, it was terrible. So is it the road factor or environmental factor? You know, at times when it is very hot it can also contribute to accidents. The rains can also contribute to accidents. What can you say are the causes? Social factors? You know people can be very angry on the roads, which can affect the way they drive and might cause accidents. So in short, what do you think might be the causes

R1: I would say that humans cause 85% of road traffic accidents due to speeding, drunk driving and fatigue. People can control this, but they don't and hence accidents. Maybe around 5% can be attributed to the other factors like road state and type of vehicle, 10% can be attributed to road structure. Our roads are not up to standard. There is a need to maintain roads, especially now when it is during the rainy times. There are potholes everywhere. Social factors also contribute to accidents. We as a nation tend to travel a lot during weekends, and we have a drinking culture, and at the end of the day, accidents happen.

I: That's interesting sir, who do you think is to blame?

R2: Humans are largely to blame. Affording to buy a car and then affording to service a car are two different things. Those that afford to buy cars at times do not service their cars. There will be worn tyres, and that coupled with speeding will put the travellers at risk. Servicing cars should be mandatory. With a well-serviced road and competent driver, I am sure we can have fewer accidents.

I: What about the environment and social factors

R3: Social factors also contribute. We have a young population that is vibrant and outgoing, and will increase the accident rate.

I: You mentioned the environment. When it is raining, you do not see the potholes, and because of that, a tyre might burst. So what about the hot temperatures? How can the hot temperatures cause accidents?

R1: High temperatures can cause accidents depending on the quality of the road as well as the conditions of the tyres. The tyres are most likely to burst when it is very hot.

I: And you also feel very drowsy when it is hot. Now to our next question. What do you think should be done in the future to reduce road traffic accidents on Botswana roads. We have talked about the causes of road traffic accidents in terms of human factors, road

factors, vehicle factors, environmental and social factors. Now, what do you think should be done to prevent those accidents?

R1: When I look at the human factors and drunk driving, I think we should put in place harsh laws that restrict people from committing the crime. Let us take an example of a bar set up where you see a lot of cars parked, and you know full well that the drivers are drinking but come to the end of the day, they will go behind the wheel and drive. What if we come up with a law that prohibits cars in the vicinity of bars. This will work as a positive to the taxi drivers who can then have the duty to carry the pub users to their homes. This can also encourage safe driving, it is also an individual responsibility not to drive when fatigued. There should also be a law that stipulates that when you come to renew your licence, you should also bring a defensive driving certificate to show that you have done something to improve your driving skills. If we can have about 90% of our drivers having defensive driving, we can make our roads safe. I feel that laws should be harsh. If we can say 10000pula for reckless driving, we could have fewer people making that offence. Our laws are very lenient and therefore easy to break.

When we look at the road factors, I think it is high time we use tollgates. The money we get from the taxes is not enough to maintain the roads. Let the tollgates garner money for road construction and maintenance. Let us look at South Africa as an example. They have SANRAL, an organisation that collects money from tollgates and reinvest it in the roads. They do not use the budget from the government because there is already an independent organisation responsible for that. We also have our tourism roads giving us money, and I strongly feel they should always be serviced.

I: Ok, you mentioned the south African organisation that is collecting money from tollgates? What about the environmental factors?

R1: In the government needs to look at the issue of standards. We do not have to look at the lowest bidder, but we have to look at the constructor who can give us the best. I have observed the construction of some roads, and I cannot say that they are nicely constructed. Other roads are already damaged a few years into their construction, and I feel this caused by always hiring the lowest bidder at the expense of quality. On the question of the environment, I think we go back to the quality of the roads. If we go for the best constructors, I think we will not have environmental factors affecting us.

I: Ok, thank you, sir. So what are your recommendations?

R3: We have drunkards using the roads, and I think we should have awareness campaigns and law enforcement. There is a need to balance education and enforcement. People should know that there are consequences. We need to educate people on vehicle maintenance. Resources permitting, we should carry out road vehicle tests. When it comes to imports, we should not import old vehicles. We should not import vehicles that are five years older to make sure that those that we allow are roadworthy. I understand that they have what they call the safe system approach in Sweden, and I think we have to be safe conscious. Most of our roads do not have safe escape routes. This will make people suffer more injuries when they fall into those trenches along the roads. At times, roads will forgive you for constructing them well, but they are indeed punishing us in our cases. When it comes to environmental factors, I think we are aware of our hot climate and sometimes very hot weather, and because of that we need to match our infrastructure to this kind of weather conditions. I feel our learner drivers should be tested under such harsh conditions because, in reality, we cease to test drivers when it is raining, yet they will be driving under such conditions.

I: So you are saying that tests are not done during rainy seasons?

R3: Yes, when it is raining, no testing takes place.

I: Ok, that is very interesting.

R3: when it comes to social factors, I think there is a need for both education and law enforcement. We should also change the way we socialise. Our people should stop driving when drunk. So, in short, I am saying let us talk about behaviour change.

I: Are there any problems in implementing traffic safety measures? Were you saying laws should be stiffer? Sometimes rules are there, but they are not just implemented.

R1: We have problems with our police where not all of them are familiar with all the laws. They are familiar with the laws they use and may not implement what they do not know.

I: so are you saying that there are problems in implementing the law?

R2: Yes, there is. We collect data on everything, but we do nothing with then collect data. We don't implement what would have been discussed. After campaigns, we do not revise information from those campaigns. At times we go to parliament with the information, but nothing changes. I, therefore, feel that we lack a lot on implementation.

I: Thank you for that, sir.

R3: I also feel that we do not implement resolutions. One of the major challenges is the ratio of the police against the population. The police force is always overwhelmed and cannot cope with the road users to make sure that they comply with the rules. Therefore, we have a lot of people who break the laws on driving and are not caught. They continue breaking the law thinking that It does not matter.

R4: I also think that all the stakeholders like the police, the ministry of transport and all the other groups should share data so that they come together and achieve one goal instead of working as single entities. A lot of funding is there, and I feel what is needed is just implementation. There is a law on drunk driving that says that a driver should not exceed 0,22mg, and when he is driving public transport, he should not exceed 0,11mg. This law has been changed down from the previous 0,35mg limit, yet the law has not been amended yet.

R5: There is ignorance of the law. We also talk of 0% alcohol and not about these limits. We are advocating for 0% alcohol when on the road. When it comes to enforcement, we cannot just increase fines, and we need to balance education and fines. We need people to change and not arrest them because they will be a burden to the state. There is, therefore, a need to make laws that not burden the government.

I; We have covered number 7 on what are your views regarding law enforcement.

R1: Yes, I also feel there is a need for automated speed cameras.

I: oh, Like those in South Africa? That will be interesting.

R1: when people know that there is a speed trap, they will reduce speed.

R2: people are likely to behave on those roads.

I: maybe if we also put fixed ones on black spots, drivers communicate, they warn each other of the speed traps.

I: do you think there has been any change in the road traffic accident statistics for the last ten years?

R1: There is no change; we have been losing the same number of around 400 per year.

I: So what does that mean?

R1: it means we have to come up with more effective ways of doing things. We need to do thorough driver training. Learner drivers should have a lot of exposure before getting their licences

R2: we should also use social media to get to a lot of people on behaviour change.

I: also educate the young ones?

R1: yes, we need to school them. We need to have programs in schools so that we create a safe culture

I: ok, what do you need to add on what we have discussed?

R1: we need to educate people on safety. There is a need for change so that lives are saved. We should look at the issue of import vehicles. We should have a limit on the number of cars getting into the country every year. Let us restrict everyone from importing cars.

I: In other countries they select roads, so if you want to use a road you pay and this will act as a restrictive measure for people to just travel when it is not necessary and the money collected will be used on road maintenance. They also import cars which are not older than five years.

R1: People want to buy their cars because they feel that public transport is not safe and not reliable. If we can make public transport attractive, then people will want to use it.

I: Yes, even in the UK public transport is cheaper.

R2: If the majority of the people use public transport the number of accidents will go down.

R3: I think that on the issue of tollgates, the government will have to service its roads first. People will pay for what they are using. You cannot just impose tollgates when the roads are not in a good state.

R4: We need to involve politicians in all the plans so that whatever is planned will eventually pass in the parliament. They should know all the information so that they make informed decisions.

R4: the council should also be involved.

R:6 Resources must be availed like ambulances and proper roads to prevent consequences of road traffic accidents.

I: Is there anyone who would like to say something? It seems we have exhausted everything.

I: thank you very much for coming; your recommendations are very important, and I will put all of them in the guideline, which I will share with you so that you can see that I would have captured everything. Once again, I thank you.

Annexure C 1



RESEARCH ETHICS COMMITTEE: DEPARTMENT OF HEALTH STUDIES
REC-012714-039 (NHERC)

7 March 2018

Dear Roy Tapera

Decision: Ethics Approval

HS HDC/837/2018

Roy Tapera

Student: 42207754

Supervisor: Prof PR Risenga

Qualification: D Cur

Joint Supervisor: -

Name: Roy Tapera

Proposal: Development of guidelines to reduce road accidents amongst community members in Botswana: A Public Health issue.

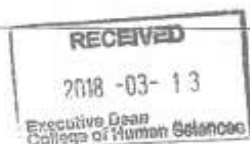
Qualification: DCPHS04

Thank you for the application for research ethics approval from the Research Ethics Committee: Department of Health Studies, for the above mentioned research. Final approval is granted from 7 March 2018 to 7 March 2022.

The application was reviewed in compliance with the Unisa Policy on Research Ethics by the Research Ethics Committee: Department of Health Studies on 7 March 2018.

The proposed research may now commence with the proviso that:

- 1) The researcher/s will ensure that the research project adheres to the values and principles expressed in the UNISA Policy on Research Ethics.*
- 2) Any adverse circumstance arising in the undertaking of the research project that is relevant to the ethicality of the study, as well as changes in the methodology, should be communicated in writing to the Research Ethics Review Committee, Department of Health Studies. An amended application could be requested if there are substantial changes from the existing proposal, especially if those changes affect any of the study-related risks for the research participants.*



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Telephone: +27 12 429 3111 Facsimile: +27 12 429 4150
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Annexure C2

PRIVATE BAG 00384
GABORONE
BOTSWANA



REPUBLIC OF BOTSWANA
MINISTRY OF DEFENCE, JUSTICE AND SECURITY

TEL: (+267) 3698200
FAX: (+267) 3185761

Ref: MDJS 1/18/5 III (20)

6th October 2020

Mr. Tapera Roy
P. O. Box 203156
Old Naledi
Gaborone

Dear Sir,

RE: REQUEST TO CONDUCT RESEARCH

Reference is made to our letter ref: MDJS 1/18/5 III (18) dated 27th July 2020, in which we sought for advice from Botswana Police Service regarding your request.

This serves to inform you that Botswana Police Service has acceded to your request to undertake research with them. The condition for approval is that;

1. your study will be confined to the research questions and locations contained in your proposal, and further that,
2. You will share the results or findings of your study with Botswana Police Service.

You are therefore advised to liaise with the Director of Traffic Branch under Botswana Police Service at telephone number 3624010 regarding your study.

Yours faithfully,

A handwritten signature in blue ink, appearing to read 'Mmabonnye Tsetse'.

Mmabonnye Tsetse
For / Permanent Secretary

CC: Commissioner - Police



PRIVATE BAG 0038
GABORONE
BOTSWANA
REFERENCE:



REPUBLIC OF BOTSWANA

MINISTRY OF HEALTH AND WELLNESS

TEL: (+267) 363 2500
FAX: (+267) 291 0647
TELEGRAMS: RABONGAKA
TELEX: 2818 CARE BO

REFERENCE NO: HPDME 13/18/1

19th August 2020

Health Research and Development Division

Notification of IRB Review: **New application**

Roy Tapera
Private Box 82293
Molapo Crossing
Gaborone
Botswana

Dear Roy Tapera

Protocol Title: **DEVELOPMENT OF GUIDELINES TO REDUCE ROAD ACCIDENTS AMONGST COMMUNITY MEMBERS IN BOTSWANA**

HRU Approval Date:	19 August 2020
HRU Expiration Date:	18 August 2021
HRU Review Type:	Expedited Review
HRU Review Determination:	Approved
Risk Determination:	Minimal risk

Thank you for submitting new application for the above referenced protocol. The permission is granted to conduct the study.

This permit does not however give you authority to collect data from the selected sites without prior approval from the management. Consent from the identified individuals should be obtained at all times.

The research should be conducted as outlined in the approved proposal. Any changes to the approved proposal must be submitted to the Health Research and Development Division in the Ministry of Health for consideration and approval.

Furthermore, you are requested to submit at least one hardcopy and an electronic copy of the report to the Health Research, Ministry of Health and Wellness within 3 months of completion of the study. Approval is for academic fulfillment only. Copies should also be submitted to all other relevant authorities.

Continuing Review

In order to continue work on this study (including data analysis) beyond the expiry date, submit a Continuing Review Form for Approval at least three (3) months prior to the

Vision: *A Healthy Nation by 2036*

Values: *Botho, Equity, Timeliness, Customer Focus, Teamwork, Accountability*



Annexure D 1

Letter to request permission to conduct the study

P.O. Box 203156
Old Naledi
Gaborone
Botswana
Cell: 0026776533462

13 June 2020

The Permanent Secretary
Ministry of Health and Wellness
Private Bag 0038
Gaborone
Botswana

RE: REQUEST TO CONDUCT A RESEARCH STUDY

I Roy Tapera, a Ph.D. (Public Health) student at the University of South Africa (UNISA), kindly request the authorities of the Ministry of Health and Wellness to grant me permission to conduct a research study for the partial fulfilment of a Doctor of Philosophy (Public Health). I hereby kindly request permission to conduct a study entitled: Development of guidelines to reduce road accidents among community members in Botswana.

The objectives of the study will be to explore, describe the factors contributing to road traffic accidents amongst automobile drivers in Botswana and to develop guidelines for stakeholders to reduce road traffic accidents.

Data collection will be in two phases. The first phase will involve collecting quantitative data through document analysis of the police records using a checklist. The records will be from the only two cities of Botswana (Gaborone and Francistown). In Gaborone the data will be collected at 2 sites namely Main Mall Police station and Princess Marina hospital. In Francistown the data will be collected at Francistown police station and the main hospital in the Central Business District.

The second phase will involve collection of qualitative data using focus group interviews with various stakeholders from both Gaborone and Francistown like traffic police, third party claims officers and emergency nurses/doctors who have been in contact with people involved in road traffic accidents. Tesch's eight steps of data analysis will be followed.

The proposed study will contribute to the existing body of knowledge towards reducing road traffic accidents.

Confidentiality and anonymity will be maintained throughout the research process.

I hope my request will be highly considered.

Yours sincerely

A handwritten signature in black ink, appearing to read "Tapera Roy", is placed on a light gray rectangular background.

Tapera Roy

Annexure D 2

P.O. Box 203156
Old Naledi
Gaborone
Botswana
Cell: 0026776533462

20 June 2020

Permanent Secretary
Ministry of Defence, Justice and Security
Private Bag 00384
Gaborone
Botswana

RE: REQUEST TO CONDUCT A RESEARCH STUDY

I Roy Tapera, a Ph.D. (Public Health) student at the University of South Africa (UNISA), kindly request the authorities of the Ministry of Health and Wellness to grant me permission to conduct a research study for the partial fulfilment of a Doctor of Philosophy (Public Health). I hereby kindly request permission to conduct a study entitled: Development of guidelines to reduce road accidents among community members in Botswana.

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Yours sincerely

A handwritten signature in blue ink, appearing to read "Tapera Roy", is placed on a light grey rectangular background.

Tapera Roy

Annexure E

INFORMED CONSENT

DEVELOPMENT OF GUIDELINES TO REDUCE ROAD ACCIDENTS AMONGST COMMUNITY MEMBERS IN BOTSWANA.

What you should know about this research study:

- ☐ We give you this informed consent document so that you may read about the purpose, risks, and benefits of this research study.
- ☐ You have the right to refuse to take part or agree to take part now and change your mind later.
- ☐ Please review this consent form carefully. Ask any questions before you make a decision.
- ☐ Your participation is voluntary.

PURPOSE

- ☐ You are being asked to participate in a research study to develop guidelines to reduce road accidents amongst automobile drivers in Botswana.
- ☐ You were selected as a possible participant in this study because of our purposive sampling procedures. Before you sign this form, please ask any questions on any aspect of this study that is unclear to you. You may take as much time as necessary to think it over.

PROCEDURES AND DURATION

- ☐ If you decide to participate, you will be invited to answer the researcher's questions in the next few minutes.

RISKS AND DISCOMFORTS

- ☐ There will not be any risk discomforts in participating in the study.

BENEFITS AND/OR COMPENSATION

- ☐ Though no benefits will be offered through this study, your contribution will be appreciated for your time and effort involved in the tasks you will perform.

CONFIDENTIALITY

- ☐ The data from this investigation will be kept safe. None of these will be used for commercial use.

VOLUNTARY PARTICIPATION

- ☐ Participation in this study is voluntary. If you decide not to participate in this study, your decision will not affect your future relations with the lead researcher, its personnel, and associated institutions. If you decide to participate, you are free to withdraw your consent and to discontinue participation at any time without penalty. Any refusal to observe and meet appointments agreed upon with the researcher will be considered as implicit withdrawal and therefore will terminate the subject's participation in the investigation without his/her prior request

AUTHORISATION

- ☐ You are making a decision whether or not to participate in this study. Your signature indicates that you have read and understood the information provided above, have had all your questions answered, and have decided to participate.

I hereby give consent to participate in this study and I am aware that the results of this study will be used for scientific purposes and may be published. I agree to this, provided my privacy is guaranteed.

.....
Name of participant	signature of participant
.....
Place	date

Statement by the researcher:

- I provided written information regarding this study
- I agree to answer any future questions concerning the study
- I will adhere to the approved protocol

Tapera Roy
Name of researcher	signature	date	place