ASSESSMENT OF HUMAN FACTORS AS A MAIN CONTRIBUTORY FACTOR TO YOUTH-RELATED ROAD FATALITIES, AND COUNTERMEASURES TO ADDRESS THE PROBLEM

by

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DECLARATION

I, **Motselisi Precious Juma,** hereby declare that the dissertation, with the title: **Assessment of human factors as a main contributory factor to youth-related road fatalities, and countermeasures to address the problem**, which I hereby submit for Master's in Business Management at the University of South Africa, is my own work and has not previously been submitted by me for a degree at this or any other institution.

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I declare that during my study I adhered to the Research Ethics Policy of the University of South Africa, received ethics approval for the duration of my study before the commencement of data gathering, and have not acted outside the approval conditions.

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ABSTRACT

Road-related deaths contribute significantly to the death rate in South Africa (SA) and across the world, especially among the youth. The current study investigated road fatalities among the age group classified as youth, between the ages of 20 and 35 years, from the perception of traffic officers and crash investigators. In addition, the current study attempted to identify countermeasures to address this problem.

The cross-sectional, quantitative study used a questionnaire for the collection of the data. The study found that the main human factors that contribute to fatalities among youth aged 20-35 years are drunken driving, speeding, disregard for traffic lights, overtaking and not wearing a seatbelt. The study found a strong correlation between speeding and drunken driving. The study also captured strategies that can be implemented, and key among those was the need for stricter requirements for obtaining a driver's licence, increased visibility of traffic officers at high-accident zones, more traffic fine enforcement, and implementing road safety education as part of the school curriculum.

The results of this study could assist policymakers to develop programmes aimed at this specific age group between 20 and 35 years and passing laws that can address the legislative-related gaps as identified in the current study.

OPSOMMING

Padverwante sterftes dra aansienlik by tot die sterftesyfer in Suid-Afrika (SA) en regoor die wêreld, veral onder jeugdiges. Hierdie studie het padsterftes ondersoek onder die ouderdomsgroep wat as jeug geklassifiseer word – dit is persone tussen 20 en 35 jaar oud – vanuit die persepsie van verkeersbeamptes en ongelukondersoekers. Boonop het hierdie studie gepoog om teenmaatreëls te identifiseer om hierdie probleem op te los.

Dié deursnee- kwantitatiewe studie het ’n vraelys gebruik om data in te samel. Die studie het bevind dat die belangrikste menslike faktore wat tot sterftes by jeugdiges tussen die ouderdomme van 20 en 35 jaar bydra, dronkbestuur, spoed, die minagting van verkeersligte, verbysteek en versuim om ’n sitplekgordel te dra, is. Die studie het ook ’n sterk korrelasie tussen spoed en dronkbestuur gevind. Die studie het ook strategieë uitgewys wat geïmplementeer kan word, met die volgende strategieë wat deurslaggewend was: die behoefte aan strenger vereistes om ’n rybewys te bekom, verhoogde sigbaarheid van verkeersbeamptes by hoë-ongeluksones, strenger afdwinging van verkeersboetes en die implementering van padveiligheidsonderrig as deel van die skoolkurrikulum.

Die resultate van hierdie studie kan beleidmakers help om programme te ontwikkel wat op hierdie bepaalde ouderdomsgroep – persone tussen 20 en 35 jaar – gerig is en wette aanneem wat aandag sal gee aan die regsverwante leemtes wat in dié studie geïdentifiseer is.

KAKARETŠO

Mahu ao a hlolwago ke dikotsi tša mebileng ke sebakwakgolo go palomoka ya mahu ka Afrika Borwa le lefaseng ka bophara, kudukudu go baswa. Nyakišišo ye e sekasekile dikotsi tša mebileng go dihlopha tša baswa ba mengwaga ya magareng ga 20 le 35, go ya ka dipego tša bahlankedi ba mebila le banyakišiši ba dikotsi tša mebileng. Go tlaleletša mo, nyakišišo ye e laeditše magato ao a ka tšewago go šomana le bothata bjo.

Nyakišišo e šomišitše mokgwa wa khwanthithethifi ka go šomiša mananeopotšišo go kgoboketša datha. Nyakišišo e hweditše gore mabaka ao a hlolago dikotsi go baswa ba mengwaga ye magareng ga 20 go ya go ye 35 ke go otlela ba nwele madila, go otlela ka lebelo, go hlokomologa melao ya mebileng (diroboto), go feta dinamelwa tše dingwe le go se apare mapanta a polokego. Nyakišišo e hweditše gore go na le tswalano e matla magareng ga go otlela ka lebelo le go otlela o nwele madila. Dipoelo tša nyakišišo di laeditše gore go na le tlhokego ya go bea melawana e thata ya go hwetša laesense ya go otlela, go oketša bahlankedi ba taolo ya sephethephethe mafelong ao go bago le dikotsi tše ntši, go oketša kotlo go bao ba tshelago melao ya mebileng le go akaretša thuto ya polokego ya mebileng go kharikhulamo ya sekolo.

Dipoelo tša nyakišišo ye di ka thuša badiramelao go hlama mananeo ao ba ka a lebišago go sehlopha sa baswa ba mengwaga ya magareng ga 20 le 35 le go bea melao yeo e tla thibago tlhaelelo ye e utolotšwego ke nyakišišo ye.

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LIST OF ABBREVIATIONS AND ACRONYMS

The following abbreviations and acronyms are used throughout the study:

BAC	Blood Alcohol Concentration
DoT	Department of Transport
GDP	Gross Domestic Product
GNP	Gross National Product
HBM	Health Belief Model
MVCs	Motor Vehicle Crashes
NRTA	National Road Traffic Act
OECD	Organisation for Economic Co-operation and Development
RTA	Road Traffic Accident
RTC	Road Traffic Crash
RTI	Road Traffic Injury
RTMC	Road Traffic Management Corporation
SA	South Africa
WHO	World Health Organisation

CHAPTER 1:
INTRODUCTION AND RATIONALE OF THE STUDY

1.1 INTRODUCTION

The World Health Organisation (WHO) stated that road traffic-related injuries and fatalities are an economic, health and social problem. It has been estimated that worldwide 1.35 million people are killed in road traffic crashes each year, according to the WHO (2018:4). The report revealed that most of the mortality rates are higher in low- to middle-income countries than they are in high-middle income countries. In 2016, Africa had the highest road fatality rate of 26.6 per 100 000 population, which was higher than the global average of 18,2 per 100 000 population, as stated in the WHO report (2018:8). According to the Road Traffic Management Corporation (RTMC) (2017:23), the road fatality rate for South Africa (SA) was 14 071 in 2016, which translated to 25.2 per 100 000 population. This death rate is high compared to the global average of 18.2 per 100 000 population.

SA is not immune to the global challenge of increasing road fatalities, and investment in the right interventions will go a long way towards eradicating the high levels of road fatalities. The Organisation for Economic Co-operation and Development (OCDE) (2016:116) defines a fatality as any person killed immediately, or dying within 30 days, because of a road injury accident, which is the same definition used in SA. Although road fatalities in SA declined in 2017 from 2016, this was not a substantial decrease, considering that SA is a signatory to the United Decade of Action which planned to reduce road fatalities by 50% from the 2010 baseline of 13 967, as indicated in the Department of Transport (DoT) strategy plan 2020-2025 (2020:40).

The WHO (2018:5) specified that road fatalities are a leading cause of death among young people aged between five and 29 years. Houwing and Twisk (2015:62) maintained that road fatalities among the youth are overrepresented due to the higher risk exposure of this age group because of the dangerous trip conditions they undertake and a higher tendency to take risks. The youth is described by the African Youth Charter Commission (2006:11) as “a person between the ages of 15 and 35 years”, whilst the South African National Youth Commission Act; section 1 (vi) of 1996

defines the term ‘youth’ as persons between the ages of 14 and 35 years. However, the current study focused on the age group between 20 and 35 years of age.

The high concentration of youth road fatalities in the SA context paints a bleak picture, considering that the youth are expected to play a big part in contributing to the economy of any country. More so, Thapa (2021) argues that it has a dire economic impact when active people of productive age are involved in Road Traffic Crashes (RTCs). Thus, Road Traffic Injuries (RTIs) place an enormous burden on a country’s economic growth and health care systems, especially where young people constitute a major part of the population. Therefore, a reduction in road fatalities presents an opportunity to increase future productivity by reducing the life years lost in the age group of people who are deemed to be productive (Miller, Levy & Swedler (2018:113).

RTIs are currently estimated to be the eighth leading cause of death across all age groups globally and are predicted to become the seventh leading cause of death by 2030, as stated by the WHO (2021). Consequently, if road fatalities among the youth are not addressed, it will have high economic consequences, considering that Maiers (2017:213) indicates that by 2025 it is estimated that the youth will represent 75% of the global workforce.

Gaining a better understanding of the reasons why the youth are overrepresented in the South African context will assist policymakers and intervention agencies to improve their programmes aimed at the reduction of road fatalities among this age group. Additionally, without knowledge of the magnitude of the problem and the risks of death and injury, the ability to implement context-specific and appropriate interventions is limited, as stated by WHO (2018:xii).

Therefore, to understand the burden of road fatalities among the youth it is vital to obtain a clear epidemiology of the risk factors associated with road crashes invariably leading to death and the contributory factors to the causality of a crash. The current research is based on the Haddon Matrix. As developed by William Haddon in 1970, the model is used to determine the causal factors of road crashes through the application of a systematic approach by categorising them as human, vehicle and environmental factors (Williams, 1999:15). According to the RTMC (2021:15), human factors made the highest contribution to road fatalities in SA, namely, 85%, compared to vehicle factors at 5%, and environmental factors at 10%. Hence, the emphasis of

the current research was on the human factors that lead to fatalities among the youth. Ojo (2015:69) supported the notion that there is a need for more research that focuses on the human factors that lead to an increase in fatality rates among young people. Moreover, Cardamone, Eboli and Mazzulla (2014:59) specified that less progress has been made in research into the human factors as contributors to risky driving and accident causation, and the behaviour of the road user.

The impact of road crashes and fatalities is limited not only to the social but also the economic impact. According to Mogambi and Nyakeri (2015:1), the economic burden of road crashes is estimated to cost countries from 1% - 2% of the Gross National Product (GNP), exceeding the aid most developing countries receive annually. A study that was conducted in SA by the RTMC indicated that the Road Traffic Crashes (RTC) costs for 2015 amounted to R142.95 billion, which translated to 3.4% of SAs Gross Domestic Product (GDP) (RTMC, 2016:36). Consequently, the devastating impact of road crashes results in the loss of lives, amputations, regrets, financial mayhem, and everlasting pain (Ekpenyong & Oko, 2015:29). Given that these fatalities are concentrated in the economically active population, a reduction in the number of RTIs and fatalities could confer large welfare gains to households (Grimm & Treibich, 2013:915).

The world report compiled by Peden *et al*. (2004) for the WHO on Road Traffic Injury (RTIs) prevention emphasised that traffic events are avoidable, largely preventable, and predictable, and the causes are human-made problems amenable to rational analysis and countermeasures. Hence, in road safety literature, the preferred term is ‘road crashes’ not road accidents. The term ‘accident’, according to the Oxford Dictionary (2023), is described as an unfortunate incident that happens unexpectedly and/or without being intended, whilst a ‘crash’ is defined as colliding violently with an obstacle or another vehicle. A crash is described by Stewart and Lord (2002:334) as an event without implying the presence or lack of drivers’ responsibilities. As such, for the current research study, the word ‘crash’ and not ‘accident’ was used throughout the study.

The current research study focused on crashes that took place on the road between two or more objects, one being a moving vehicle. The problem, as captured, was to determine those human factors that contribute to road fatalities among young people between the ages of 20 and 35 years. The current study aimed to identify those human

factors with the highest correlation among this specific age group. The research study envisaged obtaining first-hand feedback from road safety experts, such as officers from the National Traffic Police (traffic officers) and crash investigators. The study will provide possible recommendations, based on the findings of the respondents, regarding strategies that can be implemented to address the problem under investigation.

1.2 RESEARCH PROBLEM

The problem under investigation pertains to the high road fatalities in SA impacting the youth. This age group is the most economically active population group, and the loss of income is significant, as emphasised by Parkinson, Kent, Aldous, Oosthuizen and Clarke (2013:851). Crawford and McGrowder (2008:184) and Pal, Ghosh, Kumar, Galwankar, Paul, Pal, Sinha, Jaiswal, Moscote-Salazar, Agrawal (2019:775) concurred that people from this active and productive age group are involved in road traffic crashes and this has an economic impact.

Bates, Davey, Watson, King and Armstrong (2014:297) emphasised that young car drivers are five to ten times more likely to experience injuries because of road crashes. The discussion above clearly captures the current problem relating to road fatalities among the youth, and that there is a much higher risk of them being involved in road crashes leading to fatalities. Crawford and McGrowder (2008:184) argued that there is a need to find ways to address this challenge, noting that young people also play a critical role in the economy. The implication is that people who are part of the active and productive age group are involved in road traffic crashes, a fact that has both a social and an economic impact. Constantinou, Panayiotou, Konstantinou, Loutsiou-Ladd and Kapardis (2011:1323) maintained that an understanding of the causes of such crashes would contribute significantly to public policy to minimise the socioeconomic impact of road fatalities.

Parkinson *et al.* (2013:852) emphasised that road crashes are a major public health problem, and therefore, they suggested that the approach to address road crashes should include research conducted at a local and regional level aimed at directing primary prevention strategies to locally relevant crash risk factors. Thus, Scott-Parker and Oviedo-Trespalacios (2017:31) maintained that the persistent overrepresentation

of young drivers in road crashes in low- and middle-income countries in particular, means that the formulation of policies and interventions for protecting youth from road trauma should be a priority in these regions.

The current study not only focused on the factors that contribute to road fatalities among this selected age group by the determination of which human factors contribute towards road fatalities among the youth between the ages of 20 and 35 years but the research was also expanded to consider strategies that can be implemented to address the problem in relation to road fatalities among the youth.

1.3 RESEARCH OBJECTIVES AND QUESTIONS

The aim of the study was to capture the perceptions of traffic officers (National Traffic Police) and Crash Investigators on what they perceive to be the human factors that contribute to road fatalities among the youth. The research objectives and research questions that were formulated for the current study are listed below.

1.3.1 Primary research objective and question

The following primary research objective and research question were formulated for the current study:

- To determine the human factors contributing towards road fatalities among South African youth between the ages of 20 and 35 years.
    - What are the human factors which contribute towards road fatalities among the youth between the ages of 20 and 35 years?

1.3.2 Secondary research objectives and questions

The current study also sought to achieve the following secondary research objectives and questions:

- To determine which factors are perceived to be the most frequent contributors to road fatalities among the youth between the ages of 20 and 35 years.
    - Which factors are perceived to be the most frequent contributors to road fatalities among the youth between the ages of 20 and 35 years?

- To recommend possible strategies to reduce fatalities among the youth between the ages of 20 and 35 years.
    - Which strategies can be implemented to reduce fatalities among the youth between the ages of 20 and 35 years?

1.4 RESEARCH DESIGN AND METHODOLOGY

The current study adopted the positivist paradigm and the deductive approach using a quantitative research design. The detailed methodology of the research will be presented in Chapter 3. Table 1.1 summarises the area of study for this research study. It provides the objectives of the research, research questions, the type of research method used in the study.

Table 1.1: Summary of research study

Topic: Assessment of human factors as a main contributory factor to youth-related road fatalities, and countermeasures to address the problem			
Problem	**Contribution of the study**	**Research question**	**Research objectives**
The problem is the high road fatalities amongst the youth (20 – 35 years) in SA.	The fatality rates are high as provided in the research in SA; more critically it affects the youth mainly between the ages of 20 and 35. This is not only a local challenge but also a global challenge.	What are the human factors which contribute to road fatalities among the youth between the ages of 20 and 35 years?	To determine which factors are perceived to be the most frequent contributors to road fatalities among the youth between the ages of 20 and 35 years
		Which factors are perceived to be the most frequent contributors to road fatalities among the youth between the ages of 20 and 35 years?	To determine which factors are perceived to be the most frequent contributors to road fatalities among the youth between the ages of 20 and 35 years.
		Which strategies can be implemented to reduce fatalities among youth between the ages of 20 and 35 years?	To recommend possible strategies to reduce fatalities among the youth between the ages of 20 and 35 years

Topic: Assessment of human factors as a main contributory factor to youth-related road fatalities, and countermeasures to address the problem			
Problem	**Contribution of the study**	**Research question**	**Research objectives**
Type of research	Quantitative research		
Method to collect data	Structured questionnaire		
Population	Traffic Officers and Crash Investigators		
Sampling method	Convenient sampling, the sample was: ▪ Six Crash Investigators (6), which translated into 100% of the population). ▪ 195 Traffic Officers (195), which translated into 100% of the population.		
Type of questions	A structured questionnaire was used to gather data for the research study.		
Time Horizon	Cross-sectional time horizon. The study was undertaken over a period of three months.		
Validity and reliability	**Validity** All the questions used in the questionnaire were adapted from the literature. In addition, once the questionnaire was finalised, a small pilot study was undertaken to validate the questionnaire by experts within the field of study. **Reliability** ▪ Participant error: To avoid this the questionnaire was placed in the most convenient areas that allowed the respondents to complete the questionnaire at the most convenient time. ▪ Participant bias: Due to the anonymity of the questionnaire there was no room for influence by other respondents or fear of others knowing the respondents' answers. ▪ Researcher error: Measures were put in place to ensure that there was no researcher error during the data collection and analysis. ▪ Researcher bias: It was not possible to influence or change the interpretation of the data, as statistical tools were used to conduct the analysis which ensured objectivity.		
Ethical considerations	A letter was written to the institution to request permission to conduct the research study. In addition, the participants had to sign a consent letter to participate voluntarily in the study. The information that was collected throughout the process was handled with the utmost confidentiality and was stored in a password-protected hard drive.		

Source: Researcher's own compilation

1.5 DELIMITATIONS AND LIMITATIONS OF THE STUDY

The following delimitations and limitations applied to the current study.

1.5.1 Delimitations

The research study focused on road fatalities impacting the youth. The age group selected for the study was between the ages of 20 and 35 years, which has been defined as youth for the purposes of the study. The traffic department that was selected for the study was the RTMC based in Gauteng, which has traffic officers, named National Traffic Police, that has national jurisdiction (meaning they can enforce traffic law enforcement across the country) and Crash Investigators (responsible for the reconstruction of a crash). The Gauteng Province was selected due to having the highest number of fatalities over the past two years (2020-2021), according to the RTMC (2021:19)

1.5.2 Limitations

The research study adopted a quantitative research approach using a questionnaire to collect data. A limitation might be a low response rate from the target population which might be an issue at the analysis stage. In addition, due to a limited budget and time constraints, the researcher limited the study to focus on Gauteng.

1.6 LAYOUT OF THE STUDY

The study is divided into five chapters. A synopsis of each chapter is presented below:

- **Chapter 1:** The introduction chapter captures the topic, problem statement, discusses the merits of the research, focus, limitations and research question and objectives.
- **Chapter 2:** This chapter presents the literature review relevant to the current study. This chapter provides an overview of road safety theories, identifies the human factors that contribute to road fatalities, and discusses interventions that have been implemented.
- **Chapter 3:** The research methodology chapter presents and discusses the research methods and design adopted by the current study. It also covers the research unit of analysis, data sources, sampling method and sizes, as well as the data collection and ethical considerations applicable to the study.

- **Chapter 4:** The findings the chapter details the findings, the analysis of the collected data and discusses all the findings of the research study.
- **Chapter 5:** The conclusion and recommendations chapter is the final chapter which covers the final findings and key recommendations of the research study.

1.7 CONTRIBUTION OF THE STUDY

The current research study focused on the human factors that contribute to road fatalities among the youth. As observed by Ogilvie, Curtis, Lam, McCloughen and Foster (2014:219), there has been limited research focusing on the characteristics of major injuries within the adolescent and young person population. Hence, the motivation for the current study that this dissertation is reporting on. The research from Ogilvie *et al.* (2014) proposed that further research is required that examines the complexity and relationship between risk factors relevant to young people, as well as research examining the long-term burden for young people already injured, not only those who were fatally injured. Adanu, Riehle, Odero and Jones (2020:298) added that identifying the characteristics that contribute to severe-injury crashes that could be addressed by some recommended countermeasures would also serve to mitigate potential fatalities. In addition, a study by Rolison, Regev, Moutari and Feeney (2018:23) revealed that the collection of contributory factors through the views of the driving public and the police investigation revealed the potential underreporting of existing factors in accident records, thus requiring a need to continuously review and update to ensure that accident statistics reflect the full range of factors.

Therefore, in efforts to understand the impact of driving risk among young drivers, most studies show that human factors such as speeding, violating rules of the road, distracted and inattentive driving (for example, use of cell phones), and driving at night are associated with increased crash risk (Shaaban, Gaweesh & Ahmed, 2020:10). Thus, the current study will contribute to the body of knowledge by assisting government policymakers and road safety practitioners to better understand the contributory factors leading to the high concentration of road fatalities among young people.

Road fatalities among the youth should be seen as a socioeconomic problem, as not only are they a burden to the economy and health system, but also impact family life. Kohli, Aathi and Sethi (2013:256) indicated that road crashes have four effects,

namely, physical and psychological effects, effects on families and effects on countries. Firstly, the physical effect referred to may be death or injury, as globally almost 60% of road traffic deaths are among the age group 15–44 years, and road crashes are a leading cause of death for young people aged 15–29 Seid, Azazh, Enquselassie and Yisma (2015:2).

Secondly, as indicated by Kohli *et al.* (2013:251), after a crash people might suffer from psychological effects, such as Acute Stress Disorder (ASD), Post-Traumatic Stress Disorder (PTSD), anxiety disorders, depression, and mood disorders.

Thirdly, in terms of the effect on families, a study by Øvstedal, Moe, Dyregrov and Dyregrov (2017:71) found that losing a child causes major psychosocial strain, and is a life-altering situation that affects the immediate family, relatives, friends, colleagues, and those involved in the road crash itself.

Fourthly, in terms of the effects on countries, road deaths also lead to economic losses due to skill drainage. Additionally, the 2009 WHO Global Status Report on Road Safety (2009:9) indicated that road traffic crashes will become the fifth leading cause of death in 2030, in comparison to being the ninth cause of death in 2004. This assertion that road fatalities will become the top five leading causes of death has not changed over the period following the initial study. Henceforth, road fatalities continue to be classified as a health problem, and the most challenging is that they occur among young adults, thus supporting the need for the study.

1.8 CONCLUSION

This chapter introduced the study and provided the rationale for the study, problem statement, research objectives and questions, and methodology. It further captured the scope and limitations of the areas that are not addressed in the study. The chapter also highlighted the value and contribution that the study will make academically to the transport sector.

The next chapter, Chapter 2, begins with a discussion of the theories within road safety, consideration of research studies previously undertaken, and strategies implemented to address the challenges.

CHAPTER 2:
LITERATURE REVIEW

2.1 INTRODUCTION

The problem statement as presented in Chapter 1 highlighted that the youth are most affected by road fatalities. This chapter focuses on the literature review in relation to human factors contributing to fatalities among the youth. The review applied a structured approach to come up with a streamlined way to capture the problem and develop a foundation for conducting the study. The literature review encompassed the road safety theories and generational theory, the identification of human factors that contribute towards road fatalities among youth and the strategies to address the problem.

2.2 ROAD SAFETY THEORIES

Road safety research has been undertaken by different researchers in different eras. To that end, a determination of the applicable theories was considered which aimed to provide the researcher with the basis for the selected application of the most applicable theories. The theories that will be discussed capture the different periods, which are referred to as probabilistic, causal, systemic, and behavioural research Jamroz (2008:91). Figure 2.1 below depicts the evolution of road safety theories over the different periods, and the discussion will show how these theories enabled the application of a systematic approach in the determination of the causes of road crashes.

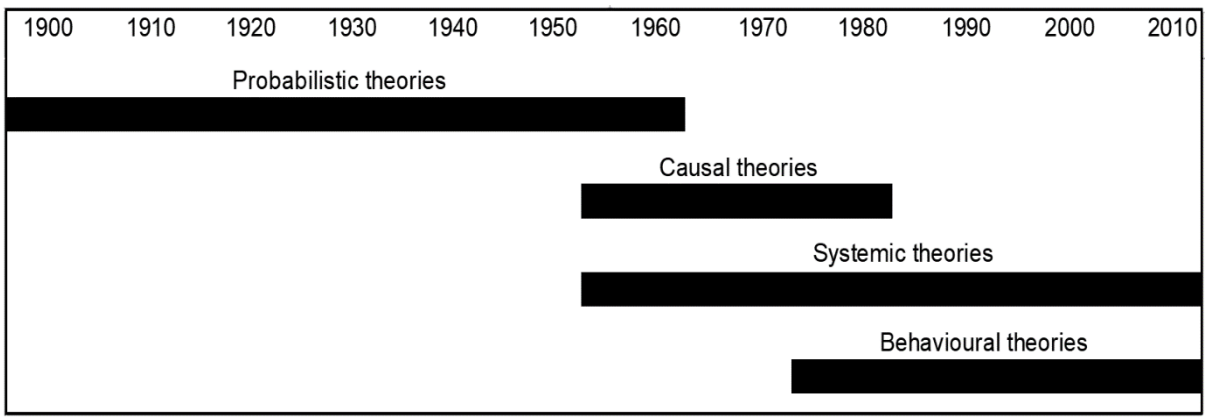

Figure 2.1: Chronologic sequence of groups of road safety theories

Source: Adapted from Jamroz (2008:91)

2.2.1 Probabilistic theories

Jamroz (2008:91) specified the probabilistic theories, such as regression analysis and time series, that analysed crashes as random events. indicated that the cause of the road crash was believed to be due to bad luck. Whilst, Andree (2022:2) believed that it can be stated in terms of the properties of the true measure that describes a process stochastically Therefore the research focused on describing 'what happened' and on collecting basic statistics on the cause of the road crash. As such, the process of analysing the crash was limited and did not provide detailed information about the road crash itself due to the limited description of the causes.

2.2.2 Causal theories

Jamroz (2008:92) stated that causal theories, such as the domino theory and multi-linear event sequences, advocated for a detailed analysis of a road crash to determine the cause. The process required the analysis of each crash and the events leading up to the crash. Hagenzieker *et al.* (2014:151) stated that research during this period was focused on finding the characteristics of accident-prone drivers (including others who were to blame for causing accidents) by using psychological testing as a predictor of crash-prone drivers. However, Barman (2023:3) viewed the theory as a single causal chain leading from a single cause to a failure, resulting in a more singular and simplified methods in determining causes of accidents.

2.2.3 Systemic theories

Systemic theories focused on providing proof or evidence that the road crash occurred and indicated that the causal theories were limited because they only focused on one element, namely, human error and tried to only solve that problem, which resulted in the ineffective management of road safety. The theory focused on why people are involved in road crashes. One of the general theories for application was the Haddon Matrix developed in 1970 by William Haddon.

Haddon (1972:196) believed that the three factors, namely, human, environment and vehicle were the first series of categorising road crashes which led to an understanding of the causes and identification of interventions to address the causes of the crash. The model is still widely used in road safety to determine the causes of road crashes,

as shown in Chapter 1, on the determination of causes of road fatalities by the RTMC. Therefore, the foundation of this study is premised on the Haddon Matrix approach.

Haddon believed that crashes have the following phases:

- Pre-crash: What factors affected the host before the event occurred?
- During crash: What are the factors related to the crash phase? Post-crash: What are the factors related to the Post-Event Crash Phase?

The assumption being if nothing is done to prevent the crash, during the phases that can result in losses such as road fatality, serious injury, minor injury, damage to the vehicle or damage to the road infrastructure. These incidents can then be analysed to determine the cause by classifying the contributory factors by human, vehicle and environmental factors. Table 2.1 depicts the three phases in the occurrence of a road crash and the contributory factors that contribute to the road crash.

Table 2.1: Phases and factors within a road crash

Phases	Contributory factors		
	Human factors	**Vehicle factors**	**Environment**
Pre-crash	Poor vision Drinking (Alcohol) Speeding Overtaking (when it is not safe to do so)	Failed brakes Lighting	Poor signals Narrow road Potholes
During crash	Seatbelt use	Failed airbags Malfunctioning seatbelt	Unsafe vehicles (not complying with standards)
Post-crash	Ambulance arrival Blood Alcohol Concentration (BAC)	Car burning (due to changes to the vehicle tank)	Lack of systems for ambulance or accident response

Source: Haddon (1972:196)

These contributory factors were defined by Williams (1999:65) and are as follows:

- **Human factors** are defined as stable, general human abilities and limitations that are valid for all users, regardless of age, culture or race, and they represent the typical limitations of the perception system, information processing, learning or decision-making of all human beings);

- **Vehicle and equipment factors,** which are more focused on the vehicle itself and which cover issues around mechanical failures, such as bad brakes, roadworthiness; and
- **Environmental factors** which include limited visibility, poorly marked roads, missing road signs, sudden changes in road infrastructure, gravel roads, and the state of the road (potholes, slippery roads and weather conditions).

Goniewicz, Goniewicz, Pawłowski and Fiedor (2016:434) argued that the application of Haddon's Matrix in practice led to progress in the understanding of human behaviours connected to road traffic, as well as the recognition of the factors that exert an effect on the number and severity of bodily injuries. Bocage *et al.* (2020:S39) conducted a study in Botswana that used the Haddon Matrix as a conceptual framework and asked trainees to identify host, vector, and physical/social environment risk factors for Motor Vehicle Crashes (MVCs) that, if targeted, may lead to primary, secondary, or tertiary prevention. The observation is that if the model is applied in consideration of the phases defined by Haddon, namely, pre-crash, during and post-crash after the accident, strategies can be identified for road traffic injury prevention.

A similar approach is adopted for the current study, but the emphasis is on the identification of human factors and preventative measures that can be implemented to prevent road crash fatalities among youth aged between 20 and 35 years. Figure 2.2 details the phases, as described by the Haddon Matrix, that should be considered pre-crash, post-crash, during and the relevant strategies. The researcher further linked them to the human factors that are usually associated with the phases, as adapted from Rustagi, Kumar, Norbu and Vyas (2018:485).

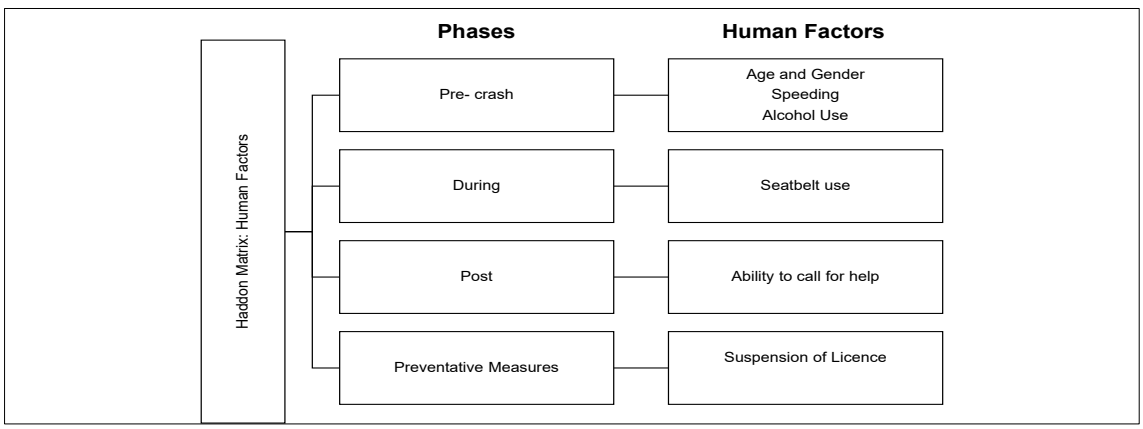

Figure 2.2: Application of the Haddon Matrix considering human factors

Source: Researcher's own compilation

2.2.4 Behavioural theories

Behavioural theories, according to Gielen and Sleet (2003:65), are an integral part of a comprehensive injury prevention strategy. According to Glanz, Rimer and Viswanath (2008:31), one of the most applied behavioural theories since 1986 to date in road safety research is the Health Belief Model (HBM), which is discussed in Table 2.2.

The HBM model has six constructs, namely, perceived susceptibility, perceived severity, perceived benefit, perceived barriers, cues to action, and self-efficacy of the model (Glanz *et al*., 2008:48).

Table 2.2 below details the constructs of the HBM theory, and also provides definitions of those constructs. The table further shows how such a model can be applied to the current study.

Table 2.2: Health Belief Model constructs

Construct	Definition	Application to the planned research
Perceived susceptibility	Belief about the chances of experiencing a risk or getting a condition or disease.	Define population(s) at risk, risk levels, personalise risk based on a person's characteristics or behaviour, and make perceived susceptibility more consistent with individual's actual risk.
Perceived severity	Belief about how serious a condition and its sequelae are.	Specify consequences of risks and conditions.
Perceived benefits	Belief in efficacy of the advised action to reduce the risk or seriousness of impact.	Define action to take how, where, when; and clarify the positive effects to be expected.
Perceived barriers	Belief about the tangible and psychological costs of the advised action.	Identify and reduce perceived barriers through reassurance, and the correction of misinformation, incentives, assistance.
Cues to action	Strategies to activate 'readiness'.	Provide how-to information, promote awareness, and use appropriate reminder systems.
Self-efficacy	Confidence in one's ability to act.	Provide training and guidance in performing recommended action, use progressive goal setting, give verbal reinforcement, demonstrate desired behaviours, and reduce anxiety.

Source: Glanz *et al.* (2008:48)

The model is premised on the belief that people will act to prevent injury if they believe they are vulnerable. Thus, they will take the necessary actions to reduce the chances of injury, and negative attributes will be overridden by the need to change (Jones *et al.,* 2015:567). The consideration of such a model in the context of other studies that focused on explaining why people would or would not participate in a programme to prevent or detect disease has since been applied to a wide variety of health-related behaviours, such as seatbelt use, as captured in the study by Okyere *et al.* (2021:993) and the study relating to helmet use by Kamakshi and Maheswari (2021:446).

2.2.5 Application of the selected model for the purpose of the research study

The theories and models discussed above all support a structured approach in the development of the problem statement for the current research. The models focus on problem identification and responding strategies to address the problem. The purpose of the discussion of the different theories above is to indicate the applicable theories and models that exist and have been applied in different studies. The aim is also to achieve an understanding of the systematic theory that introduced the Haddon Matrix model that is referenced throughout the study. As shown in the previous chapter, the premise of the study and the topic itself are built on the application of the Haddon Matrix.

The use of the Haddon Matrix for the current study is to investigate road fatalities from the South African perspective. As presented in Figure 2.4, the analysis showed the high number of road fatalities in SA, the age of the victims impacted by road fatalities, and lastly, the categorisation of the contributory factors (human, vehicle and environmental factors).

Figure 2.3 illustrates the number of fatal crash activities and fatalities reported for a specific period (2010-2021). The road fatalities rate for SA stood at 10 629 fatalities, according to the RTMC (2021:21).

The WHO (2015:4) emphasised that to turn the situation around countries must stabilise and reduce the predicted levels of road traffic fatalities. This is not only a South African phenomenon, but similar patterns were also recorded in the global road safety report that records the number of fatalities globally, which indicated that globally 1.3 million road fatalities were recorded in 2018. The report further stated that the

number of road fatalities has stabilised and that the rate of traffic deaths has remained constant over the last 15 years (WHO, 2018:4).

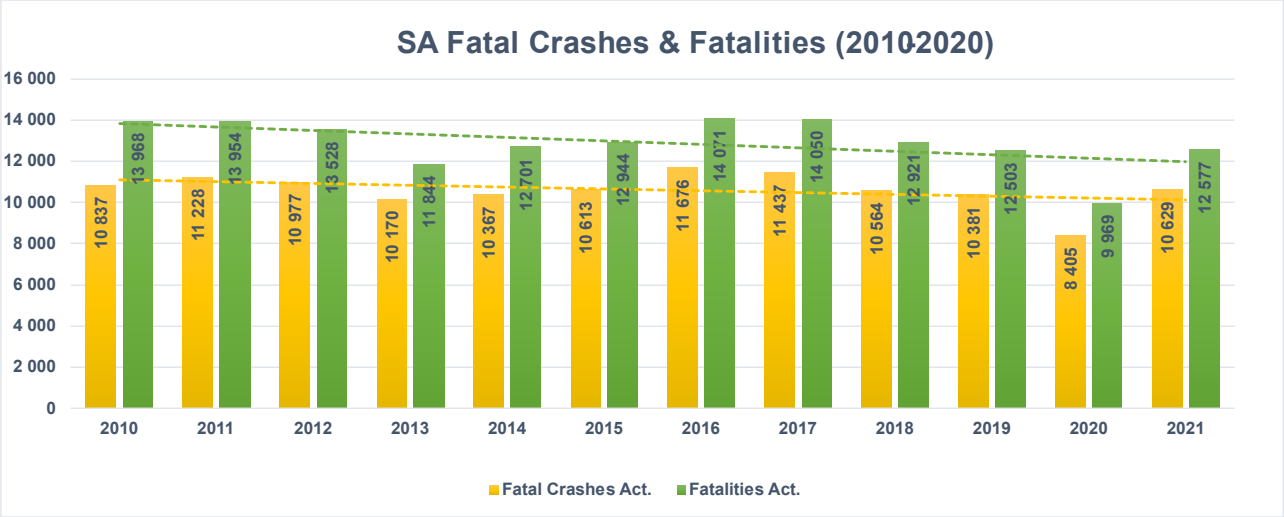

Figure 2.3: Number of recorded fatalities in SA from 2010 to 2021

Source: RTMC Calendar Reports, 2010-2021

The RTMC state of the road safety report (2020:19) depicted that the number of fatalities for 2020 was lower, resulting in a 20% decline from 2019. This was due to the Covid-19 pandemic that led to the declaration of a state of emergency on 25 March 2020 and which was lifted on 5 April 2022. The biggest impact of this on the road crash data was due to the risk-adjusted level strategies 1-5 that were implemented by the government wherein the movement of people was restricted, especially during levels 4 and 5. Therefore, the observation from the numbers was that less movement led to fewer road crashes resulting in fatalities. Similarly, during the Covid-19 lockdowns, some countries reported a significant decrease in road fatalities, according to the Carson, Jost and Meinero (2022:12). The lesson is that the reduction of mobility is not a solution, as shown by the increase in fatalities in 2021 in SA.

Further analysis of the statistics from the RTMC included the contributory factors to road fatalities and the age groups impacted by road fatalities. Figure 2.4 presents the contributory factors from the SA context. The analysis of the contributory factors is classified per human, vehicle and road factors based on the Haddon Matrix. Fritch, Agnew, Rosman, Cadorette and Barnett (2021:2709) opined that the Haddon Matrix, which was developed by Dr William Haddon, Jr. in 1968, aims to address challenges faced within the field of injury prevention. As previously mentioned, the model was also

adopted within the road safety discipline by developing a matrix that groups factors that lead to road crashes as human, vehicle, and environmental factors.

Figure 2.4 shows that, on average, over the past years human factors have contributed 80% to road fatalities in SA, followed by road factors at 12%, and vehicle factors at 7%. Human factors have been identified as the predominant causative factor in road traffic crashes, supported by Parkinson *et al.* (2013:852) Singh (2017:4712), Bakhtiyari *et al.* (2014:102), and Gicquel *et al.* (2017:4).

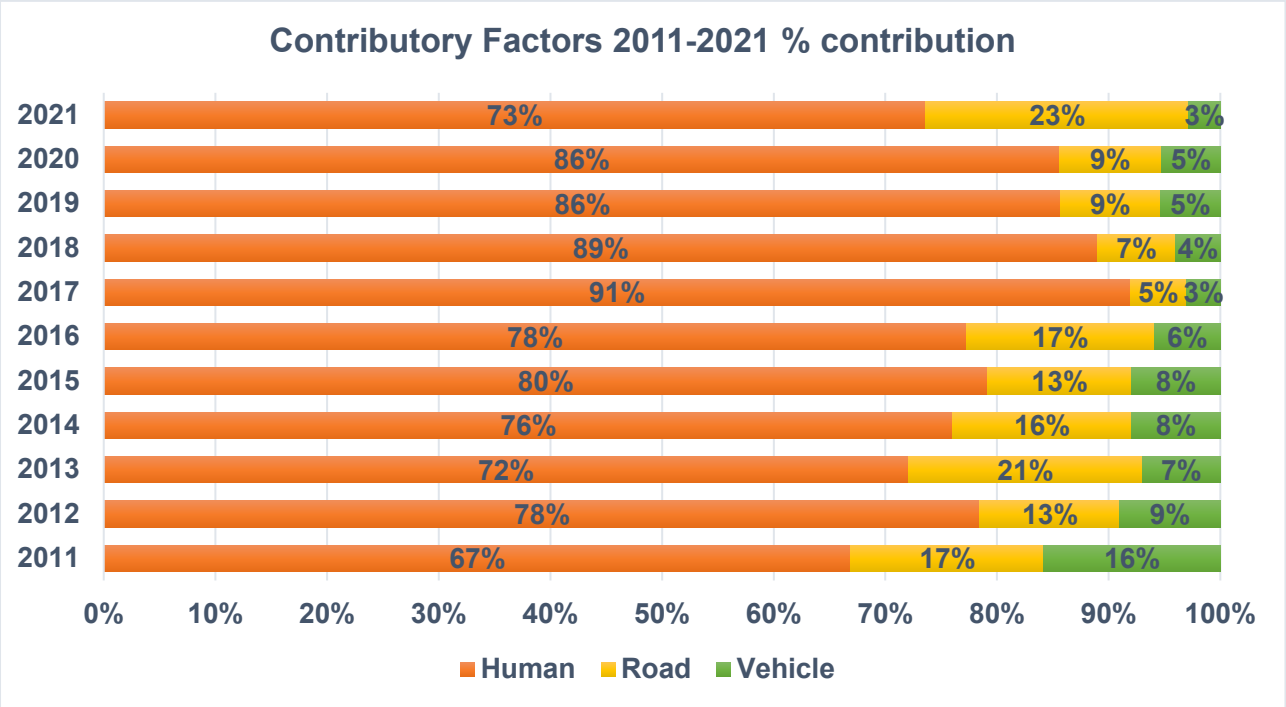

Figure 2.4: Contributory factors from 2011 to 2021

Source: RTMC Calendar Reports 2011-2021

2.3 IDENTIFICATION OF HUMAN FACTORS

Human factors are identified as the highest contributory factor to road fatalities. Figure 2.4 presented a detailed analysis of the human, vehicle, or environmental factors in the SA context. It has further been perceived that human factors play a far greater role in the severity of traffic crashes than environmental, vehicle or road factors (Siskind, Steinhardt, Sheehan, O'Connor & Hanks, 2011:1088; Assailly, 2017:524). Modiba believed that little is known about human factors in the SA road safety environment. Similarly, Mehryar *et al.* (2022:18) argued that there are various factors affecting the occurrence of accidents, and investigations are needed to determine the contribution

of each of the risk factors to these accidents and to be able to provide general guidelines.

A study by Singh (2017:4709) that analysed road accidents in India found that while there are several factors responsible for accidents, drivers' fault is the most prominent one, as drivers' fault accounted for 78% of total accidents in 2013. Additionally, Zhang *et al.* (2013:12) suggested that human error might have accounted for 92% of road traffic crash deaths in 2009 in China. They believed that human behavioural factors are the principal cause of road traffic deaths. This is also supported by Figure 2.4, that shows that human factors on average contributed 80% to road fatalities in SA from 2011-2020.

Theeuwes and Van der Horst (2017:27) viewed human factors as human error, concluding that even if people are highly motivated to behave safely, they will make errors that may result in crashes. Eiksund (2009:530) categorised human factors into three elements, namely, experience, excitement, and exposure. The three elements are discussed in detail below.

2.3.1 Experience

Experience refers to the level of driving competency, and according to Vassallo *et al.* (2014:161), inexperienced drivers tend to underestimate the level of risk associated with certain types of driving behaviour or situations. Theeuwes and Van der Horst (2017:135) indicated that young drivers have deficiencies in competence, they have less developed control skills, make more errors than experienced drivers, and have a strong tendency to overestimate their own driving skills.

Rasmussen (1983:259) distinguished between the different types of human errors that people make, depending on the three levels of task performance in accordance to skill-based, rule-based, and knowledge-based. Reason (1990:43) described the three levels of task performance as follows:

- **Skill-based level of task performance:** Human performance is governed by stored patterns of pre-programmed instructions represented as analogue structures in a time-space domain. Theeuwes and Van der Horst (2017:43) maintained that they are conducted automatically and very quickly; incoming information automatically results in the right behaviour without any cognitive

control. For example, the more a driver uses a specific route, the more they can drive without having to focus as much on the route. However, if the route changes, they will need to familiarise themselves with the route and more focus will be needed, and they might make some errors, such as missing a turn;

- **The knowledge-based level of task performance** comes into play in novel situations for which actions must be planned on-line, using conscious analytical processes and stored knowledge. Theeuwes and Van der Horst (2017:43) explained that it resonates more with frequent new situations (for example, finding the best route to a new destination), or situations that occur frequently but of which the driver still has little experience; and
- **The rule-based level of task performance** applies to tackling familiar problems in which solutions are governed by stored rules (productions) of the type, if (state), then (diagnosis), or if (state), then (remedial action). Theeuwes and Van der Horst (2017:43) argued that only brief cognitive attention is needed to select the proper rule or programme. For example, while most people are taught how to drive into a traffic circle, people often drive into it without giving way to those already in the circle.

The three performance levels apply to an individual from the time they acquire their driving licence; a time during which they depend highly on the knowledge acquired from the driving schools. Over time, people become rule-based by being highly effective in following rules. Ultimately, the individual reaches a skill-based performance where they become more experienced in how they drive. However, in all this, the individual can commit different errors which are linked to their performance levels. The different errors based on performance levels are described in Table 2.3 below.

Table 2.3: Performance levels and human errors.

Performance	Types of errors
Skill-based	Slips and lapses
Rule-based	Mistakes
Knowledge-based	Mistakes

Source: Reasons (1990:12)

The interpretation of the link between performance levels and errors can be deduced as follows: when a crash occurs at the skill-based level, slips and lapses occur, which,

as described by Reason (1990:8), are errors which result from some failure in the execution and/or storage stage of an action sequence, regardless of whether or not the plan which guided them was adequate to achieve its objective. According to Theeuwes and Van der Horst (2017:29), a road user may believe they are doing the right thing (speeding to overtake a car moving slowly in a lane without a barrier) but while the plan is correct, the execution fails (failing to observe that another vehicle is on the lane, resulting in a head-on collision). While these acts may be unintentional, they are sometimes committed intentionally, for example, if the person overtakes at a barrier line which clearly stipulates no overtaking.

At the rule- and knowledge-based level, Reason (1990:9) argues that these are more mistakes which are described as deficiencies or failures in the judgemental and/or inferential processes involved in the selection of an objective, or in the specification of the means to achieve it, irrespective of whether the actions directed by this decision-scheme run according to plan. For example, a person might enter the wrong road without knowing that it is a one-lane road and crash into the oncoming traffic.

2.3.2 Excitement

Excitement is defined as a feeling of great enthusiasm and eagerness (Oxford Dictionary, 2023). Mallia, Lazuras, Violani and Lucidi (2015:146) stated that excitement seeking was directly (positively) associated with traffic-rule violation acts, such as speeding and the aggressiveness trait directly related to drunk driving.

2.3.3 Risk exposure

Hakkert, Braimaister and Van Schagen (2002:8) defined exposure as the time spent travelling using the road. Furthermore, Pei, Wong and Sze (2012:465) stated that risk exposure measures the likelihood of being involved in a dangerous or hazardous situation, and this element in road safety research is a critical factor in the estimation of crash risk.

Risk is defined as the observed number of casualties per unit of exposure (Mindell, Leslie & Wardlaw (2012:2). Hakkert *et al.* (2002:8) defined risk as a quantification of the level of road safety relative to the amount of exposure (measures the likelihood of being involved in a dangerous or hazardous situation), thus, signifying that more time spent on the road increases the likelihood of the road user being involved in a road

crash. Bates *et al.* (2014:300) stated that the risk among youth is further aggravated by social and situational influences, particularly human factors, such as driving skills, drunken driving, distracted and inattentive driving, fatigue and speeding.

Therefore, the skill level of the driver can be beneficial, meaning that the more the individual drives, the more the individual will gain experience and become more familiar with the road. However, if the person is intoxicated, slips or errors can occur, even if their level of driving is at a skill-based level, and adding excitement can further lead to speeding by the intoxicated driver, thus, resulting in a road crash.

In addition, the inclusion of risk exposure can be translated into the following: the more a person drives, the higher the likelihood of being involved in a crash. A published report by the RTMC (2020:21) showed a decline in the number of road fatalities from 12 503 in 2019 to 9 969 in 2020. As a result, a reduction of 20% has been observed. This was attributed to less movement on the road during the risk-adjusted Covid-19 strategy that sought to curb the number of infections by restricting the movement of people.

2.3.4 Identification of human factors

The researcher in the current study seekst to identify the human factors that contribute to road fatalities to assist in capturing such human factors for the purpose of the study. The process applied to gather those human factors is an analysis of academic articles that captured studies relating to the identification of contributory factors in road crashes. Table 2.4 presents a summary of the human factors that were identified from the literature, and includes the country/region, provides a short description and the findings of the relevant author(s) on the contributory human factors.

Table 2.4: Literature review summation of human factors

Country	Reference	Description	Speeding	Drunken driving	Distracted driving	Fatigue	Not wearing a seatbelt	Turning in front of oncoming traffic	Disregard for yield sign/stop sign/ red traffic light	Overtaking	Jaywalking	Distracted walking	Driver losing control of the vehicle
India	Kapoor (2018); Singh (2017)	**India way behind 2020 target, road accidents still kill over a lakh a year:** In India, the 2016 road fatalities rates showed that a staggering 60% of people who lost their lives in road accidents were in the age group of 18-35 years. **Road Traffic Accidents (RTAs) in India: Issues and challenges:** The study found that the distribution of road accidental deaths and injuries in India varies according to age, gender, month and time. The study showed that the most productive age group, 30-44 years, is the most prone to road accident fatality in India.	X	X	X	X	X	X	X	X			
Bangladesh Dhaka city	Hossain, Maggi and Vezzulli (2022:4)	**Factors associated with crash severity on Bangladesh roadways: empirical evidence from Dhaka city:** In Dhaka city, the impact of RTAs is extremely significant, as people frequently travel in this area for more job and business opportunities. The study found that most at-risk individuals were those who were young and unmarried, and unaware ofRTAs.	X				X	X	X				

Country	Reference	Description	Speeding	Drunken driving	Distracted driving	Fatigue	Not wearing a seatbelt	Turning in front of oncoming traffic	Disregard for yield sign/stop sign/ red traffic light	Overtaking	Jaywalking	Distracted walking	Driver losing control of the vehicle
Ethiopia	Denu, Osman, Bisetegn, Biks and Gelaye (2021:329)	**Prevalence and risk factors for RTIs and mortalities in Ethiopia: systematic review and meta-analysis:** The aim of this systematic review and meta-analysis was to estimate the proportion of RTIs, mortalities and risk factors for road traffic injuries and mortalities among all age groups in Ethiopia by including all studies based on hospital data and police registry data.	X	X	X								
United Kingdom	Rolison and Moutari (2020:23)	**What are the factors that contribute to road accidents? An assessment of law enforcement views, ordinary drivers' opinions, and road accident records:** The study assessed the causes of road accidents involving young, middle age, and older male and female drivers reported in accident records and compared these with expert views of police officers and lay views of the driving public.	X	X									X
France	Gicquel *et al.* (2017:2) Gicquel *et al.* (2017:2)	**Description of various factors contributing to traffic accidents in youth and measures proposed to alleviate recurrence:** In France, traffic accidents also represent a major and persistent public health problem. Data analysed	X	X	X								

Country	Reference	Description	Speeding	Drunken driving	Distracted driving	Fatigue	Not wearing a seatbelt	Turning in front of oncoming traffic	Disregard for yield sign/stop sign/ red traffic light	Overtaking	Jaywalking	Distracted walking	Driver losing control of the vehicle
		between 1979 and 2013 showed the young people aged 15–24 years had the highest death rate as a result of road accidents.											
Czech Republic	Bucsuházy, Matuchová, Zůvala, Moravcová, Kostíková and Mikulec (2020:560)	**Human factors contributing to the RTAs occurrence:** The aim of this study was the analysis of human behaviour or condition which can lead to the accident or influenced the accident causation.	X	X	X	X				X			
SA	RTMC Calendar reports (2021:19)	**State of road safety report:** The report captures the recorded number of road fatalities in SA including the human factors that contribute to those fatalities.	X	X	X	X	X	X	X	X	X	X	X
USA	Mwakalonge, Siuhi and White (2015:330)	**Distracted walking: Examining the extent to pedestrian safety problems:** This study reviewed the state-of-practice on policies, campaigns, available data, identified research needs, and opportunities pertaining to distracted walking. The study found 116 reports of death or injury of pedestrians										X	

Country	Reference	Description	Speeding	Drunken driving	Distracted driving	Fatigue	Not wearing a seatbelt	Turning in front of oncoming traffic	Disregard for yield sign/stop sign/ red traffic light	Overtaking	Jaywalking	Distracted walking	Driver losing control of the vehicle
		wearing headphones. The majority of victims were male (68%) and under the age of 30 years (67%).											
United Kingdom	Rolison and Moutari (2020:176)	**Combinations of factors contribute to young driver crashes:** Motor-vehicle crashes are a leading cause of death in adolescence and young adults. This study sought to investigate whether combinations of factors underlie crashes involving young drivers.	X	X									X
SA	Modipa (2022)	**Analysing factors contributing to RTAs in SA:** This article focused on preventative measures to curb the factors contributing to RTAs in SA	X	X	X								
Total			**9**	**8**	**6**	**3**	**3**	**3**	**3**	**3**	**1**	**2**	**3**

Source: Researcher's own compilation

The determination of the human factors that contribute to road fatalities is key, as it provides a theoretical foundation to motivate the inclusion of the human factors identified as part of the study. It is evident from the summary that the human factors that are most prevalent were factors such as speeding, followed by drunken driving. The following are the descriptions of the human factors identified in Table 2.4:

- **Speeding:** Michael *et al.* (2014:105) defined 'speeding' as driving at a speed unsuitable for the prevailing road traffic condition and above the allowable speed limit. In addition, Pei *et al.* (2012:464) and Wali, Ahmed, Iqbal and Hussain (2017:274) argued that speed plays an important role in traffic management and control, and it is also generally believed to be a determining factor in the number and severity of crashes. Furthermore, Goniewicz *et al.* (2016:436) stated that an increase in speed by 1 km/h causes a 3% increase in the risk of an accident, the participants of which will sustain bodily injuries, and a 5% increase in the risk of a fatal accident.
- **Drunken driving**: Drunken driving is defined by Crawford and McGrowder (2008:183) as driving when the blood alcohol content is increased, and the risk of crash involvement increases dramatically due to increased impairment.
- **Distracted driving**: Distracted driving, according to the RTMC Cost of Crashes (2015:8), is defined as anything that diverts the drivers away from the primary task of navigating a vehicle.
- **Fatigue:** Zhang, Yau, Zhang and Li (2016:35) described fatigue driving as a "silent killer", where drivers are more likely to drive while fatigued and deploy ineffective measures such as opening windows or listening to music to help them become more alert.
- **Not wearing a seatbelt**: A seatbelt is a belt that fastens around you when you are travelling in a vehicle and holds you in your seat to reduce the risk of being injured in an accident. Ghaffari *et al.* (2018:1) and Oxley, O'Hern and Jamaludin (2018:177) found that the use of a seatbelt may prevent severe collision damage and may keep passengers safe and secure from sustaining serious injury and from being thrown out of vehicles after the collision. Thus, seatbelts are one of the most efficient and inexpensive in-vehicle safety devices, capable of reducing the risk of death or serious injury in a crash by almost 50% for both

drivers and front-seat passengers, and about 25% for rear-seat passengers (Oxley *et al.,* 2018:177).

- **Turning in front of oncoming traffic** is described by Hossain, Maggi and Vezzulli (2022:8) as an act of driving the wrong way.
- **Disregard for yield sign/stop sign/red traffic light** is described by Devalla (2018:50) as an act of performing unsafe lane changes, failing to detect the presence of other vehicles in the intersection, the failure to comply with stop signs, and jumping a red traffic light. Road signs, as per the National Road Traffic Act No. 93 of 1996 (NRTA) (SA, 1996:55) Section 56 (1), are used to prohibit, limit, regulate or control traffic in general or any particular class of traffic on a public road.
- **Overtaking** means passing with a vehicle by another participant in road traffic moving in the same direction along the same traffic lane or part of the road that is intended for traffic (Law Insider, 2022). Bucsuházy *et al.* (2020) and the RTMC (2021:19) referred to risky overtaking as when it is not safe to overtake (such as overtaking in a barrier line, when another vehicle is approaching).
- **Jaywalking** is defined as the act of crossing a street in an illegal, careless, or unsafe manner (Merriam-Webster (2022).
- **Distracted walking:** Stavrinos, Pope, Shen and Schwebel (2018:117) described distracted walking as inattention evoked by secondary task engagement in road environments and is a significant contributor to unintentional road injuries, In addition, Wells, McClure, Porter and Schwebel (2018:101) observed the following secondary behaviours that lead to distraction among pedestrians, namely, wearing of headphones (the most common distraction), text-messaging and talking on the phone.
- **Driver losing control of the vehicle** occurs when a driver is travelling too fast for the conditions, for example, on a sharply curving road or slippery road due to poor weather (Rolison & Moutari (2020:175).

2.3.5 Who is impacted by road crashes?

According to the WHO (2015:6), the growing burden of road fatalities remains a challenge in Africa, and the continent continues to have the highest road traffic death rates compared to high-income countries. The report reiterated that one of the biggest challenges is the impact of road crashes on young car drivers who run a higher risk of

road traffic crashes (RTC) and road traffic injury (RTI), not only because of their lack of experience but also because of their young age and stage of development. Houwing and Twisk (2015:62) argued that road fatalities among the youth are overrepresented due to the higher risk exposure because of dangerous trip conditions and a higher tendency to take risks. Young drivers are believed to have a greater propensity for adopting unsafe driving practices, including among others, alcohol/drug consumption, high speed, night driving, and disregard for traffic regulations, hence, they become victims of horrendous road crashes resulting in fatalities.

According to StatsSA, the age groups that are most affected by non-natural deaths (all deaths that were not attributable or may not have been attributable to natural causes) are the ages between 15 and 19 (44.7%) and 20 and 24 (46.3%). Furthermore, the third most common cause of non-natural deaths was transport crashes (StatsSA, 2019:55). Similarly, the RTMC (2021:22) categorised the age groups per driver, passenger and pedestrians. The analysis demonstrated that the driver and pedestrian age group between 30 and 34 years was most impacted by road fatalities, whilst for passengers, the most affected age group was 25 to 34 years, and for cyclists, 25 to 29 years. In summary, and considering the results of the analysis, the researcher deemed it necessary to focus on the human factors contributing to road fatalities among youth aged between 20 and 35 years for the current study.

2.3.6 Generational theory

As the focus of the current study is mainly on the youth aged between 20 and 35, it was thus necessary to incorporate the generational theory into the study to support the choice of the selected group and the characteristics that define them. The current study aims to show the different generations and applicable years, and the emphasis is on the generation that has been selected for the study.

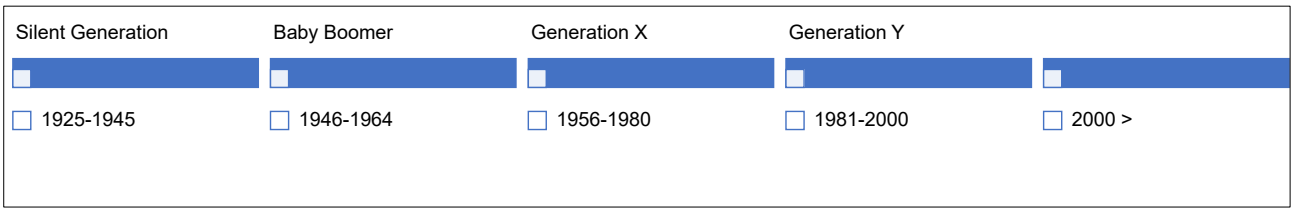

Figure 2.5: Generational theory description

Source: Ercömert and Güneş (2021:141)

The group selected from the research is classified as Generation Y which, as described by Hopkins (2016:150), includes people born between 1981 and 2000. Valentine (2013:568) described them as individualistic, well-educated, technologically savvy, sophisticated, mature, and they consider themselves to be 'cool' (in other words, worldly-wise). Evans, Ozdalga and Ahuja (2016:381) described them as an optimistic and assertive generation surrounded by technology and comfortable with multitasking. Bolton *et al.* (2013:247) described the selected age group as the generation that 'want it all' and 'want it now', in all aspects of their life.

Generational theory has been used in research to understand the characteristics of the participant or focus group for a specific study. Hopkins (2016:150) maintains that the premise of the theory is that people within these cohorts have been exposed to the same socioeconomic and political contexts, and thus, it has been suggested that this is one way that the population can be segmented to examine a particular phenomenon. Therefore, the current study considered the age group between 20 and 35 years to determine what human factors contribute to road fatalities among this cohort, and the strategies that can be implemented from the perspective of traffic officers and crash investigators.

2.4 ROAD SAFETY STRATEGIES

The current research study did not only seek to identify the human factors as a causality of road fatalities among young people but also attempted to investigate the critical strategies that might be implemented to address the problem. The importance of understanding road safety theories provides context to the critical evolution that has taken place in relation to road safety. These strategies will also guide the development of the research solution as part of the study. Scott-Parker and Oviedo-Trespalacios (2017:37) stated that an improved understanding of the risk factors related to young drivers will result in informed interventions at local, state, national and international levels to improve safety for all who share the road.

Bumbasirevic *et al.* (2014:317) emphasised that if the high number of road fatalities among young people persists there is a need to develop an implementable well-defined national strategy to protect young road users. Ojo (2015:28) made a fundamental point that road crashes have been accepted as an integral part of human fate, which has made Africa indifferent to the occurrence of increasing road crashes.

It is not acceptable that countries are losing young people who should be contributing to the economy and might have been the leaders of tomorrow. There is a need to perceive road fatalities among the youth as a national problem that requires urgent attention. Notably, Lagarde (2007:967) stated that research is scarce on road safety in developing countries, especially in Africa with high levels of fatalities. Thus, the importance of not only looking at the causes of road fatalities but also emphasising the identification of strategies to address them.

According to Banstola and Mytton (2017:13), youth should adapt their behaviour to cope with traffic, however, the authors recommend that young people should be addressed in the design and management of the whole road system. Bambach and Mitchell (2015:291) advocated for a holistic approach to dealing with road crashes. Their idea was premised on the principle that the four cornerstone areas, namely, the roads, speeds, vehicles and people, must be combined (Bambach & Mitchell, 2015:291). Thus, even though they recognised that the different cornerstone areas influence road crashes individually, the emphasis should be on a combination of all of them to improve safety by reducing the risk level of road users.

This section will identify and outline the different strategies that have been adopted by different countries or authors in dealing with road fatalities to derive substantial key strategies for the current study. The strategies must be active to encourage or require people to take an active role in protecting themselves. Goniewicz *et al.* (2016:437) explained that strategies and programmes for the improvement of road traffic safety should primarily cover the following four actions:

- Reduction of exposure to the danger of accidents;
- Prevention of accidents;
- Reduction of the injuries which are the effect of accidents; and
- Decreasing the consequences of accidents by improving post-accident medical care.

Peden *et al.* (2004:5) emphasised that the application of the Haddon Matrix also provided opportunities for interventions to reduce road crash injuries.

Table 2.5 describes the preventative strategies that can be applied to proactively manage the impact, once a crash has occurred.

Table 2.5: Intervention at every stage of the crash

	Human	Vehicle and equipment	Environment
Pre-crash (Crash prevention)	▪ Information ▪ Attitudes ▪ Impairment ▪ Police enforcement	▪ Roadworthiness ▪ Lighting ▪ Handling ▪ Speed management	▪ Road design and road layout ▪ Speed limits ▪ Pedestrian facilities
During crash (Injury prevention during the crash)	▪ Use of restraints ▪ Impairment	▪ Occupant restraints ▪ Other safety devices ▪ Crash-protective design	▪ Crash-protective roadside objects
Post-crash (Life sustaining)	▪ First aid skill ▪ Access to medics	▪ Ease of access ▪ Fire risk	▪ Rescue facilities ▪ Congestion

Source: Peden *et al.* (2004:5)

The table above lists the strategies that address all the contributory factors, namely, human, vehicle and equipment, and environment. The pre-crash phase relates to the information (education and training of drivers), attitudes (speeding, disregarding traffic lights, and so forth), impairment (being under the influence of a substance), and police officers enforcing the applicable traffic laws (wearing of a seatbelt). The post-crash phase includes the ability to access help from medics.

Fundamentally, the strategies listed above focus on three different levels, namely, legislation, enforcement and education. The view of Akbari *et al.* (2021:76) is that when educational interventions are accompanied by other important factors such as road safety, vehicle quality and safety, and even signalisation, policy, legislation, law enforcement, and so forth, it could improve safe behaviour. Similarly, Modipa (2022:444) concluded that law enforcement agencies enforce laws, and partner with stakeholders, road safety promotions and traffic authorities to empower road users with in-depth knowledge, skills and attitudes related to road safety.

Therefore, in trying to determine the strategies that can be implemented, the literature review has been categorised by reviewing strategies that focus on these elements, namely, legislation, enforcement and education. This is because Akbari *et al.* (2021), Modipa (2022), Singh (2017:4717) and Hossain *et al.* (2022) maintained that strategies should always include elements that address legislation, education

(including training, awareness campaigns), and enforcement. The abovementioned authors believed that without consideration of all these elements, the strategy implemented will not yield the results in reducing crashes that lead to injuries and fatalities, as discussed below.

2.4.1.1 Legislation

Legislation is considered an effective way of eliminating risky behaviours among road users and a means to increase road safety. Furthermore, traffic legislation is perceived as an important element in the improvement of road safety (Sheng *et al.,* 2018:576). Nangana *et al.* (2016:345) and Gössling (2017:8) argued that the reinforcement of road traffic regulation is necessary through the application of measures mainly targeting high-risk behaviours such as over-speeding, sleepiness, distracted driving (phone calls, text messaging) and driving under the influence of alcohol or drugs.

Furthermore, Sweden, Poland and Russia have implemented preventative strategy laws, such as the reduction of the BAC from 0.05 mg% to 0.02 mg%. Haghpanahan *et al.* (2019:323) indicated that countries, such as Australia, France, Austria, and Serbia, have provided evidence that the reduction of the BAC is effective in reducing road traffic crashes. Some of the regulations that are considered to reduce the occurrence of fatalities are summarised in the table below.

Table 2.6: Legislative strategies from literature

No.	Reference	Statement from literature
1	WHO (2015:18)	▪ Punishment for speeding should be more restrictive. ▪ Introducing speed limits in densely populated urban areas.
2	WHO (2015:18)	▪ The law should be changed so that drivers are not allowed to drink any alcohol. ▪ The control of alcohol levels among drivers by introducing zero alcohol blood alcohol concentration.
3	WHO (2015:18)	▪ Seatbelts reduce the risk of injury for drivers and passengers. ▪ Helmet and seatbelt usage.
4	Carthy *et al.* (1993b); Gicquel *et al.* (2017:7)	▪ Change the manner in which drivers acquire a licence, such as introducing Graduate Driver Licensing.

No.	Reference	Statement from literature
5	Gössling (2017:9) Sheng *et al.* (2018:579)	▪ Officers suggested making fines dependent on income. ▪ Demerit point system and increase in fines and imposing tougher penalties to deter offenders and anyone who commits traffic crimes.

Source: Researcher's own compilation

2.4.1.2 Enforcement

Enforcement of legislation is pivotal, however, the WHO (2019:69) indicated that the enforcement of laws remains a huge challenge across the world, and as such, this enforcement is limited. Effective enforcement goes a long way towards ensuring that interventions such as speed laws, drunken driving management, and seatbelt laws lead to the reduction of road fatalities. It is perceived, as stated by Gössling (2017:4), that without the enforcement of traffic rules, drivers will ignore speed limits more frequently, drive faster, use seatbelts less often, ignore the severity of the penalty issued, and the speed that is imposed, disregard alcohol limits and drive more aggressively. Therefore, for enforcement to be effective, it is dependent on the type and frequency of enforcement, and the degree of traffic monitoring.

According to Gössling (2017:13), enforcement interventions, such as speed limit reduction, speed control on the most dangerous roads, breathalyser testing for BAC, banning of substances that influence driver capabilities, fines based on income, and sanctions of foreign offenders assist in bringing about law and order, however, it must be supported by clear traffic legislation. Desapriya, Iwase and Taye (2002:80) stated that enforcement laws work best when enforcement is strict, extensive, and prompt, from the time of the law's inception throughout the years.

The table below indicates some of the strategies that have been implemented:

Table 2.7: Strategies for enforcement from literature

No.	Reference	Statement from literature
1	Gössling (2017:8)	There are not enough controls in traffic due to a lack of traffic officer visibility, a need to have more visibility of traffic officers. Increasing law enforcement officials on the road and providing them with all the necessary resources.
2	Gössling (2017:8)	Increasing number of traffic officers at high-accident zones.
3	Parker, Stradling and Manstead (1996)	Random breath testing of drivers should be introduced.
4	Gössling (2017:8)	Repeated and severe traffic offences to be punished with driving bans or losing their driving licence.
5	Gössling (2017:13)	More speed control, specifically in areas where accidents occur frequently.

Source: Researcher's own compilation

2.4.1.3 Education

Assailly (2017:525) defined road safety education as the promotion of knowledge and understanding of traffic rules and situations, improvement of skills through training and experience, and strengthening and/or changing attitudes toward risk awareness, personal safety and the safety of other road users. Alonso, Esteban, Useche and Manso (2016:2) indicated that road safety knowledge is an independent protective factor for RTIs and fatalities.

According to Goniewicz *et al.* (2016:436), Goniewicz, Misztal-Okońska, Rzońca, Lulek, Bednarz and Goniewicz (2017b) and Sheng *et al.* (2018:579), the interventions that need to be considered in road safety education include promotional campaigns, educational programmes, and training programmes. The implementation of a combination of those interventions may contribute to a change in behaviours and an increase in awareness in communities. A study by Odonkor, Mitsotsou-Makanga and Dei (2020:6) in Ghana, showed that the level of education of road users, government staff, and officials regarding road safety signs and signals is low, which is such a critical skill in acquiring a licence.

The table below summarises strategies as adopted from the literature:

Table 2.8: Strategies for education from literature

No.	Reference	Statement from literature
1	Amo (2014:55), Dash, Sethi and Dash (2021:10)	▪ Stronger training for drivers and pedestrians. ▪ Increase the number of specific training courses on road traffic rules for all citizens. ▪ Evaluate and strengthen drivers' training so as to have competent and well-disciplined drivers.
2	Amo (2014:55), Dash *et al.* (2021:10)	▪ Periodic refresher courses for younger drivers/riders on traffic law to bring to bear the adherence of good driving/riding principles and attitudes and also stringent application of traffic laws. ▪ Proper awareness programmes regarding road safety and changes in attitude of population are needed to a greater extent.
3	Goniewicz *et al.* (2017b:166)	Did you change your behaviour after seeing social campaigns?
4	Goniewicz *et al*. (2017a:46), Hammoudi, Karani and Littlewood (2014:10)	▪ Introducing campaigns in schools on the dangers of drunk driving and conducting school-based driver education. ▪ Traffic safety education as part of the school curriculum must be a key consideration and must also expand to other road users (drivers, passengers, motorcyclists, cyclists, and pedestrians).
5	Alonso *et al*. (2016:10), Abdul-Wahab (2016:138), Gössling (2017:8), Hossain *et al.* (2022:8), Modipa (2022:444)	▪ Road safety campaigns coincide with a 10% reduction of crashes, especially those which involve personal communication, billboards and social media-related strategies. ▪ There should be continuous enlightenment campaigns through radio, television, and motor garages to educate road users on the importance of disciplined driving and on the laws guiding the road usage. ▪ Social media, TV programmes, radio, print (newspapers/magazines), newsletters, leaflets, pop-up advertisements on social media apps (YouTube, games) and TV advertisements should be used for road safety education. ▪ Conduct mass media campaigns to build awareness of the prevalence and dangers of RTAs. ▪ The promotion of road safety in SA could be used to empower more road users about the rules of the road and how to conduct themselves through the use of all relevant platforms such as radio, television, newspapers, social networks, and so forth, to provide messages to the masses on the ground.

Source: Researcher's own compilation

The discussion above demonstrates that a responsive strategy requires that regulation, enforcement and education should be combined. This is supported by O'Neill and Mohan (2020:10), who focused on the prevention of crash injuries and deaths, and emphasised that education by itself does not work, and to effect, a change to road user behaviour needs a combination of legislation, education, and enforcement of traffic laws.

Lastly, Hossain *et al.* (2022:8) also supported that a mix of interventions, such as increasing the number of specific training courses, mass media campaigns, safer road infrastructure, strict law enforcement, increasing traffic police and strict punishments should be implemented. Therefore, what this discussion seeks to highlight is to emphasise that the identified countermeasures in isolation will not deliver a tangible and sustained reduction in deaths and serious injuries and that a multi-disciplinary approach should be adopted. Thus, it is important that in any effort to develop the best strategies all these elements are considered as they work together.

The above section included a discussion of various theories and human factors and how they have been enhanced over time. It further captures an understanding of the human factors that contribute to fatalities, and lastly, the strategies. The section below gives an overview of the chapter.

2.5 CONCLUSION

Firstly, through an overview of the relevant literature, the researcher was able to explore the theories relating to road safety. In addition, it was identified that human factors contribute to road fatalities much more than other factors, namely, vehicle and environmental factors. Secondly, through an exploration of the literature, the researcher was able to identify the human factors that contribute to road fatalities, which resulted in the identification of the ten human factors. Notably, in the identification of the human factors that contribute to road fatalities, speeding and drunken driving were the most frequently identified contributory human factor. Lastly, the strategies that can be adopted to address the problem were determined through legislation, enforcement, and education, as critical by adopting an integrated approach.

The next chapter will discuss the research methods that were applied in the study. These were informed by the above research and are not only instrumental in noting that this is a social issue, but that the economic impact of such fatalities, especially within this age group, require interventions that will ensure that the rates are drastically reduced through a clear understanding of the problem and identifying the right solutions to the problem. Chapter 3 will discuss in detail the research methodology that was adopted to assist the researcher to respond adequately to the objectives and questions of the study.

CHAPTER 3:
RESEARCH METHODS

3.1 INTRODUCTION

This chapter draws on the elements highlighted in the literature review presented in Chapter 2. The literature review chapter enclosed subjects relating to theories in road safety-related research, provided an understanding of human factors as a contributory factor to road fatalities among the youth and identified some interventions that can be adopted to address the problem. Chapter 3 outlines the procedures and techniques that were used to undertake the study. It focuses on the systematic approach deployed in the collection, analysis, findings and conclusion.

The problem under investigation is the high road fatalities among the youth between the ages of 20 and 35 years due to human factors. The objective of the current study is to determine the human factors that contribute to road fatalities among the youth. The impact of road fatalities among the youth has become a socioeconomic problem, due to this age group being the most economically active population and the loss of income is significant not only to the economy but the community at large.

Parkinson *et al.* (2013:851) and Crawford and McGrowder (2008:184) Pal *et al.* (2019:775) emphasised that people who are active and of productive age are involved in road traffic crashes and this has an economic impact and also impacts family life. The fatality rates are high in SA, and more critically, it affects the youth.

Table 3.1 presents a summary of the research objectives and questions.

Table 3.1: Research objectives and questions researcher compilation

Research objective	Research question
▪ To determine the human factors that lead to the increase in fatalities among the youth between the ages of 20 and 35 years. ▪ To determine which factors are perceived to be the most frequent contributors towards road fatalities among the youth between the ages of 20 and 35 years.	▪ What are the human factors which contribute towards road fatalities among the youth between the ages of 20 and 35 years? ▪ Which factors are perceived to be the most frequent contributors towards road fatalities among the youth between the ages of 20 and 35 years?

Research objective	Research question
▪ To recommend possible strategies to reduce fatalities among the youth between the ages of 20 and 35 years.	▪ Which strategies can be implemented to reduce fatalities among the youth between the ages of 20 and 35 years?

Source: Researcher's own compilation

Therefore, in an attempt to answer the research questions, the foundation established in Chapter 2 was tested in a South African context through the use of a quantitative research design. The researcher used a structured questionnaire to gather the perception of traffic officers and crash investigators as to what they perceive to be the human factors that lead to road fatalities among the youth and possible strategies to address the problem.

3.2 RESEARCH PROCESS

The research process was underpinned by the use of the 'research onion', as depicted in Figure 3.1. Saunders, Lewis and Thornhill (2016:124) developed the research onion to help scholars with an effective way of how to choose paradigms that are congruent with their strategies, time horizon and procedures.

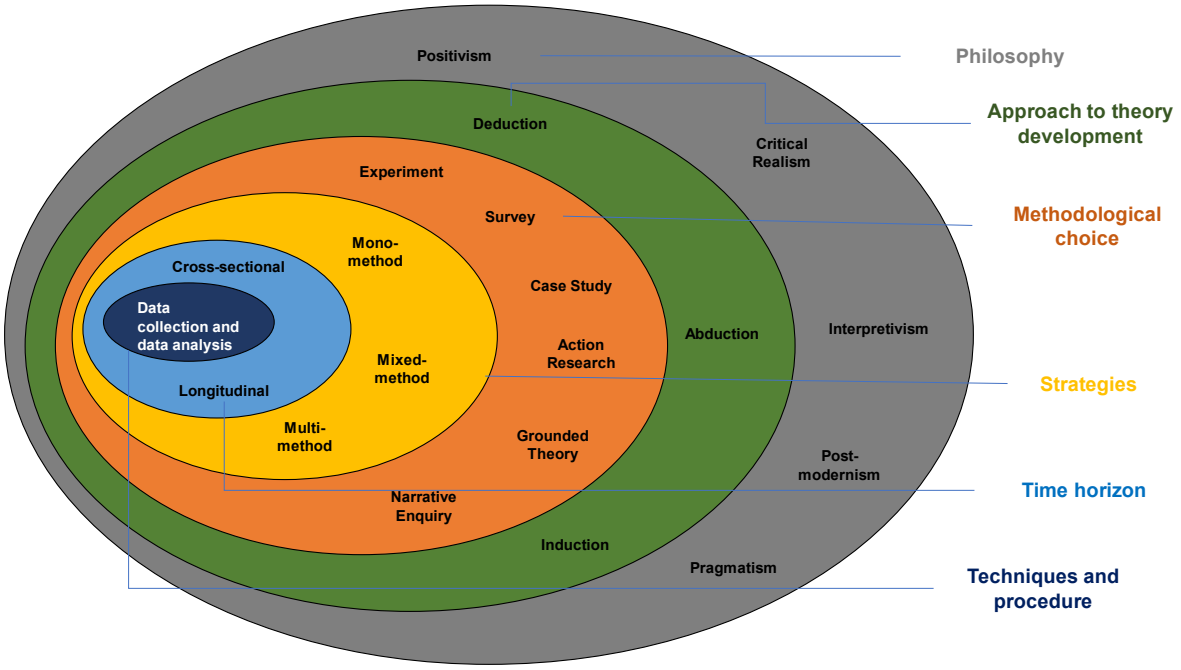

Figure 3.1: The research onion

Source: Saunders *et al.* (2016:164)

The elements of the research process applied to the current study are summarised in Table 3.2 and discussed in detail below.

Table 3.2: Research process and structure

Category	Study structure
Research philosophy	Positivism paradigm
Research approach	Deductive
Research strategy	Quantitative mono method
Methodological choice	Structured questionnaire
Time horizon	Cross-sectional

Source: Researcher's own compilation

3.3 RESEARCH PHILOSOPHY

Research methodologies are grounded on philosophies and beliefs, in general, and strategies and assumptions that the researchers hold, in particular (Buchanan & Hvizdak, 2009:37). A paradigm is defined as a set of interrelated assumptions about the social world that provides a philosophical and conceptual framework for the organised study of that world (Filstead, 1979:34). Allemang, Sitter, Dimitropoulos (2022:39). believed that paradigm arose out of the desire to focus efforts on solving practical problems in the real world through inquiry.

Rocco, Bliss, Gallagher, Pérez and Prado (2003:20) defined a paradigm as a 'world-view', whilst Creswell (1998:74) defined it as "basic set of beliefs or assumptions". Similarly, Guba and Lincoln (1994:107) defined a paradigm as a set of basic beliefs that deal with ultimate or first principles. They argued that while beliefs must be simply accepted by faith, they must be well-argued, although their ultimate truthfulness cannot be determined.

Hence, Guba and Lincoln (1994:107) contended that a paradigm is based on assumptions of ontological, epistemological and axiology, which are used as assumptions to distinguish research philosophies. Fayolle, Kyrö and Ulijn (2005:137) defined ontology as how people think the world is constructed at its deepest and broadest level; epistemology is how people see the world and they shape what they

think with the methods they use; and axiology refers to the role of values and ethics within the research process (Saunders *et al.,* 2016:128).

Saunders *et al.* (2016:135) introduced five research theories, namely, positivism, critical realism, interpretivism, postmodernism and pragmatism. Positivism, as described by Ponterotto (2005:128), is based on the reasoning that leads to the control and prediction of phenomena. Critical realism focuses on explaining what we see and experience in terms of the underlying structures of reality that shape observable events (Saunders *et al.,* 2016:138). In contrast, the main purpose of the interpretive paradigm is to understand the world from the person's perspective (Burrell, 1979:28). Postmodernism emphasises the role of language and of power relations, seeking to question accepted ways of thinking and giving a voice to alternative marginalised views (Saunders *et al.,* 2016:141), whilst pragmatism accepts different realities and the aim is to provide pragmatic solutions and outcomes (Winit-Watjana, 2016:430).

Positivists believe that the external world is ordered and regular and that there is an objective reality (or truth) with specific patterns that can be predicted or explained through theories or laws. The positivism paradigm was applied as the basis for the chosen paradigm in the current study. The data collection allowed the researcher to make observations without influencing the process. However, positivism has been criticised for being misrepresentative (Hirschheim & Klein, 1992) and being exclusionary of purpose and meaning, as well as context-stripping (Guba & Lincoln, 1994:106). According to Ponterotto (2005:129), dissatisfaction with the positivism approach led to the development of post-positivism. The current study is a quantitative study, hence, the positivism paradigm applies.

3.4 RESEARCH APPROACH

Sekaran and Bougie (2016:26) described deductive methods as an approach to test a theory using an organised set of assumptions that generate testable predictions about a topic of interest while moving from the general to the more specific. The above authors defined inductive reasoning as a process where specific phenomena are observed, and, on this basis, allows the researcher to arrive at general conclusions, working from the more specific to the more general.

The current study adopted a deductive approach. The researcher sought to determine whether human factors contribute to fatalities among youth through an exploration of the perceptions of traffic officers and crash investigators. The literature review revealed that human factors contribute far more to fatalities than vehicle and environmental factors. The literature further highlighted which human factors contribute to these phenomena, and in most of the research studies, speeding and drunken driving seemed to make a higher contribution than the other human factors. The literature further highlighted the concepts that can be adopted to address the problem. The researcher used the findings from the literature to determine whether this applies to a South African context by gathering the perceptions of traffic officers and crash investigators through the use of a questionnaire.

3.5 RESEARCH STRATEGY

Research designs are types of inquiry within qualitative, quantitative, and mixed methods approaches that provide specific direction for procedures in a study (Creswell & Creswell, 2017:49). Thus, the research design assists in the planning and recording of the process to allow the researcher to objectively answer the research questions of the study. The key themes for the research design are underpinned by the synchronisation of the research problem, research question and objectives, data collection methods, data analysis methods and interpretation of data in a practically viable and justifiable way. A quantitative research design was selected for the purpose of the current study.

Quantitative research is described by Mahoney and Goertz (2006:245), as a research methodology that focuses on theory testing, frequently uses numerical data, shows hypothetical relationships between constructs, and frequently predicts the outcomes. It is one of the most used research methodologies in social research. The quantitative method assisted the researcher in the current study to gain insight into and understanding of the human factors leading to road fatalities among the youth through the perception of traffic officers and crash investigators. In some instances, the respondents were not flexible because the quantitative research programmed instruments could not capture their information correctly (Henning, Van Rensburg & Smit, 2004:3).

A quantitative research design was selected for the current study as it allowed the study to gather the required data within a reasonable time. Also, due to the nature of the work of the selected respondents, the methods were convenient as it did not take much time to complete the questionnaire. Therefore, it was deemed to be the best method to reach each participant without spending too much time and creating unnecessary inconvenience to them.

In addition, quantitative research consists of two types of designs, namely, descriptive and experimental. The main purpose of a descriptive research design is to describe a given state of affairs (Fraenkel, Wallen & Hyun, 2011:15). The main purpose of experimental research is to test the variables that cause and affect relationships (Saunders *et al.,* 2016:178).

In the current study, the perceptions of crash investigators and crash investigators were measured by quantitative research, albeit following a descriptive research design. The aim was to capture the perceptions of traffic officers (National Traffic Police) and crash investigators regarding what they perceive as the human factors that contribute to road fatalities among the youth.

3.6 POPULATION

According to Sekaran (2000:266), a population is defined as “the entire group of people, events, or thing of interest that the researcher wishes to investigate”. Similarly, Parahoo (2014:256) defined a population as the total universe that the data can be collected from. Cooper, Schindler and Sun (2006:409) defined population as the entire group of people or elements that a researcher needs to make inferences from.

For the current study, the sample population selected was traffic officers and crash investigators. The sample group is heterogenous, which is defined as “using your judgement to choose participants with sufficiently diverse characteristics to provide the maximum variation possible in the data collected” (Saunders *et al.,* 2016:301).

The study represents the perception of traffic officers and crash investigators which allowed the study to compare the different views that can be gathered from these different groups. The sample for both groups, namely, traffic officers and crash

investigators is small, which necessitated the entire population of both groups being selected for the study.

The basis for the selection of the target group has been encapsulated below:

- **Traffic Officers** are persons appointed in terms of section 3A of the National Road Traffic Act (NRTA), and any member of the service, and any member of a municipal police service, both as defined in section 1 of the South African Police Service Act, 1995 (Act No. 68 of 1995), and includes a peace officer (NRTA 1996:11). Section 31 of the NRTA outlines the role of the traffic officers with the main aim being to ensure they the role of traffic officers includes, among others, ensuring that they enforce traffic laws, regulate traffic and are responsible for impounding of vehicles. Traffic officers are a good source of observational data, as their day-to-day duties allow them to observe the behaviour of road users to the extent that they are familiar with the different road user groups, the type of offences committed, and the type of road crashes they report on.
- **Crash Investigators** are specialists who, through experience, have developed a considerable ability to examine and analyse phenomena related to road crashes (Mackay, 1970:245). They are a critical target group as they reconstruct the road crash through in-depth crash investigation methods that aim to determine those factors that likely contributed to the crash and injury outcomes, using data collected from the vehicle(s), the crash site, the road users involved, and police or traffic incident reports, where available (Allen, Newstead, Lenné, McClure, Hillard, Symmons and Day (2017:158).

The researcher in the current study chose to gather the perceptions of both the traffic officers and crash investigators as she believed it would enrich the research. Siskind *et al.* (2011:1087) stated that high reliance on the judgement of one group may create bias, and to address this limitation crash investigators were selected as part of the population which will allow for a divergent view from the respondents.

The selected traffic officers and crash investigators are employed by the RTMC which is based in Gauteng. 198 traffic officers and six crash investigators were selected to participate in the study due to the small population number. Confirmation was acquired

from the Human Resources of the RTMC regarding the total number of traffic officers and crash investigators.

3.6.1 Sampling method

Probability and non-probability sampling are two broad categories for sampling. According to Gate and McDaniel (2004:267), the research objectives, the phenomena of the research problem being examined, and the availability of resources, such as time and costs, influence the type of sampling technique. Sekaran and Bougie (2016:242) described probability sampling as when elements in the population have a known, non-zero chance of being chosen as subjects in the sample, namely, simple random, stratified, systematic cluster, and area double.

However, with non-probability sampling designs, the elements in the population do not have any probabilities attached to their being chosen as sample subjects (Sekaran & Bougie, 2016:247), namely, convenience, judgemental, and quota sampling.

Figure 3.3 below shows the different types of sampling techniques.

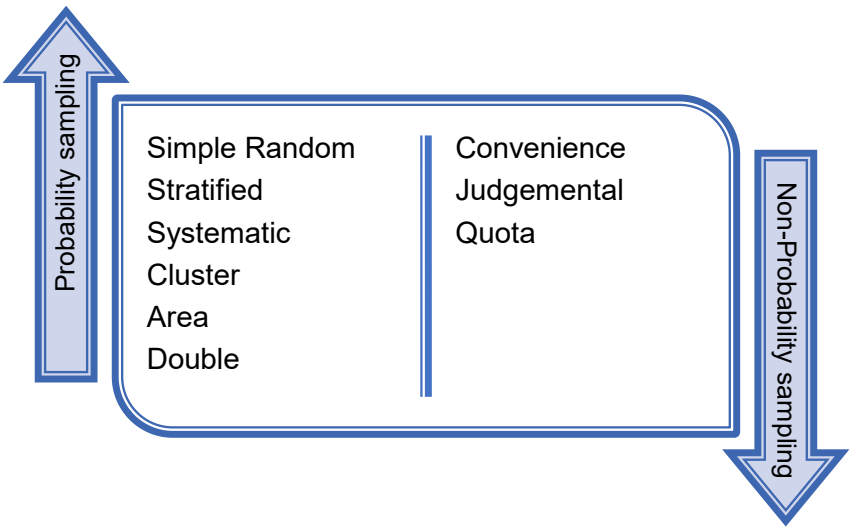

Figure 3.2: Classification of sampling techniques

Source: Adapted from Sekaran and Bougie (2016:249-250)

The non-probability sampling typically consists of persons either known by the investigators and/or who are readily available to the investigators (Özdemir, Louis & Topbaş, 2011:263). The current research chose non-probability sampling using the convenience sampling technique. The motivation for this decision was that the researcher did not know the probability of each element being selected. Hence, the entire population was included for data collection, due to the numbers being limited.

In addition, convenience sampling was easy and cost-effective, and as the researcher did not have the financial funding to interview traffic officers in other provinces, the sample was limited to Gauteng. Even more, during the Covid-19 lockdowns, provincial travel was banned. Hence, utilising the RTMC traffic officers based in Gauteng was more practical.

3.6.2 Sample size

According to Yoon (2002:60), the larger the sample size, the better to undertake research, however, the sample size will always depend on the areas of focus of the research. With this in mind, the advantage of a larger sample is that it will eliminate the possibility of bias. In the same manner, larger sample sizes improve the reliability of correlation coefficients (Tabachnick & Fidell, 2007). Sample sizes can be influenced by population (Bryman & Cramer, 2012), and the researcher's degree of accuracy and population characteristics will vary (De Vaus, 2001). Hence, the entire population consisting of 198 traffic officers and six crash investigators within the RTMC were selected for the study to allow as many respondents as possible in this research study.

3.7 DATA COLLECTION

A structured questionnaire was selected to gather the required data for the study. The questionnaire included both closed and some open-ended questions, presented at the end of each section. A hard copy of the questionnaire was distributed to the six crash investigators and the 198 traffic officers. The adoption of the use of a hard copy questionnaire was motivated by the need to increase the number of respondents participating in the study. Additionally, due to the nature of the work of traffic officers, they may not have easy access to computers to complete the survey electronically as they spend more time on the road and are not office based. Therefore, a paper-based questionnaire was more accessible to all the respondents, easier to administer and not time-consuming.

3.7.1 Structure of questionnaire

The questionnaire consisted of three parts: demographics, identification of the human factors, and the strategies to address the problem to be investigated. The detailed questionnaire is provided in Appendix A.

Figure 3.2 below provides a detailed synopsis of the key elements within the three parts of the questionnaire.

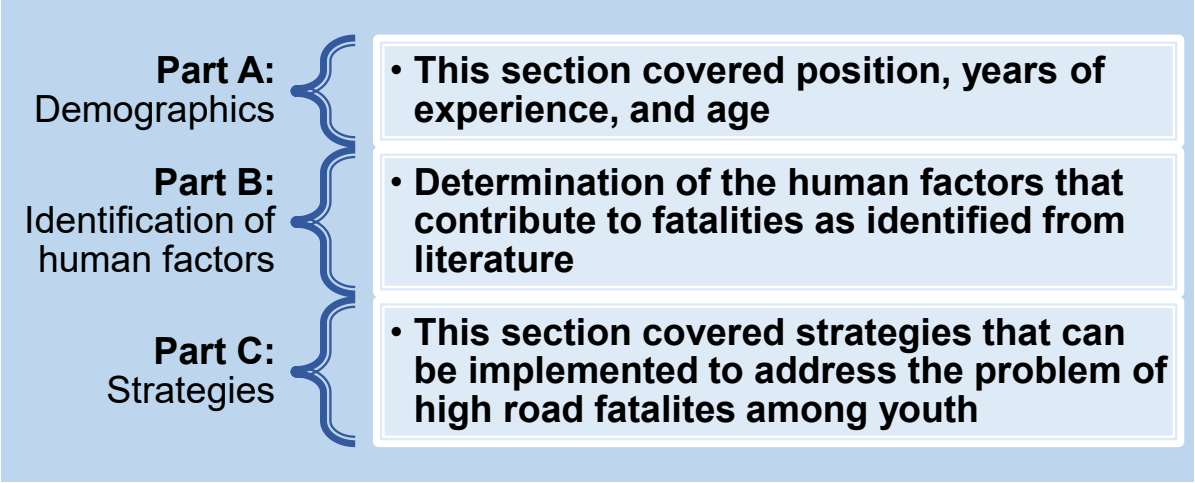

Figure 3.3: The structure of the questionnaire

Source: Researcher's own compilation

3.7.2 Question format

Table 3.3 below lists the type of questions in the questionnaire.

Table 3.3: Format of the questions in the questionnaire

Part	Question	Type of scale	Type of questions
Part A	1	Check box	Multiple choice (Job type)
	2	Check box	Multiple choice (number of years in the job)
	3	Check box	Multiple choice (Age)
Part B	4	Likert scale	Ratio
Part C	5, 6, 7	Likert scale	Ordinal
	8	Multiple choice	Nominal (Multiple choice)

Source: Researcher's own compilation

To gather additional in-depth information from the respondents (that was not covered in the closed-ended questions) Parts B and C included an open-ended question which

required respondents to provide personalised feedback. The questions are discussed in detail below:

3.7.2.1 Part A (Demographic information)

All the respondents were required to complete the demographic forms. The questions included information relating to their role, experience in their specific role, and age.

3.7.2.2 Part B (Contributory human factors)

The human factors identified from the literature were used to request the respondents to identify which human factors they believed contributed to fatalities among youth. The respondents were required to allocate a percentage contribution per each human factor from a scale of 0% (never) to 100% (always) as per the level of agreement, as follows: Never 0%, Very rarely 20, Rarely 40%, Occasionally 60%, Frequently 80%, Always 100%.

This scale that was selected assisted the researcher to capture the perception of traffic officers and crash investigators. The respondents were required to allocate a percentage to assist in determining their level of agreement to those factors as per their perception. The statements were adopted from the literature and are listed in Table 3.4. The validity of the statements adopted in the questionnaire is captured in Table 2.4.

Table 3.4: List of the human factors questionnaire

No	Human factors	Never	Very rarely	Rarely	Occasionally	Frequently	Always
		0%	20%	40%	60%	80%	100%
4.1	Speeding	1	2	3	4	5	6
4.2	Drunken driving	1	2	3	4	5	6
4.2	Distracted driving	1	2	3	4	5	6
4.4	Fatigue	1	2	3	4	5	6
4.5	Jaywalking	1	2	3	4	5	6
4.6	Distracted walking	1	2	3	4	5	6

No	Human factors	Never	Very rarely	Rarely	Occasionally	Frequently	Always
		0%	20%	40%	60%	80%	100%
4.7	Overtaking	1	2	3	4	5	6
4.8	Not wearing a seatbelt	1	2	3	4	5	6
4.9	Disregarding traffic signs	1	2	3	4	5	6
4.10	Turning to incoming traffic	1	2	3	4	5	6
4.11	Driver losing control of vehicle	1	2	3	4	5	6

Source: Researcher's own compilation

3.7.2.3 Part C (Possible strategies)

This section gathered key strategies that the respondents believed can be implemented to address the problem. Specific statements were provided, and the respondents were required to indicate their choice using a 4-point Likert scale ranging from 'Strongly disagree' to 'Strongly agree' to allocate a rating to those statements in accordance with their perception. The most frequently used Likert scale has five or more scales. The research initially chose a 5-point scale, however, the scales were reduced to four points, removing the measure of 'Neither agree/disagree'. Having a measurement of 'Neither agree nor disagree' would have been limiting to the research, specifically since the population selected for the study had the knowledge of the environment, thus, they were expected to be able to respond from their perception in their field.

The statements for the identification of strategies were segregated by traffic regulation, enforcement and education (as discussed below). An open-ended question was included to allow respondents to include additional information not covered by the close-ended questions.

Traffic Regulations

Table 3.5 lists the statements that focused on the important traffic regulations identified from the literature. The respondents were required to rate their choice of answer from a 4-point Likert scale, ranging from 'Strongly disagree' to 'Strongly agree' to allocate a rating to those statements in accordance with their perception.

Table 3.5: Possible strategies in relation to regulation questionnaire

REGULATION					
No.	**Statement**	**Strongly disagree**	**Disagree**	**Agree**	**Strongly agree**
5.1	Stricter speed laws.	1	2	3	4
5.2	Zero BAC for drivers.	1	2	3	4
5.3	Seatbelt usage compulsory for all occupants in the vehicle.	1	2	3	4
5.4	Stricter requirements for obtaining a driver's licence.	1	2	3	4
5.5	Increase the amount of fines.	1	2	3	4

Source: Researcher's own compilation

In addition, a space was provided in which the respondents could indicate any other methods that can be considered in relation to improving the traffic regulatory environment that was not mentioned in the above statements.

Enforcement

Table 3.6 lists the statements relating to enforcement. Enforcement of traffic laws is critical to ensure that road users comply with traffic laws to ensure safe usage of the road by all road users. The respondents were required to rate their choice of answer from a 4-point Likert scale, ranging from 'Strongly disagree' to 'Strongly agree' to allocate a rating to those statements in accordance with their perception.

Table 3.6: Possible strategies in relation to enforcement questionnaire

ENFORCEMENT					
No.	**Statement**	**Strongly disagree**	**Disagree**	**Agree**	**Strongly agree**
6.1	Increased visibility of traffic officers in high-accident zones.	1	2	3	4
6.2	Increase the number of traffic officers to improve visibility.	1	2	3	4
6.3	Random testing for drunken driving.	1	2	3	4
6.4	Suspend driver's licences of repeat offenders.	1	2	3	4
6.5	Speed control at high-accident zones.	1	2	3	4

Source: Researcher's own compilation

In addition, a space was provided in which the respondents could indicate any other methods that can be used during the enforcement that were not mentioned in the above statements.

Educational awareness

Table 3.7 lists the statements relating to educational awareness. The questions was meant to measure their perceptions related to key areas of education that can be improved to ensure road users have the knowledge and awareness of how to stay safe in the road environment. The respondents were required to rate their choice of answer from a 4-point Likert scale, ranging from 'Strongly disagree' to 'Strongly agree' to allocate a rating to those statements in accordance with their perception.

Table 3.7: Possible strategies in relation to education and awareness questionnaire

EDUCATION					
No.	**Statement**	**Strongly disagree**	**Disagree**	**Agree**	**Strongly agree**
7.1	Change driver training when acquiring a licence.	1	2	3	4
7.2	Introduction of refresher training for drivers.	1	2	3	4
7.3	Regular educational campaigns.	1	2	3	4
7.4	Road safety education part of school curriculum.	1	2	3	4

Source: Researcher's own compilation

Table 3.8 lists the potential educational mediums. The respondents were requested to indicate the best method they believe should be used to educate youth on road safety-related issues.

Table 3.8: List of best educational mediums to be used questionnaire

Social media	**1**
TV programmes	**2**
Radio	**3**
Print (Newspapers/Magazines)	**4**
Newsletters	**5**

Leaflets	**6**
Pop-up advertisements on social media apps (e.g. YouTube, games, etc.)	**7**
TV advertisements	**8**

Source: Researcher's own compilation

Furthermore, a space was provided in which the respondents could indicate any other methods that can be used for educational purposes that were not mentioned in the above statement.

3.8 TIME HORIZON

According to Saunders *et al.* (2016:200), there are two types of time horizons: 1) cross-sectional, which refers to a study of a particular phenomenon (or phenomena) at a particular time, and 2) longitudinal, which is a study over different periods. The current research study adopted a cross-sectional time horizon, as it was done once, and no further research will be conducted.

3.9 DATA COLLECTION

The process to collect the data was through a structured questionnaire. The process followed was in line with the four steps illustrated in Figure 3.4 below, which will be discussed in detail in the section below.

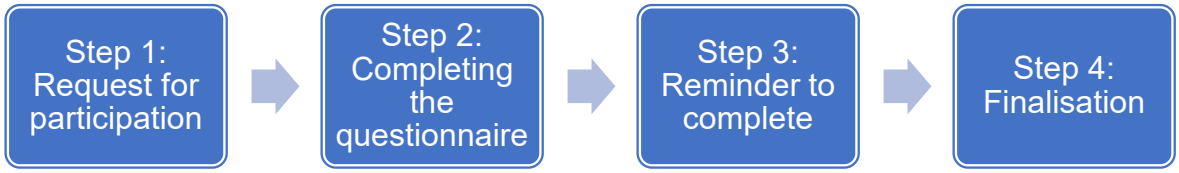

Figure 3.4: Data collection steps

Source: Researcher's own compilation

The next section discusses the steps that were followed during data collection.

3.9.1 Step 1: Request for participation

Table 3.9: Request for participation

Traffic Officers and Crash Investigators: The participation information letter (summarising the scope of the research) was provided to the respondents, (refer to Appendix B). In addition, this included a letter of consent (requesting the respondents to partake in the research and to sign the consent letter) (refer to Appendix C). The process was undertaken as follows:	
a)	A hard copy cover letter and soft copy (digital copy) were circulated to the respondents.
b)	A hard copy consent letter was signed by all the respondents who participated in the study.
c)	All the documents were returned to the researcher by placing them in a lockable designated box at the RTMC offices.

Source: Researcher's own compilation

3.9.2 Step 2: Completing the questionnaire

The questionnaire was produced in a hard copy format. The respondents were required to consent to participate. The steps undertaken by the researcher were as follows:

Table 3.10: Completing the questionnaire

Traffic Officers and Crash Investigators	
a)	The researcher made a short presentation to the participating respondents explaining the process of completing the questionnaire in a video format.
b)	The respondents were requested to take the questionnaire which was placed in a designated area. Sanitiser and pens were provided to ensure the respondents sanitised their hands before touching the pens and paper. The respondents were provided with pens to complete the questionnaire.
c)	Once the questionnaire was completed, it was placed in a lockable designated box.

Source: Researcher's own compilation

3.9.3 Step 3: Reminder to complete

A customised message was developed to communicate to the respondents as a reminder and communicate the deadline.

Table 3.11: Reminder

Traffic Officers and Crash Investigators	
a)	Emailed and communicated with the respondents and the designated person to remind the respondents to complete the questionnaire.

Source: Researcher's own compilation

3.9.4 Step 4: Finalisation

The section below discusses the finalisation process.

Table 3.12: Finalisation

Traffic officers and Crash Investigators	
a)	All the completed questionnaires were collected from the lockable boxes that had been placed by the Shift Supervisor for the researcher.
b)	A message was communicated to the RTMC informing them of the end of the data collection process.

Source: Researcher's own compilation

3.10 DATA ANALYSIS

The primary source of data was through the use of a structured questionnaire. The following statistical model was used for the analysis of the data. The statistical technique of data analysis in this section involves the generation of descriptive statistics on the variables that include univariate analysis, bivariate analysis and multivariate analysis. Welman, Kruger and Mitchell (2005:231) defined descriptive statistics as the data summary obtained for a set of entities' units of analysis. Univariate means one variable is involved, bivariate means two variables are involved, and multivariate means more than two variables are involved. The adopted statistical analysis is based on the research questions.

3.10.1 Research question 1

What are the human factors which contribute towards road fatalities among the youth between the ages of 20 and 35 years?

a) Univariate

Frequency tables

One of the initial steps of the current study was to perform frequency distribution, which is the analysis of one variable at a time, and in some cases, their corresponding graphs. For the variable under consideration, Bell and Bryman (2007:357) posited that frequency provides the percentage for each of the categories and the number of respondents, as shown in Table 3.13.

Table 3.13: Methods of analysis summary frequency

Methods of analysis	Purpose
Frequencies	To count the number of times a human factor is found in the data set

Source: Researcher's own compilation

The data was analysed to determine the most prominent human factors that contribute towards the high number of fatalities among the youth. The data analysis process ensured that the right procedure was selected to bring sanity, meaning and structure to the quantity of generated data (Marshall & Rossman, 2014:2). The information was grouped by first allocating a unique case number to each case, then classifying them under the different attributes related to human factors in as systematic manner.

To calculate the frequency (f), the data was inserted into and MS Excel spreadsheet table. The International Business Machines (IBM) Statistical Package for Social Sciences (SPSS) software version 27 was used to analyse the data. The number of times each variable appears in the data set was calculated and the percentage was calculated by using % = (f (frequency) / n (total number of the items in the data)) × 100. The data received from the traffic officers and crash investigators were kept separately.

3.10.2 Research question 2

Which factors are perceived to be the most frequent contributors towards road fatalities among the youth between the ages of 20 to 35?

b) Bivariate

Correlation

According to Hofstee (2006:215), correlation analysis does not imply causality. In other words, the relationship between variables does not mean that a variable can cause another variable.

To calculate the correlation between the variables, the Kendall's Tau correlation coefficient was used. The Kendall's Tau correlation, as described by Kossowski (2011:89), is a nonparametric (distribution-free) rank statistic proposed as a measure of the strength of the association between two variables, as shown in Table 3.14.

Table 3.14: Methods of analysis summary correlation

Methods of analysis	Purpose
Correlation	Describes the nature of a relationship between two variables, such as strong, negative positive, weak, or statistically significant.

Source: Researcher's own compilation

Cross-tabulation

Cross-tabulation refers to the comparison of two variables to investigate if the variables are strongly related. Chi-square tests were used to scrutinise if relationships existed among these variables. The researcher used chi-square to determine the correlation among the human factors.

3.10.3 Research question 3:

Which strategies can be implemented to reduce fatalities among youth aged between 20 and 35 years?

The most frequently used Likert scale has five or more scales. The research initially chose a 5-point scale, however, the scales were reduced to four points, removing the measure of 'Neither agree/disagree'. Having a measurement of 'Neither agree nor disagree' would have been limiting to the research, specifically since the population selected for the study had knowledge of the environment, thus, they were expected to be able to respond from their perception of their field. The Likert scale used in the questionnaire is shown in Table 3.15 below.

Table 3.15: 4-point Likert scale for strategies

Strongly disagree	Disagree	Agree	Strongly agree
1	2	3	4

Source: Researcher's own compilation

A weighted approach was used, where depending on the mean, the one above will be considered the most preferred view, whilst the ones below will be the least preferred view.

3.11 VALIDITY AND RELIABILITY

This section deals with the validity and reliability of the measuring instrument.

3.11.1 Validity

Validity over time has been defined differently by different researchers. Engward (2013) regarded it as the point to which the empirical measure precisely represents the claims it portrays. Kothari (2004:73) defined it as "the extent to which a test measures what we actually wish to measure". Joppe (2000:1) defined validity as "whether the research truly measures that which it was intended to measure or how truthful the research results are". In addition, Bell, Bryman and Harley (2018:174) defined validity as 'regarding indicators, refers to the issue whether or not (or a set of indicators) that is devised to gauge a concept really measures that concept'.

In consolidating all these definitions, the current study defines validity as the extent to which the empirical measure precisely represents the variable it anticipated measuring. The topics in the questionnaire were adopted from the literature and adapted for the study by the researcher.

According to Welman *et al.* (2005:142), irrelevant constructs, intended constructs, and random measurement errors are the three components measured in any survey. Systematic sources of variation which result in data validity problems, are caused by irrelevant constructs and intended constructs. On the other hand, random measurement errors are an unsystematic source of variation, which also results in data validity problems. Gill and Johnson (2010) found that validity can be damaged by research errors like poor samples, unreliable research procedures and deceptive instruments measurements.

Table 3.16 summarises the different types of validity.

Table 3.16: Validity types and application in the research study

Validity type	Definition
Construct validity	"Extent to which a set of measured items actually represents the theoretical latent construct those items are designed to measure." (Hair, Black, Babin, Anderson & Tatham, 2018:707).
Discriminant validity	"Extent to which a construct is truly distinct from other constructs." (Hair *et al.*, 2018:138).
Nomological validity	"Determines whether the scale demonstrates the relationships shown to exist based on theory or prior research" (Hair *et al.*, 2018:138).
Face validity	"Extent to which the content of the items is consistent with the construct definition." (Hair *et al.*, 2018:771).
Criterion-related validity	Observes the association between the newly developed scales and existing measures.
External validity	Focuses on the results' generalisability.

Source: Adapted from Hair *et al.* (2018)

For the current study, the following two validities were identified as applicable:

- **Construct validity**: As demonstrated in Chapter 2, a literature review was conducted to assist with the identification of relevant statements for the development of the questionnaire.
- **Face validity:** To ensure the usability of the questionnaire a few selected individuals were requested to review, and a small number of traffic officers were selected to complete the questionnaire prior to the study commencing on a full scale. The questionnaire was subjected to a review process by a statistician and editing by the editor. It was further submitted to three individuals within the RTMC who have knowledge within the area of road safety for review. The individuals were selected in terms of the position they occupy within the organisation. First participant had a doctorate in road safety, second participant was head of road safety, and third participant was a researcher. They were asked to provide feedback and assess the usability of the questionnaire by indicating if the questionnaire was clear, and whether it would be necessary to remove or include certain elements. In addition, five traffic officers were

requested to complete the questionnaire and provide feedback on its usability (in other words, this was a small pilot study). The outcome of the findings are discussed in Table 3.21. The validity of the different statements in the questionnaire is also provided below.

- **Part B** of the questionnaire was used to request the respondents to identify which human factors they believed contributed to fatalities among the youth. The respondents were required to allocate a percentage contribution per each human factor from a scale of 0% (never) to 100% (always) as per the level of agreement. The statements, as identified, were adopted from the literature review in Chapter 2 (see Table 2.4).
- **Part C** of the questionnaire provided statements in relation to strategies that can be implemented in the areas of Traffic Regulation, Enforcement and Education. The validity of the statements is shown in the tables below.

Table 3.17 captures the validity of the statements relating to traffic regulations.

Table 3.17: Regulation strategies and reference

No.	Reference	Statement from literature	Researcher statement
1	Iversen and Rundmo, (2004:559); WHO (2015:18)	▪ Punishments for speeding should be more restrictive. ▪ Introducing speed limits in densely populated urban areas.	Stricter speed laws.
2	Parker *et al.* (1996); WHO (2015:18)	▪ The law should be changed so that drivers are not allowed to drink any alcohol. ▪ The control of alcohol levels among drivers by introducing a zero BAC	Zero BAC for drivers.
3	Lee and Humphrey, 2011); WHO (2015:18)	▪ Seatbelts reduce the risk of injury for drivers and passengers. ▪ Helmet and seatbelt usage.	Seatbelt usage standards for all occupants in the vehicle.
4	Carthy *et al.* 1(993b); Gicquel *et al.* (2017:7)	▪ Change the manner in which drivers acquire licences, such as introducing Graduate Driver Licensing.	Stricter requirements for obtaining a driver's licence.

No.	Reference	Statement from literature	Researcher statement
5	Gössling (2017:9) Sheng *et al.* (2018:579)	▪ As a suggestion, officers suggested making fines dependent on income. ▪ Demerit point system and increase in fines and imposing tougher penalties to deter offenders and anyone who commits traffic crimes.	Increase the amount of fines.

Source: Researcher's own compilation

Table 3.18 provides the validity of the statements in relation to strategies that can be implemented in relation to Part C of the questionnaire.

Table 3.18: Enforcement strategies and reference

No.	Reference	Statement from literature	Statement by researcher
1			Increased visibility of traffic officers in high-accident zones
2	Gössling (2017:8); Modipa (2022:443)	There are not enough controls in traffic due to lack of traffic officer's visibility, a need to have more visibility of traffic officers. Increasing law enforcement officials on the road and provide them with all the necessary resources.	Increase the number of traffic officers to improve visibility
3	Parker *et al.* (1996); Denu *et al.* (2021:391)	Random breath testing of drivers should be introduced. Technologies such as blood alcohol level detectors.	Random testing for drunken driving
4	Gössling (2017)	Repeated and severe traffic offences to be punished with driving bans or lose of a driving licence.	Suspend driver's licence for repeat offenders
5	Gössling (2017:13)	More speed control, specifically in areas where accidents occur frequently.	Speed controls at high-accident zones

Table 3.19 below provides validity for the statements strategies that can be implemented in relation to Part D of the questionnaire.

Table 3.19: List education strategies and reference

No.	Reference	Statement from literature	Researcher statement
1	Hossain *et al.* (2022:8); Carthy *et al.* (1993a); Denu *et al.* (2021:391)	More in-depth training for drivers and pedestrians. Increase the number of specific training courses on road traffic rules for all citizens. Evaluate and strengthen drivers' training to have competent and well-disciplined drivers.	Change driver training when acquiring a licence
2	Amo (2014:55) Dash *et al.* (2021:10)	Periodic refresher courses for younger drivers/riders on traffic law to bring to bear the adherence of good driving/riding principles and attitudes and also stringent application of traffic laws. Proper awareness programme in terms of road safety and changes in attitude of population are needed to a greater extent.	Introduction of refresher training for drivers
3	Goniewicz *et al.* (2017b:166)	Did you change your behaviour after seeing social campaigns?	Regular educational campaigns
4	Goniewicz *et al.* (2017a:46); Hammoudi *et al.* (2014:10);	Introducing campaigns in schools on the dangers of drunk driving and conducting school-based driver education. Traffic safety education as part of the school curriculum must be a key consideration and must also expand to other road users (drivers, passengers, motorcyclists, cyclists, and pedestrians).	Road safety education as part of school curriculum
5	Alonso *et al*. (2016:10); Abdul-Wahab (2016:138); Gössling (2017:8); Hossain *et al.* (2022:8); Gharaibeh and Abdo (2011:214); Modipa (2022:444)	Road safety campaigns coincide with a 10% reduction in crashes, especially those involving personal communication, billboards and social media-related strategies. There should be continuous educational campaigns through radios, television and motor garages to educate road users on the importance of disciplined driving and the laws guiding road usage for road users. Social media, TV programmes, Radio, Print (Newspapers/ Magazines), Newsletters, Leaflets,	Refer to Table 3.20 for the questionnaire.

No.	Reference	Statement from literature	Researcher statement
		Pop-up advertisements on social media apps (e.g., YouTube, games) and TV advertisements should be used for road safety education. Conduct mass media campaigns to build awareness of the prevalence and dangers of RTAs. The promotion of road safety in SA could be used to inform more road users regarding the rules of the road and how to conduct themselves through the use of all relevant platforms, such as radio, television, newspapers, and social networks, to provide messages to the masses on the ground.	

Point 5 in the table above identified the different platforms that are available to deliver educational messaging. A list of the best communication platforms to deliver road safety educational awareness and campaigns was adopted from (Carthy *et al.*, 1993a), as shown in Table 3.20 below.

Table 3.20: List of educational platforms

Social media	**1**
TV programmes	**2**
Radio	**3**
Print (newspapers/magazines)	**4**
Newsletters	**5**
Leaflets	**6**
Pop-up advertisements on social media apps (YouTube, games, etc.)	**7**
TV advertisements	**8**

The following were the issues raised by the three RTMC experts during the pilot phase of the study, and the amendments that were made to the questionnaire:

Table 3.21: Expert questionnaire review recommendations

Reviewer	Comments	Response by researcher
Reviewer 1	*It would have made sense to add EMS.*	Not included
	Driving whilst fatigued.	Was changed to fatigue
	Intoxicated driving (including driving under the influence of drugs).	The matter relating to drugs could be added as there was not sufficient support for it through literature. This will be due to the difficulty identifying a person on drugs.
	Vehicle safety features.	Was not part of scope of the current research.
	Address engineering, safer more forgiving roads.	The matter relating to engineering was not included, as the research was limited to human factors.
	Increase the number of fines (maybe include the amount).	The amount was added in the statement.
	Better / more effective post-crash response?	Was not part of the scope of the current research.
	More law enforcement officials (higher ratio to vehicles).	Included under statements under strategies law enforcement.
Reviewer 2	*I propose you use ranges like you did with question 3 below. For example, 0-3, 3.1-5, 5.1-8, 8.1-11, 11.1-14, 14.1+. This will enable you to easily generate frequency tables across the different ranges. By doing you'll avoid the need to manually rearrange individual respondents' ages for purposes of analysis.*	Updated the questionnaire to include proposal.
	It would be easier for respondents if you provided the meanings of the middle percentages, just like you did with 0% and 100%. Commonly used Likert Scale measurement tools only use what you have in brackets above, i.e. Never, Seldom, Sometimes, Not sure, Frequently, Always; for example. This makes it easy for respondents considering the common fear of anything that looks numerical.	Updated the questionnaire to include this proposal.

Reviewer	Comments	Response by researcher
Reviewer 3	*Address the numbering of the questionnaire to make it easier to cross-reference when the data analysis commences.*	That was corrected in the questionnaire.

3.11.2 Reliability

Engward (2013) defined reliability as the extent to which if the same study is repeated in a different context, it will attain the same results. Robson (2002:549) defined reliability as "the extent to which a measuring device, or a whole research project, would produce the same results if used on different occasions with the same object of study". In the current research study, reliability is defined as the extent to which if the same study is repeated in a different context, it will attain the same results.

The term generalisability, in terms of this research, means that irrespective of measurement time, the test administered, and the test used, the results or scores of the research should be consistent. Therefore, measuring of internal consistency of the constructs is done to achieve questionnaire reliability. In addition, Welman *et al.* (2005:145) argued that within reliability there is an element of generalisability. The following errors were considered as they impacted on the reliability of the research namely:

- Participant error: To avoid this, the questionnaire was printed and placed in areas accessible to the respondents. Therefore, the respondents would be able to complete the questionnaire at a time they found most convenient.
- Participant bias: The questionnaire was placed in a lockable box when completed. There would be no opportunity for influence by other respondents or fear of others knowing how they responded to the questions.
- Researcher error and bias: The researcher was not able to influence or change the interpretation of the data as statistical tools were used to conduct the analysis which ensured objectivity.

3.12 RESEARCH LIMITATIONS

The researcher had a limited time in which to finalise the research project, and all the costs associated were funded by the researcher. The researcher only focused on

traffic officers and crash investigators in the Gauteng region, and therefore, the findings cannot be generalised. There was the probability of a low response rate among traffic officers due to their different deployments in shifts. As traffic officers spend the majority of their time on the road it would have been difficult to administer the questionnaire electronically. Hence, the researcher opted for a hard copy questionnaire and personally visited the respondents to request them to participate in the research. The Covid-19 pandemic also became one critical limitation in relation to accessing respondents who required limited face-to-face contact.

3.13 ETHICAL CONSIDERATIONS

This study was executed in accordance with the University of South Africa (UNISA) research guidelines and procedures. The data generated was encrypted and will be safely archived for five years as per UNISA policies in a way that guards the data from unauthorised disclosure. A gatekeeper's letter providing permission for the study to be conducted was requested from the RTMC. The RTMC granted approval to administer the questionnaire to the traffic officers and crash investigators (refer to Appendix D).

All the respondents were above the age of 18 years. No personal information of the respondents was requested. The respondents were informed that participation is voluntary in a respondent's' information letter as well as the informed consent letter which was accompanied by the questionnaire. The researcher ensured that the information to be collected is safely stored and that it will be destroyed within the stipulated timeframes. The digital files have been encrypted with a password and letters of confidentiality were obtained from the statistician and language editor, and the hard copy questionnaires were locked in a safe place. The signed confidentiality agreements from the statistician and editor can be found in Appendix E. The University issued an ethics clearance letter and the approval is granted from 7 July 2020 until 7 July 2025, which can be found in Appendix F.

3.14 CONCLUSION

This chapter discussed the research design in detail. It covered all aspects relating to the research approach and strategy. The research approach adopted for the current study was a quantitative approach using descriptive theory to understand the

perception of traffic officers and crash investigators in terms of the human factors that contribute to road fatalities among the youth. The sampling method chosen was a convenient sampling method. The data was collected through the use of a structured questionnaire. The data collection and analysis were based on the application of quantitative data statistical tools. The time horizon, validity and reliability, research limitation, and ethical considerations were also captured. The research took place through a cross-sectional horizon and was undertaken within Gauteng. Approval for the study was sought from and obtained from the RTMC. The next chapter presents the data analysis and concludes with a discussion of the findings of the study.

CHAPTER 4:
RESEARCH RESULTS

4.1 INTRODUCTION

Chapter 3 provided an overview of the quantitative method used in the study, and described the procedures used to collect and analyse the data. The purpose of this chapter is to report and discuss the research results obtained from the study based on the research objectives and questions. This study aimed to capture the perceptions of traffic officers (National Traffic Police) and crash investigators. More specifically, the study investigated the human factors that contribute to fatalities among youth aged between 20 years and 35 years. It further sought to determine strategies that can be adopted to address road fatalities among the youth. To achieve this aim, the following research objectives guided this research:

- To determine which factors are perceived to be the most frequent contributors to road fatalities among the youth between the ages of 20 and 35 years.
- To determine which factors are perceived to be the most frequent contributors to road fatalities among the youth between the ages of 20 and 35 years.
- To recommend possible strategies to reduce fatalities among the youth between the ages of 20 and 35 years.

4.2 PROFILE OF THE RESPONDENTS

As highlighted in Section 3.7, the profiles of the respondents were as summarised in Table 4.1.

Table 4.1: Total target population

Occupation	Total respondents
Traffic Officers	198
Crash Investigators	6
Total	204

Source: Researcher's own compilation

As discussed in the preceding chapters, traffic officers and crash investigators have distinct occupations. Traffic officers' main role is to ensure the enforcement of traffic

laws, regulate traffic and impound vehicles. As a result, traffic officers were a good source of observational data as their daily duties allow them to observe behaviours among the different road user groups, the type of offences committed, and the type of road crashes they report. The crash investigators are specialists who reconstruct the road crash through in-depth crash investigation methods. According to Allen *et al.* (2017:158), crash investigators reconstruct the road crash through the application of in-depth crash investigation methods that aim to determine those factors that have likely contributed to a crash and injury outcomes, using data collected from the vehicle(s), the crash site, the road users involved, and police or traffic incident reports, where available. However, after the study's results were received, it became evident that there were no material differences in the responses and the findings, to warrant that the data be analysed separately for the two groups. Henceforth, the researcher combined the findings from both the traffic officers and crash investigators into one analysis.

Table 4.2 shows the total number of respondents and the number of respondents that answered the questionnaire.

Table 4.2: Total target population and respondents

Occupation	Total target respondents	Respondents that answered	Respondent's rate (%)
Total	204	108	52%

Source: Researcher's own compilation

The analysis depicted that the total number of respondents that participated was (n=108) from a total of (n=204) respondents resulting in a 52% response rate.

DESCRIPTIVE STATISTICS: DEMOGRAPHICS OF THE RESPONDENTS

This section provides the descriptive profile of the respondents who participated in this research, covering their ages and years of experience. However, it should be noted that the results have been combined for both the traffic officers and crash investigators. The reason for this is that the number of crash investigators is too small to analyse them separately, hence, the decision to combine the results. The results of the analysis are presented graphically in Figures 4.1 and 4.2 for the years of experience and age distribution, respectively.

4.2.1 Years of experience

The analysis reveals that in relation to the years of experience, as indicated in Figure 4.1, most of the respondents had between 8 -10 years (66.7%; *n*=72) experience, followed by 16 years and above at 15.7% (*n*=17), and 11-15 years at 10.2% (*n* =11). In contrast, the lowest percentage for years of experience was for the category 4- 7 years at 7.4% (*n*=8). Therefore, the majority (66.7%) of the respondents had between 8-10 years of experience, which represents that they have ample experience within the field of study.

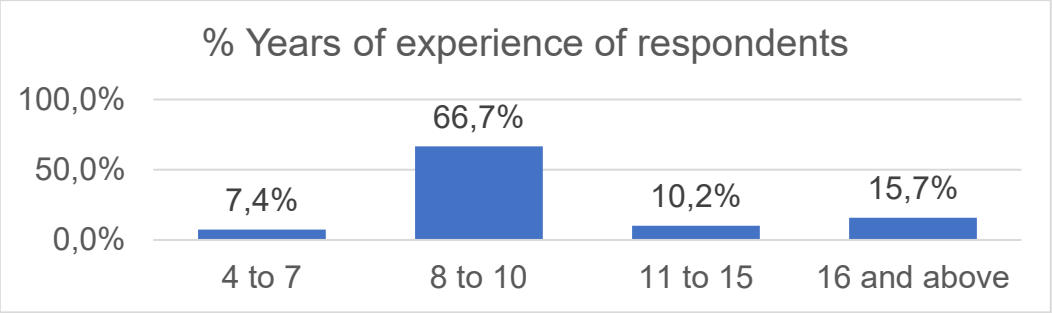

Figure 4.1: Years of experience

Source: Researcher's own compilation

4.2.2 Age distribution

With regard to the age profile, as indicated in Figure 4.2, most of the respondents were aged 31-40 years (66.7%; n = 72). In contrast, one of the smallest age categories was 51-60 years (6.5%; *n* = 7) which was slightly higher than the category of respondents aged 21-30 years (2.8%; *n* = 3). The remainder of the respondents were between 41-50 years (24.1%; *n* = 26). The majority (69.5%) of the respondents were thus younger than 41 years.

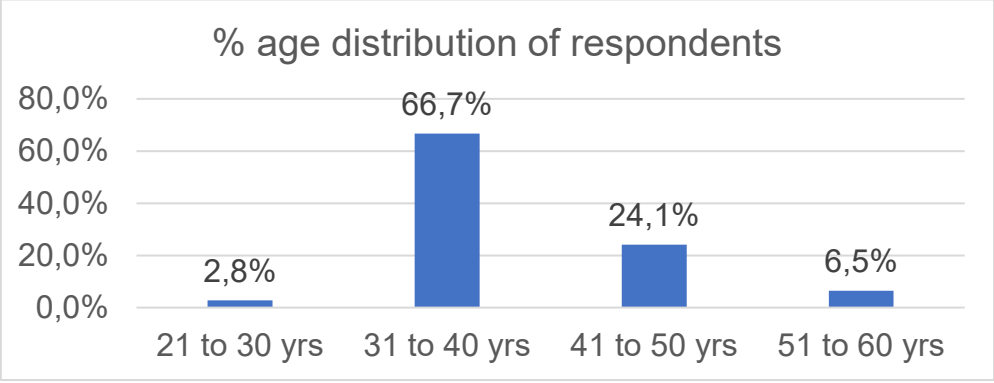

Figure 4.2: Age distribution

Source: Researcher's own compilation

4.3 DESCRIPTIVE STATISTICS

This section presents the descriptive statistics for the constructs of human factors, such as drunken driving, speeding, disregarding traffic signs, overtaking, not wearing a seatbelt, driver losing control of the vehicle, fatigue, distracted driving, turning into oncoming traffic, jaywalking and distracted walking, that contributes to human fatalities among youth aged 20-35 years. In addition, this section also discusses possible strategies to eliminate road crashes which include constructs such as traffic regulation, enforcement, and education to reduce fatalities among the youth aged 20-35.

Table 4.3 shows the 6-point Likert scale (0%=never to 6=always) that was used to measure the constructs of perception of human factors. However, for the analysis, the scale was reduced to a 3-point scale to allow a clearer graphical observation of emerging patterns. Likewise, the 4-point Likert scale (1=strongly disagree to 4=strongly agree) was used to measure the traffic regulation, enforcement, and education constructs. Stacked bar charts were used to represent the descriptive statistics of the main constructs.

Table 4.3: Scale grouping

Scale current	Scale grouping for graphical purpose
'Never' (0%) and 'Very rarely' (20%)	Disagree
'Rarely' (40%) and 'Occasionally' (60%)	Neutral
'Frequently' (80%) and 'Always' (100%)	Agree

Source: Researcher's own compilation

4.3.1 Human factors

Before the respondents answered Question 4, they were given a scenario to consider when answering the remainder of the questions. The scenario read: *This section provides a list of human factors that have been identified by research into the topic. As a respondent, you are required to indicate which human factors you perceive contribute to fatalities among the youth on a scale of 0% (never) -100% (always).*

The question further asked the respondents to indicate their level of agreement with the human factors that contribute to road fatalities amongst the youth aged from 20 to 35 years. The responses are presented graphically in Figure 4.3.

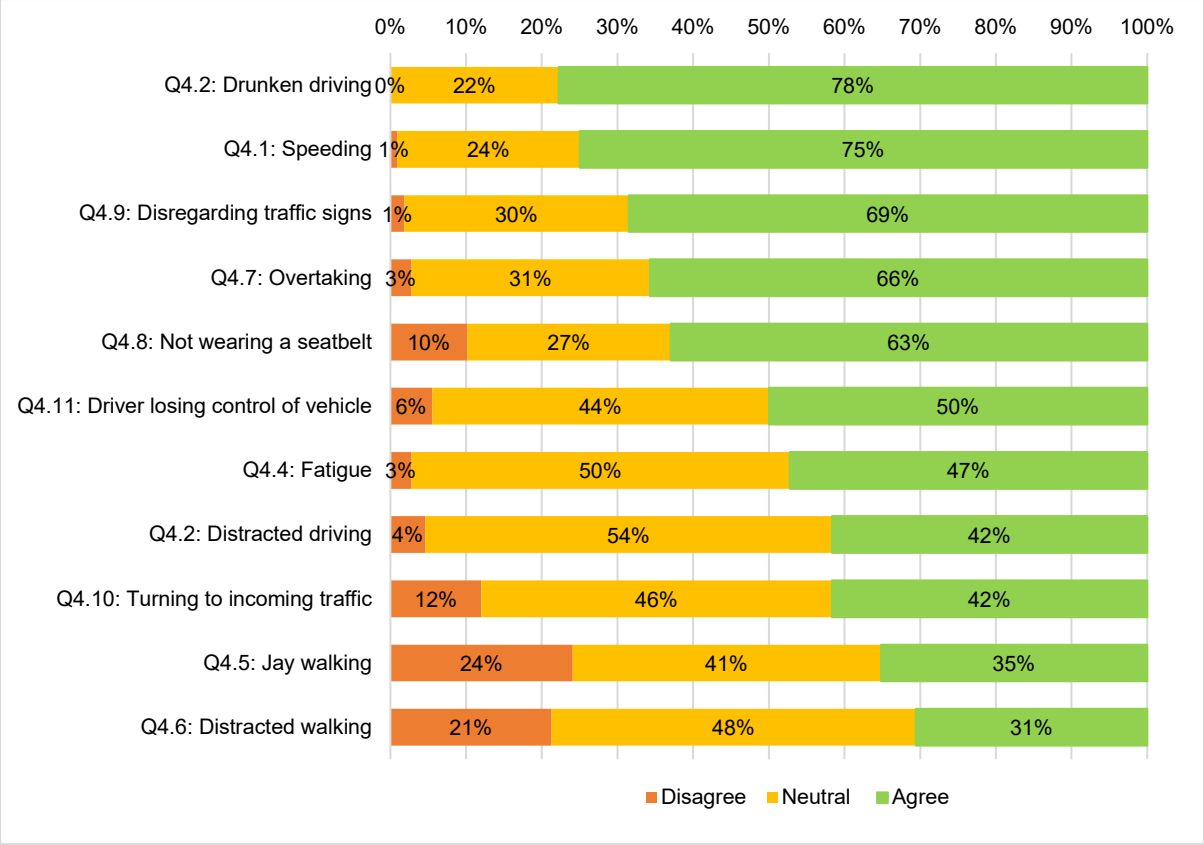

Figure 4.3: Human factors perceptions

Source: Researcher's own compilation

The analysis demonstrates that a large majority (above 50%) of the respondents agreed that drunken driving (78%), speeding (75%), disregarding traffic signs (69%), overtaking (66%), and not wearing a seatbelt (63%) contribute to human fatalities among the youth aged 20-35 years. The factors that scored approximately 50% and lower were: driver losing control of the vehicle (50%), fatigue (50%), distracted driving (54%), turning into oncoming traffic (46%), jaywalking (41%) and distracted walking (48%) as contributory factors to road fatalities.

Therefore, from the above, the combined perception of the respondents seems to indicate that they agree that the largest contributory factors to fatalities among the youth aged between 20 and 35 years are:

- Drunken driving (78%);
- Speeding (75%);
- Disregarding traffic signs (69%);
- Overtaking (66%); and
- Not wearing a seatbelt (63%).

4.3.1.1 Human factors: Mean and standard deviation

The mean and standard deviation presented in Table 4.4 of each of the identified human factors indicate that it can be assumed that these factors are normally distributed. A standard deviation close to zero shows that data points are close to the mean, whereas a low or high standard deviation indicates data points are respectively below or above the mean. A high standard deviation in this case would mean that most of these factors are statistically insignificant because they do not fit right, whilst a low standard deviation would mean most factors are statistically significant.

The data shows that 68% of the human factors were 1 standard deviation away from the mean (mean = 5.26, SD = 0.80), and 95% of human factors were 2 standard deviations away from the mean (mean = 4.92, SD = 1.07). Therefore, in the current study, the most prominent factors are drunken driving, speeding, disregarding traffic signs, overtaking and not wearing a seatbelt. Whereas, the least prominent factors were distracted driving, turning into oncoming traffic, jaywalking and distracted walking.

In other words, drunken driving had the highest mean score of 5.26 (SD = 0.80), while distracted walking had the lowest mean score of 3.70 (SD = 1.36). All of the human factors were measured on a 6-point Likert scale, anchored at (0%) never, (20%) very rarely, (40%) rarely, (60%) occasionally, (80%) frequently and (100%) always. As a result, drunken driving had the highest score in comparison with the other factors, and was statistically significant, while distracted walking had the lowest score in comparison with the other factors and was not statistically significant.

This mean score demonstrated that the average response for this factor fell between ‘frequently’ and ‘always’, indicating drunken driving contributed mostly towards human fatalities among youth aged 20-35 years. In contrast, the mean score for distracted walking demonstrated that the average response for this factor fell between ‘very rarely’ and ‘rarely’, indicating distracted walking contributed less towards human fatalities among youth aged 20-35 years.

Therefore, it can be deduced that drunken driving, speeding, disregarding traffic signs, and overtaking were perceived to be statistically significant.

Table 4.4: Human factors: Mean and standard deviation

	Mean	SD
Drunken driving	5.26	0.80
Speeding	5.12	0.86
Disregarding traffic signs	4.92	1.07
Overtaking	4.86	0.96
Not wearing a seatbelt	4.62	1.26
Fatigue	4.53	1.11
Driver losing control of vehicle	4.47	1.15
Distracted driving	4.31	1.16
Turning into incoming traffic	4.11	1.29
Jaywalking	3.85	1.52
Distracted walking	3.70	1.36

Source: Researcher's own compilation

4.3.1.2 Human factors: Correlation analysis

This section also analysed the correlation between the different human factors. According to Leedy and Ormrod (2016:232), correlation analysis does not imply causality. In other words, the relationship between variables does not mean that a variable can cause another variable. To calculate the correlation between the variables, the Kendall's Tau correlation coefficient was used. Table 4.5 details the parameters used to undertake the correlation analysis.

Table 4.5: Human factors: Description of correlation analysis

Item	Type of correlation	Strength of correlation
Above 0.5 or -0.5	Positive or negative	Strong correlation
0.40 and 0.50 (-0,40 and -0,50)	Positive or negative	Moderate correlation
Below (0,40 or -0,40)	Positive or negative	Weak correlation

Source: Adapted from Leedy and Ormrod (2016:232)

Table 4.6 presents the correlation between the human factors. The analysis will be based on the criteria, as explained in Table 4.5. The current study analysed only the factors that were deemed to have a moderate and strong correlation.

Table 4.6: Correlation table human factors

Human factors	Item	Speeding	Drunken driving	Distracted driving	Fatigue	Jaywalking	Distracted walking	Overtaking	Not wearing a seatbelt	Disregarding traffic signs	Turning into incoming traffic	Driver losing control of vehicle
Speeding	Correlation Coefficient	1										
	Sig. (2-tailed)	-										
Drunken driving	Correlation Coefficient	0.549**	1									
	Sig. (2-tailed)	0.000										
Distracted driving	Correlation Coefficient	0.154	-0.053	1								
	Sig. (2-tailed)	0.062	0.522									
Fatigue	Correlation Coefficient	0.276**	0.180*	0.338**	1							
	Sig. (2-tailed)	0.001	0.031	0.000								

Human factors	Item	Speeding	Drunken driving	Distracted driving	Fatigue	Jaywalking	Distracted walking	Overtaking	Not wearing a seatbelt	Disregarding traffic signs	Turning into incoming traffic	Driver losing control of vehicle
Jaywalking	Correlation Coefficient	-0.074	-0.149	0.301**	0.306**	1						
	Sig. (2-tailed)	0.358	067	0.000	0.000							
Distracted walking	Correlation Coefficient	-0.024	-0.144	0.255**	0.123	0.474**	1					
	Sig. (2-tailed)	0.768	0.079	0.001	0.119	0.000						
Overtaking	Correlation Coefficient	0.221**	0.253**	0.151	0.245**	0.308**	0.199*	1				
	Sig. (2-tailed)	0.009	0.003	0.064	0.003	0.000	0.013					
Not wearing a seatbelt	Correlation Coefficient	0.163*	0.059	0.242**	0.220**	0.243**	0.209**	0.410**	1			
	Sig. (2-tailed)	0.049	0.481	0.002	0.006	0.002	0.008	0.000				
Disregarding traffic signs	Correlation Coefficient	0.212*	0.106	0.315**	0.345**	0.195*	0.183*	0.401**	0.344**	1		
	Sig. (2-tailed)	0.011	0.211	0.000	0.000	0.014	0.021	0.000	0.000			

Human factors	Item	Speeding	Drunken driving	Distracted driving	Fatigue	Jaywalking	Distracted walking	Overtaking	Not wearing a seatbelt	Disregarding traffic signs	Turning into incoming traffic	Driver losing control of vehicle
Turning into oncoming traffic	Correlation Coefficient	0.140	0.190*	0.245**	0.199*	0.077	0.094	0.395**	0.277**	0.239**	1	
	Sig. (2-tailed)	0.085	0.021	0.002	0.012	0.319	0.226	0.000	0.000	0.003		
Driver losing control of vehicle	Correlation Coefficient	0.222**	0.192*	0.129	.161*	-0.022	0.081	0.215**	0.134	0.196*	0.422**	1
	Sig. (2-tailed)	0.007	0.021	0.106	0.044	0.777	0.299	0.009	0.094	0.015	0.000	

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed)

$P < 0.05$

The summary of the analysis in Table 4.6 will be limited to the factors that have a strong and moderate positive/negative correlation. The analysis is as follows:

Speeding and drunken driving

- There is a strong positive correlation between speeding and drunken driving (0.549).

Jaywalking and distracted walking

- There is a moderate positive correlation between jaywalking and distracted walking (0.474) (Leedy & Ormrod, 2016:232).

Overtaking and not wearing a seatbelt

- There is a moderate positive correlation between overtaking and not wearing a seatbelt (0.419) (Leedy & Ormrod, 2016:232).

Overtaking and disregard for traffic fines

- There is a moderate positive correlation between overtaking and disregarding traffic signs (0.401) (Leedy & Ormrod, 2016:232).

Not wearing a seatbelt and overtaking

- There is a moderate positive correlation between not wearing a seatbelt and overtaking (0.410) (Leedy & Ormrod, 2016:232).

Turning into oncoming traffic and driver losing control of vehicle

- There is a moderate positive correlation with the driver losing control of the vehicle (0.422) (Leedy & Ormrod, 2016:232).

From the correlation analysis, it is evident that the strongest correlation and which is statistically significant is between speeding and drunken driving.

4.3.2 Traffic regulations

Before the respondents answered Question 5, they were given a scenario to consider when answering the remainder of the questions. The scenario read: *This section gathers information on key strategies you believe can be implemented to address the problem under investigation, namely, high fatalities among the youth aged 20-35. Specific statements are provided, and you are required to indicate to what extent you*

agree with the statements, where 4 means strongly agree and 1 means strongly disagree, in accordance with your view on Traffic Regulation, Enforcement and Education.

Question 5 asked respondents to indicate the appropriate option that reflects their response. The responses are presented graphically in Figure 4.4.

Traffic regulation had five key strategies, namely, 'stricter speed laws', 'zero BAC for drivers', 'seatbelt usage compulsory for all occupants in the vehicle', 'stricter requirements for obtaining a driver's licence', and 'increase the amount for fines'. The crash investigators and traffic officers were required to indicate their level of disagreement and agreement with these strategies. Figure 4.4 details the analysis of the data obtained from the respondents.

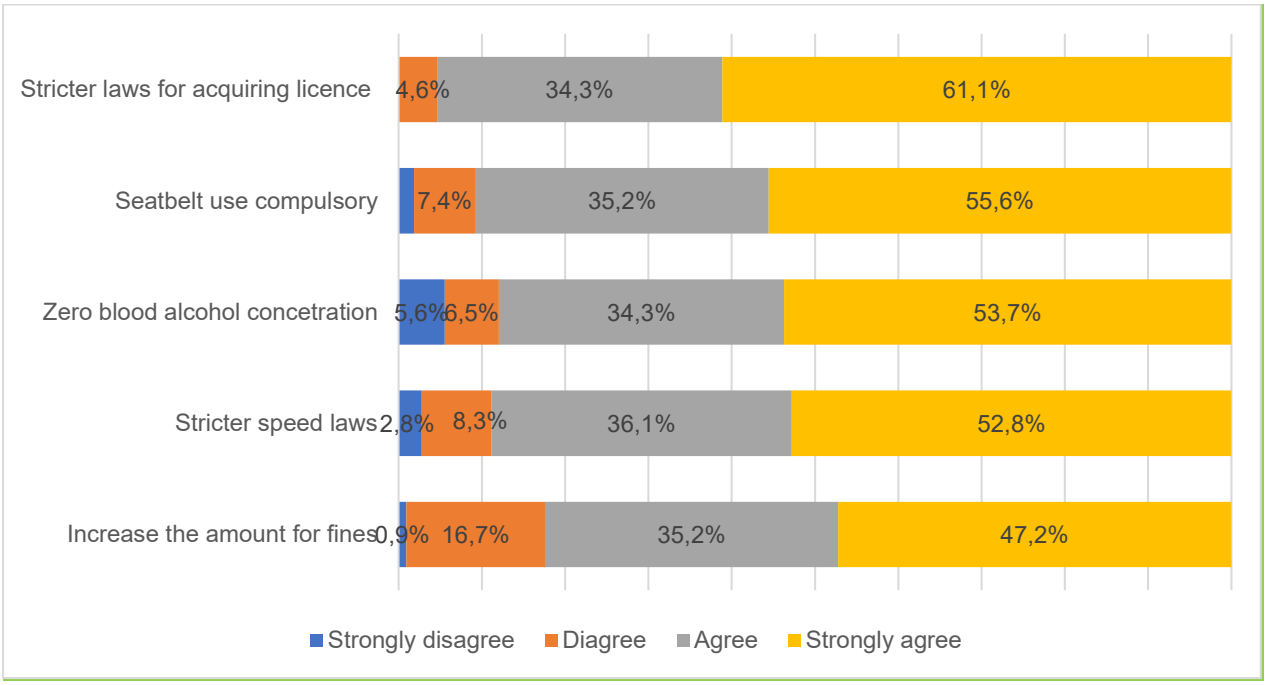

Figure 4.4: Traffic regulations strategies

Source: Researcher's own compilation

The analysis shows that the respondents strongly agreed with the following strategies: 'stricter requirements for obtaining a driver's licence' (61.1%), 'seatbelt usage compulsory for all occupants in the vehicle' (55.6%), 'zero BAC (53.7%), and 'stricter speed laws' (52.8%). It appears that most respondents strongly agreed with the strategies.

4.3.2.1 Traffic regulation strategies: Mean and standard deviation

The traffic regulations analysis indicates the findings from the data to determine the preferred strategies. The results, as presented in Table 4.7, show that 68% of the responses are within one standard deviation of the mean which implies the respondents agree with the strategies. Table 4.7 indicates that 'stricter requirements for obtaining a driver's licence' strategy had the highest mean score of 3.56 (SD = 0.58), while 'increase the amount of fines' strategy had the lowest mean score of 3.29 (SD = 0.78).

All of the traffic regulations strategy factors were measured on a 4-point Likert scale, anchored at (1) strongly disagree, (2) disagree, (3) agree, and (4) strongly disagree. As a result, 'stricter requirements for obtaining a driver's licence' had the highest score, and was statistically significant, while 'increasing the amount of fines' had the lowest score, and was also statistically significant.

This mean score demonstrated that the average response for this factor fell between 'agree' and 'strongly agree', indicating 'stricter requirements for obtaining a driver's licence' was the main strategy that can be adopted to address road fatalities among the youth aged 20-35 years. Likewise, the mean score of 'increase the amount of fines' also demonstrated that the average response for this factor fell between 'agree' and 'strongly agree', indicating that 'increase the amount of fines' is still an important strategy that can be adopted to address road fatalities among the youth aged 20-35 years, even though the mean score was the lowest. Therefore, it can be deduced that all the traffic regulation strategy factors were perceived to be statistically significant.

Table 4.7: Traffic regulation strategies: Mean and standard deviation

	Mean	SD
Stricter speed laws	3.39	0.76
Zero BAC for drivers	3.36	0.84
Seatbelt usage compulsory for all occupants in the vehicle	3.44	0.72
Stricter requirements for obtaining a driver's licence	3.56	0.58
Increase the amount of fines	3.29	0.77

Source: Researcher's own compilation

4.3.3 Enforcement

Question 6 required respondents to indicate the appropriate option that reflects their response. The responses are presented graphically in Figure 4.5. Enforcement had five key strategies, namely, 'increased visibility of traffic officers in high-accident zones', 'increase the number of traffic officers to improve visibility', 'random testing for drunken driving', 'suspend driver's licence for repeat offenders', and 'speed controls at high-accident zones'. The crash investigators and traffic officers were required to indicate their level of disagreement and agreement with these strategies.

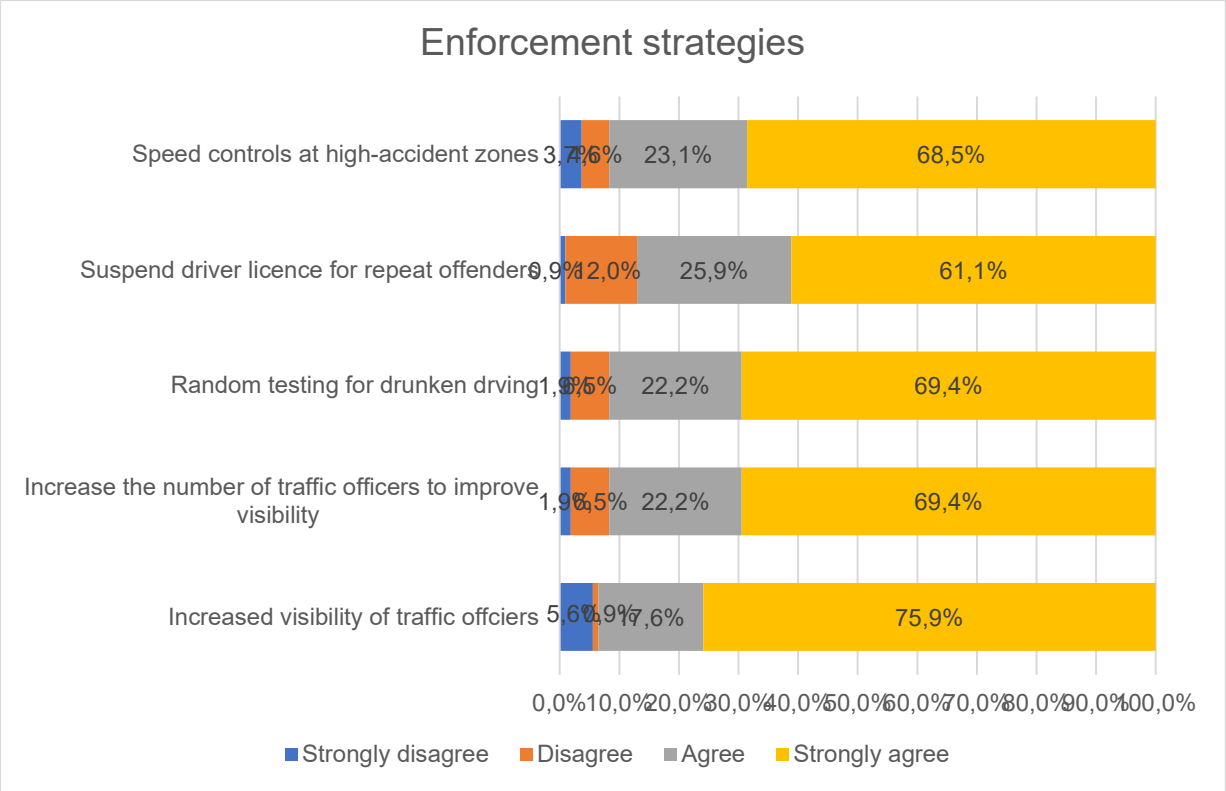

Figure 4.5: Enforcement strategies

Source: Researcher's own compilation

The analysis in Figure 4.5 shows that the respondents strongly agreed with all the strategies in the following order: 'increased visibility of traffic officers at high-accident zones' (75.9%), 'increasing the number of traffic officers' (69.4%), 'random testing for drunken driving' (69.4%), 'speed control at high-accident zones' (68.5%), and 'suspend driver's licence for repeat offenders' (61.1%).

4.3.3.1 Enforcement strategies: Mean and standard deviation

The enforcement analysis results, as shown in Table 4.8, indicate that 68% of the possible strategies were 1 standard deviation away from the mean (mean = 3.64, SD = 0.77). Table 4.8 further indicates that 'increased visibility of traffic officers in high-accident zones' strategy had the highest mean score of 3.64 (SD = 0.77), while 'suspend driver's licence for repeat offenders' strategy had the lowest mean score of 3.47 (SD = 0.74).

All of the enforcement strategy factors were measured on a 4-point Likert scale, anchored at (1) strongly disagree, (2) disagree, (3) agree, and (4) strongly disagree. As a result, 'increased visibility of traffic officers in high-accident zones' had the highest score in comparison with the other factors, and was statistically significant, while 'suspend driver's licence for repeat offenders' had the lowest score in comparison with the other factors, and was also statistically significant. This mean score demonstrated that the average response for this factor fell between 'agree' and 'strongly agree', indicating 'increased visibility of traffic officers in high-accident zones' was the main strategy that can be adopted to address road fatalities among the youth aged 20-35 years.

Similarly, the mean score of 'suspend driver's licence for repeat offenders' also demonstrated that the average response for this factor fell between 'agree' and 'strongly agree', indicating that 'suspend driver's licence for repeat offenders' is still an important strategy that can be adopted to address road fatalities among the youth aged 20-35 years, even though the mean score was the lowest. Therefore, it can be deduced that all the enforcement strategy factors were perceived to be statistically significant.

Table 4.8: Enforcement strategies: Mean and standard deviation

	Mean	SD
Increased visibility of traffic officers in high-accident zones.	3.64	0.77
Increase the number of traffic officers to improve visibility.	3.59	0.70
Random testing for drunken driving.	3.50	0.66
Suspend driver's licence for repeat offenders.	3.47	0.74
Speed controls at high-accident zones.	3.56	0.75

Source: Researcher's own compilation

4.3.4 Education

Question 7 required the respondents to indicate the appropriate option that reflects their responses. The responses are presented graphically in Figure 4.6. Education had five key strategies, namely, ‘change driver training when acquiring a licence’, ‘introduction of refresher training for drivers’, ‘regular educational campaigns’, and ‘road safety education part of school curriculum’. The crash investigators and traffic officers were required to indicate their level of disagreement and agreement with these strategies. The analysis indicates the findings from the data are aligned with the strategies.

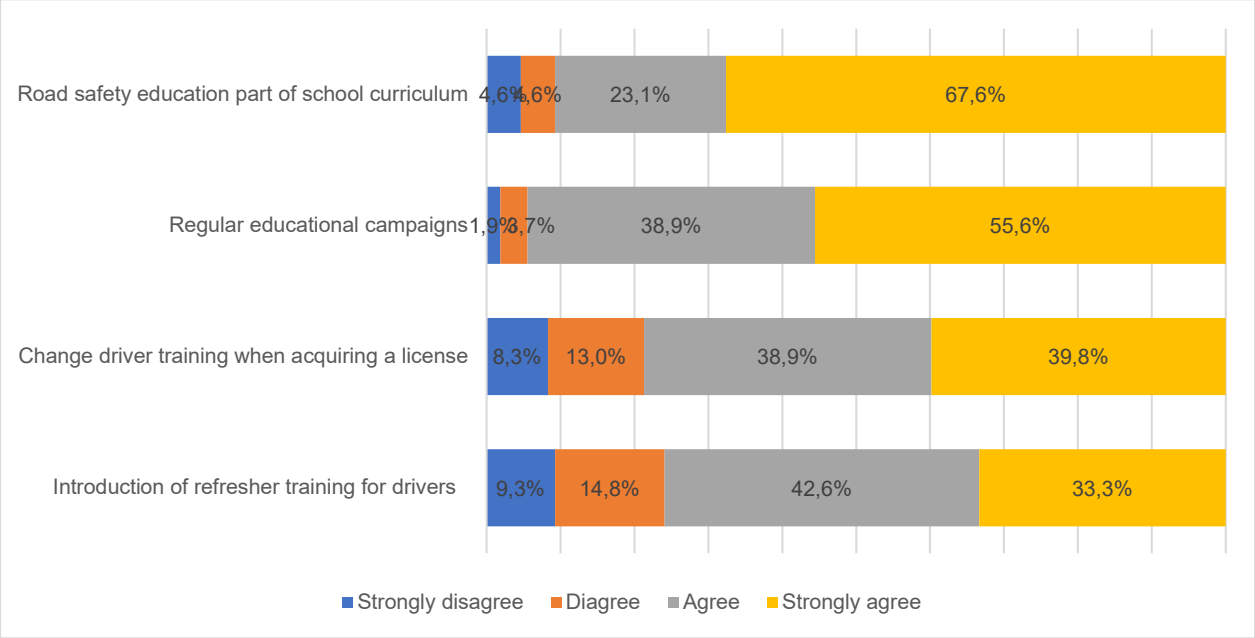

Figure 4.6: Education strategies

Source: Researcher’s own compilation

The analysis in Figure 4.6 shows that the respondents strongly agreed with the strategies in the following order: ‘road safety education part of school curriculum’ (67.6%), followed by ‘regular educational campaigns’ (55.6%). Regarding ‘change driver training when acquiring a licence’, and ‘introduction of refresher training for drivers’, it appears that there is a combination of ‘strongly agree’ and ‘agree’ of above 80% thus, it still falls within the positive response spectrum. In general, it appears the respondents agreed with all the strategies.

4.3.4.1 Education strategies: Mean and standard deviation

The education analysis results, as shown in Table 4.9, indicate that 68% of the possible strategies were 1 standard deviation away from the mean (mean = 3.54, SD = 0.79). Table 4.9 further indicates that the 'road safety education part of school curriculum' strategy had the highest mean score of 3.54 (SD = 0.79), while the 'introduction of refresher training for drivers' strategy had the lowest mean score of 3.00 (SD = 0.93).

All of the education strategy factors were measured on a 4-point Likert scale, anchored at (1) strongly disagree, (2) disagree, (3) agree, and (4) strongly disagree. As a result, 'road safety education part of school curriculum' had the highest score in comparison with the other factors, and was statistically significant, while the introduction of refresher training for drivers, had the lowest score in comparison with the other factors, and was also statistically significant. This mean score demonstrated that the average response for this factor fell between 'agree' and 'strongly agree', indicating that 'road safety education part of school curriculum' was the main strategy that can be adopted to address road fatalities among the youth aged 20-35 years.

Similarly, the mean score of 'introduction of refresher training for drivers' also demonstrated that the average response for this factor fell between 'agree' and 'strongly agree', indicating that 'introduction of refresher training for drivers' is still an important strategy that can be adopted to address road fatalities among the youth aged 20-35 years, even though the mean score was the lowest. Therefore, it can be deduced that all the education strategy factors were perceived to be statistically significant.

Table 4.9: Education strategies: Mean and standard deviation

	Mean	SD
Change driver training when acquiring a licence	3.10	0.93
Introduction of refresher training for drivers	3.00	0.93
Regular educational campaigns	3.48	0.70
Road safety education part of school curriculum	3.54	0.79

Source: Researcher's own compilation

In addition, the respondents were further required to identify their preferred medium of communication, as shown in Table 4.10. The outcome of the analysis indicates that social media scored the highest at 65%, followed by Pop-up advertisements at 11% and TV programmes at 10%, TV advertisements at 6.0%, radio at 5.0%, leaflets at 3.0% print at 0% and newsletter at 0%. It is evident from the analysis that the preferred medium of communication for youth aged between 20 and 35 years is social media.

Table 4.10: Educational mediums

	N	Percentages
Social media	65	65.0%
TV programmes	10	10.0%
Radio	5	5.0%
Print (Newspapers/Magazines)	0	0.0%
Newsletters	0	0.0%
Leaflets	3	3.0%
Pop-up advertisements on social media apps (YouTube, games)	11	11.0%
TV advertisements	6	6.0%
Total	100	100.0%

Source: Researcher's own compilation

4.3.4.2 Correlation analysis for the strategies

This section presents the analysis of the correlation between the proposed strategies. The correlation analysis is per the categories as follows: regulation, enforcement, and education. The summary of the analysis in Table 4.11 will be limited to factors that have a strong and moderate positive/negative correlation.

a) Regulation strategies correlation

The table below shows the correlation between traffic regulation strategies.

Table 4.11: Correlation between traffic regulation strategies

Regulation strategies	Item	Stricter speed laws	Zero blood alcohol concentration (BAC) for drivers	Seatbelt usage compulsory for all occupants in the vehicle	Stricter requirements for obtaining a driver's licence	Increase the amount of fines
Stricter speed laws	Correlation Coefficient	1				
	Sig. (2-tailed)					
Zero BAC for drivers	Correlation Coefficient	0.333**	1			
	Sig. (2-tailed)	0.000				
Seatbelt usage compulsory for all occupants in the vehicle	Correlation Coefficient	0.257**	0.205*	1		
	Sig. (2-tailed)	0,004	0.021			
Stricter requirements for obtaining a driver's licence	Correlation Coefficient	0.357**	0.106	0.382**	1	
	Sig. (2-tailed)	0.000	0.241	0.000		
Increase the amount of fines	Correlation Coefficient	0.203*	0.241**	0.198*	0.132	1
	Sig. (2-tailed)	0.021	0.006	0.026	0.143	

* Correlation is significant at the 0.05 level (2-tailed).

** Correlation is significant at the 0.01 level (2-tailed)

P < 0.05

As shown above, there was no correlation between the traffic regulation strategies.

b) Enforcement strategies correlation

Table 4.12 shows the correlation between enforcement strategies.

Table 4.12: Correlation between strategies enforcement vs. enforcement

Enforcement strategies	Item	Increased visibility of traffic officers in high-accident zones	Increase the number of traffic officers to improve visibility	Random testing for drunken driving	Suspend driver's licence for repeat offenders	Speed control at high-accident zones
Increased visibility of traffic officers in high-accident zones	Correlation Coefficient	1				
	Sig. (2-tailed)	-				
Increase the number of traffic officers to improve visibility	Correlation Coefficient	0.430**	1			
	Sig. (2-tailed)	0.000				
Random testing for drunken driving	Correlation Coefficient	0.161	0.256**	1.000		
	Sig. (2-tailed)	0.080	0,005			
Suspend driver's licence for repeat offenders	Correlation Coefficient	0.261**	0.238**	0.551**	1	
	Sig. (2-tailed)	0,004	0,008	0,000		
Speed control at high-accident zones	Correlation Coefficient	0.288**	0.250**	0.413**	0.396**	1

Enforcement strategies	Item	Increased visibility of traffic officers in high-accident zones	Increase the number of traffic officers to improve visibility	Random testing for drunken driving	Suspend driver's licence for repeat offenders	Speed control at high-accident zones
	Sig. (2-tailed)	0.002	0.006	0.000	0.000	

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed)

$P < 0.05$

The analysis presented in Table 4.12 above shows that 'random testing for drunken driving' and the 'suspension of driver's licences of repeat offenders' (0.551) have a strong correlation, and are statistically significant, as per the measurement used by Leedy and Ormrod (2016:232). However, 'increased visibility of traffic officers in high-accident zones' and 'increase the number of traffic officers to improve visibility' (0.430) have a moderate correlation, similar to 'speed controls at high-accident zones' and 'random testing for drunken driving' (0.413), in line with the Leedy and Ormrod's (2016:232) measurements.

In conclusion, it is evident from the correlation analysis that the strongest correlation and which is statistically significant is between 'random testing for drunken driving' and 'suspending of driver's licence for repeat offenders'.

Table 4.13: Correlation tables strategies education vs. education

Education strategies	Item	Change driver training when acquiring a licence	Introduction of refresher training for drivers	Regular campaigns	Road safety part of school curriculum
Q7.1: Change driver training when acquiring a licence	Correlation Coefficient	1			
	Sig. (2-tailed)	-			
Q7.2: Introduction of refresher training for drivers	Correlation Coefficient	0.433**	1		
	Sig. (2-tailed)	0.000			
Q7.3: Regular campaigns	Correlation Coefficient	0.207*	0.177*	1	
	Sig. (2-tailed)	0.019	0,045		
Q7.4: Road safety part of school curriculum	Correlation Coefficient	0.152	0.206*	0.468**	1
	Sig. (2-tailed)	0.081	0.018	0.000	

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed)

$P < 0.05$

The analysis presented in Table 4.13 above demonstrates that 'regular educational campaigns' and 'road safety education part of school curriculum' have a moderate

positive correlation. Similarly, ‘change in driver training when acquiring a licence’ and ‘introduction of refresher training’ also have a moderate positive correlation (0.433), which is in line with Leedy and Ormrod’s (2016:232) measurements.

This section has provided an overview of the analysis relating to the human factors that contribute to fatalities, also the correlation between the human factors and the strategies. The sections below will discuss the reliability and validity of the results, followed by the conclusion of the chapter.

4.4 RELIABILITY

To ensure reliability in this study, existing Likert scales which are reliable were used in the questionnaire. Therefore, measuring of internal consistency of the constructs was done using the Cronbach’s alpha to achieve questionnaire reliability. Low Cronbach’s alpha coefficients suggest no existence of internal consistency, while higher Cronbach’s alpha coefficients imply that there is internal consistency. In addition, Welman *et al.* (2005:145) argued that within reliability there is an element of generalisability. The following errors were considered, as they impact the reliability of the research:

In terms of reliability, the following errors were mitigated:

- Participant error: The questionnaires were printed and given to respondents. They were able to complete the questionnaire at a time most convenient to them.
- Participant bias: The questionnaire remained anonymous and the results were not shared with any of the other respondents; only the researcher was privy to such information.
- Researcher error and bias: the researcher was not able to influence or change the interpretation of the data, as statistical tools were used to analyse the data as demonstrated above.

4.5 VALIDITY

As discussed in Chapter 3, only face and construct validity were relevant for the current research study. To assess face validity in the study, three road safety specialists from the RTMC were requested to evaluate the questionnaire for comprehension, accuracy,

clarity and relevance before the study. Five traffic officers were then requested to complete the questionnaire, and they were later excluded, once the questionnaire was submitted for data collection purposes. The traffic officers were able to complete the questionnaire and raised no challenges on the questions or the ability to complete the questionnaire.

4.6 CONCLUSION

This section discussed the results obtained from the empirical study based on the research objectives and questions. The results from this study are consistent with the results of several related studies on the impact of road fatalities. Notably, the research found that drunken driving, speeding, disregarding traffic signs, and overtaking was statistically significant human factors that contribute to fatalities among the youth. The study further determined that speeding and drunken driving had the strongest correlation. In consideration of the strategies from the perception of respondents, it was found that they were all statistically significant, therefore, they support the strategies as identified. In addition, the respondents further supported social media as the preferred medium to communicate with the youth aged between 20 and 35 years. The next chapter provides a discussion of the research findings and makes recommendations.

CHAPTER 5:
CONCLUSIONS AND RECOMMENDATIONS

5.1 INTRODUCTION

This chapter presents a summary of the conclusions and makes recommendations based on the data analysed in the previous chapter. The chapter starts by revisiting and interpreting the main research aim, research objectives and questions, followed by a brief overview of the study. The chapter then addresses the contribution of the study at both the theoretical and practical levels. Finally, the chapter discusses the study's limitations and then concludes with a list of recommendations for future research.

The purpose of this study was to understand the perceptions of traffic officers and crash investigators regarding the human factors they detect that contribute to road fatalities among the youth in SA. Table 5.1 provides a summary detailing the research study's objectives and questions, and research methodology.

Table 5.1: Research matrix

Topic: Assessment of human factors as a main contributory factor to youth-related road fatalities, and countermeasures to address the problem			
Problem	**Contribution of the study**	**Research question**	**Research objectives**
The problem is the high road fatalities amongst the youth (20 – 35 years) in South Africa.	The fatality rates are high as provided in the research in SA, more critically it affects the youth mainly between the ages of 20 and 35 years. This is not only a global challenge but also in SA.	What are the human factors which contribute towards road fatalities among the youth between the ages of 20 and 35 years?	To gather information on which human factors lead to increases in fatalities among the youth between the ages of 20 and 35 years
		Which factors are perceived to be the most frequent contributors towards road fatalities among the youth between the ages of 20-35?	To determine which factors are perceived to be the most frequent contributors towards road fatalities among the youth between the ages of 20 and 35 years.

Topic: Assessment of human factors as a main contributory factor to youth-related road fatalities, and countermeasures to address the problem			
Problem	**Contribution of the study**	**Research question**	**Research objectives**
		Which strategies can be implemented to reduce fatalities among the youth between the ages of 20 and 35?	To recommend possible strategies to reduce fatalities among the youth between the ages of 20 and 35 years.
Type of research	Quantitative research		
Data collection method	Structured questionnaire		
Data analysis	The data was captured in Excel. The International Business Machines (IBM) Statistical Package or Social Sciences (SPSS) software version 27 was used to analyse the data.		
Population	The perceptions of traffic officers and crash investigators.		
Sampling method	The research used convenient sampling. ▪ Six Crash Investigators translated into 100% of the population. ▪ 198 Traffic Officers translated into 100% of the population.		
Type of questions	A structured questionnaire was used for the research study.		
Time horizon	Cross-sectional time horizon was used, the study was undertaken over a period of three months.		
Validity and reliability	**Validity** All the questions used were adopted from the literature. In addition, once the questionnaire was finalised, a review by specialists was undertaken to validate the questionnaire. In addition, a small pilot was undertaken to complete the questionnaire to ascertain ease of use. **Reliability** ▪ Participant error: The questionnaires were printed and given to respondents. They were able to complete the questionnaire at a time most convenient to them. ▪ Participant bias: The questionnaire remains anonymous and the results were not shared with any of the other respondents; only the researcher was privy to such information. ▪ Researcher error and bias: The researcher was not able to influence or change the interpretation of the data, as statistical tools were used to conduct the analysis, as demonstrated above.		
Ethical considerations	A letter was written to the institution to request permission to conduct the research study. In addition, the participants signed a consent letter to participate voluntarily. The information that was		

Topic: Assessment of human factors as a main contributory factor to youth-related road fatalities, and countermeasures to address the problem			
Problem	**Contribution of the study**	**Research question**	**Research objectives**
	collected throughout the process was handled with the utmost confidentiality and was stored in a password-protected hard drive.		

In summary, the research study adopted a quantitative research approach under the positivism paradigm. The target population for the quantitative research study were traffic officers and crash investigators working for the RTMC in SA. A non-probability convenience sampling method was used to collect data from the respondents. A structured questionnaire was the primary data collection method to collect the quantitative data. To make the data fit for use, data analysis was performed, where the responses from the structured questionnaire were captured electronically and subjected to a thorough data preparation phase.

5.2 OVERVIEW OF THE STUDY

The research study overview is as follows:

Chapter 1: This chapter outlined the background to the research problem, and it further presented the research problem, specifying the research objectives, and laying out the research approach. It indicated the current state of road fatalities from the South African context, and the factors that contribute to the fatalities, namely, human, vehicle and environmental factors. It showed that human factors are the highest contributor and that the age group between 20 and 35 years are most impacted by road fatalities. It also provided the foundation for the selection of the research area and the identified sample group.

Chapter 2: The literature review chapter included subjects relating to theories in road safety, namely, road safety research that has been undertaken by different researchers over different eras. To that end, the most appropriate theories were identified which would provide the researcher with the basis for the selected application of the most applicable theories. The theories that were discussed captured the different periods which are referred to as probabilistic, causal, systemic, and behavioural research (Jamroz, 2008:91). The chapter also presented related research regarding the understanding of human factors as a contributory factor to road fatalities

among youth, and some interventions that can be adopted to address the problem. The researcher identified human factors that contribute to road fatalities from an analysis of articles that captured studies relating to the identification of contributory factors to road crashes, as captured in Table 2.4. Lastly, the various strategies that have been adopted by different countries or authors in dealing with road fatalities to derive substantial key strategies for the intended study were identified. Goniewicz *et al.* (2016:437) maintained that strategies and programmes for the improvement of road traffic safety should cover primarily the following actions: reduction of exposure to the danger of accidents, prevention of accidents, reduction of injuries which are the effect of accidents, and decreasing the consequences of accidents by improving post-accident medical care.

Chapter 3: This chapter presented a discussion of the methodology that was adopted in the collection of the primary data. A quantitative method using descriptive theory to understand the perception of traffic officers and crash investigators was adopted. The sampling method chosen was convenient sampling. The data was collected through the use of a structured questionnaire. The data collection and analysis were based on the application of quantitative data statistical tools. The time horizon for the research was cross-sectional.

Chapter 4 captured the findings from the data captured per objective. The findings summarised the key human factors that contribute to road fatalities. A correlation was identified among the factors, in terms of both the contributory factors and the strategies that can be implemented to address the problem.

Chapter 5: This chapter will focus on the recommendations.

5.3 ACHIEVEMENT OF THE RESEARCH OBJECTIVES

This section presents the conclusions and recommendations relating to the research objectives of the current study. This section will discuss recommendations pertaining to human factors and in addition, the strategies that can be implemented.

5.3.1 Objective 1

The literature review revealed the human factors that contribute to fatalities. The list of human factors has been adopted from Table 2.4 and was used to develop the

questionnaire. The summary of the human factors and the references are provided in Table 5.2 below:

Table 5.2: Human factors, country and reference summary

Human Factor/s	Country	Reference
Speeding	India, Bangladesh: Dhaka city, Ethiopia, United Kingdom, France, Czech Republic, SA.	Singh (2017), Kapoor (2018), Hossain *et al.* (2022:4), Denu *et al.* (2021:329), Rolison and Moutari (2020:23), Gicquel *et al.* (2017:2), Bucsuházy, Matuchová, Zůvala, Moravcová, Kostíková & Mikulec (2020:560), RTMC Calendar reports (2021:19), Modipa (2022).
Drunken driving	India, Ethiopia, United Kingdom, France, Czech Republic, SA.	Singh (2017), Kapoor (2018), Rolison and Moutari (2020:23), Gicquel *et al.* (2017:2), Bucsuházy *et al.* (2020:560), RTMC Calendar reports (2021:19), Ipa (2022).
Distracted driving	India, Ethiopia, France, Czech Republic, SA.	Singh (2017), Kapoor (2018), Denu *et al.* (2021:329), Gicquel *et al.* (2017:2), Bucsuházy *et al.* (2020:560), RTMC Calendar reports (2021:19), Ipa (2022).
Fatigue	India, Czech Republic, SA.	Singh (2017), Kapoor (2018), Bucsuházy *et al.* (2020:560), RTMC Calendar reports (2021:19).
Not wearing a seatbelt	India, Bangladesh: Dhaka city, SA.	Singh (2017), Kapoor (2018), Hossain *et al.* (2022:4), RTMC Calendar reports (2021:19).
Turning in front of oncoming traffic	India, Bangladesh: Dhaka city, SA.	Singh (2017), Kapoor (2018), Hossain *et al.* (2022:4), RTMC Calendar reports (2021:19).
Disregard for yield sign/stop sign/red traffic light	India, Bangladesh: Dhaka city, SA.	Singh (2017), Kapoor (2018), Hossain *et al.* (2022:4), RTMC Calendar reports (2021:19).
Overtaking	India, Czech Republic, SA.	Singh (2017), Kapoor (2018), Bucsuházy *et al.* (2020:560), RTMC Calendar reports (2021:19).
Jaywalking	SA.	RTMC Calendar reports (2021:19).
Distracted walking	America, SA.	Mwakalonge *et al.* (2015:330), RTMC Calendar reports (2021:19).
Driver losing control of the Vehicle	United Kingdom, SA	RTMC Calendar reports (2021:19), Rolison and Moutari (2020:23).

Source: Researcher's own compilation

While there were numerous human factors identified in the literature, the researcher found that most of the studies found that speeding, drunken driving and distracted driving were the human factors that caused road crashes.

5.3.2 Objective 2

In the literature review, the researcher considered different studies to understand what factors contribute to road fatalities. The factors, as identified, were summarised in Table 2.4. The factors were then used to develop a questionnaire wherein the respondents were requested to determine which factors they deem to contribute to fatalities among the youth, as per their perception (Table 3.4). The results that were analysed, and presented in Table 5.3, allowed for recommendations to be made from the analysed data.

Table 5.3: Human factors recommendations

No.	Human factor	Recommendation
1	Drunken driving (78%)	▪ The need to regulate the installation of alcohol-detecting devices in vehicles for repeat offenders. The vehicles must not move once alcohol is detected from the driver. ▪ Ensure that those driving under the influence of alcohol are arrested and penalised with high penalties and jail time. ▪ Increase awareness campaigns focusing on the dangers of drunken driving.
2	Speeding (75%)	▪ Review of speeds in dangerous zones to ensure the speed limit is appropriate for the road itself. ▪ Enforce speed limits to promote compliance. ▪ Focus on changing the drivers' perception of speed risk through awareness and educational programmes.
3	Disregarding traffic signs (69%)	▪ Increase the number of specific training courses on road traffic rules for all citizens.
4	Overtaking (66%)	▪ Increase awareness on the dangers of overtaking. ▪ Placement of barriers between lanes to discourage overtaking.
5	Not wearing a seatbelt (63%)	▪ The use of seatbelts by all occupants should be regulated and enforced. ▪ Stricter enforcement of seatbelt usage by all occupants, and if not complying, heavier fines to be imposed.

It is evident from Table 5.3 above that the contributory human factors, as identified, are mainly drunken driving, speeding, disregard for traffic signs, overtaking, and not wearing seatbelts among the youth aged 20-35.

5.3.2.1 Correlation findings among human factors

In addition, as found in Chapter 4, there is a positive correlation between the following factors. Again, it goes without saying that correlation does not mean causality, but it provides a good base for areas to focus on:

a) Speeding and drunken driving

According to Table 5.3, speeding (78%) and drunken driving (75%) contribute the most towards fatalities. A strong positive correlation was also observed between speeding and drunken driving, as demonstrated in Table 4.6. This suggests that people, in particular youths, who are involved in fatal car accidents were likely to have been speeding as well as drunk.

This finding, therefore, confirms the results of previous studies by Gicquel *et al.* (2017:2), Denu *et al.* (2021:391), and Rolison *et al.* (2018:23). The abovementioned studies indicated speeding and drunken driving as prevalent errors being committed that may result in fatal crashes. It must be noted from the research study (Tables 4.7 and 4.8), that from a regulatory perspective, those strategies on speeding and drunken driving display an evident need for stricter speed laws and zero blood alcohol concentration. Whilst, from the enforcement perspective, there is a need for random testing for drunken driving, and the implementation of speed control at high-accident zones.

b) Jaywalking and distracted walking

Based upon the analysis presented in this study, it shows that a person can jaywalk and be distracted in the process (usually such distraction being the wearing of headphones, or talking on a cell phone (Mwakalonge *et al.*, 2015:329). In terms of pedestrians on the highways, apart from breaking the law by walking on the highway when it is not permitted to do so, the person may also be distracted to see vehicles (usually travelling at high speeds).

The literature shows that there is a positive correlation between distraction and unsafe walking behaviour (Mwakalonge *et al.*, 2015:325), however, this is limited. Therefore, more quantifiable crash data will need to be collected that shows how much of a problem distracted walking and jaywalking have become in the SA context.

c) Overtaking and not wearing a seatbelt

Kapoor (2018), Hossain *et al.* (2022:4), and Bucsuházy *et al.* (2020:560) identified overtaking and not wearing a seatbelt, as contributory factors to road fatalities. Albeit they did not focus on the correlation of the factors. These authors believed that not wearing a seatbelt remains a problem because of the lack of laws forcing vehicle occupants to wear a seatbelt, and when laws do exist, there is a lack of enforcement which results in car occupants not using seatbelts.

A seatbelt is used to keep a person restrained, so they are not thrown out of a vehicle when a crash occurs. Overtaking is when a person is doing so when it is not safe to overtake. Therefore, it is likely that overtaking and not wearing a seatbelt are errors committed by the youth, thus, resulting in a fatal crash. In Table 4.7 it was indicated that the implementation of regulations that address the need for seatbelt usage should be made compulsory for all occupants in the vehicle.

d) Overtaking and disregarding traffic signs

Devalla (2018:50) defined ‘disregard for traffic signs’ as not following the traffic rules, such as overtaking on a barrier line, or not stopping at a red traffic light. The current study did not consider the correlation between overtaking and disregard for traffic signs. However, the current study identified them as contributory factors. Therefore, the analysis showed that it was likely that the youth, at the time of a fatal crash, might have been overtaking on a barrier line, or ignoring a red traffic light.

e) Turning into oncoming traffic and driver losing control of vehicle

The act of turning into oncoming traffic is an act of travelling the wrong way, and losing control of the vehicle may occur because of high-speed travel or bad weather. Therefore, according to Hossain *et al.* (2022:8), driving the wrong way into traffic increases the probability of a fatality, worse still if the driver is speeding, or doing so during rainy weather.

5.3.3 Objective 3

The literature review in Chapter 2 indicated the importance of combining regulations, enforcement and education. This was supported by Akbari *et al.* (2021:76), who held the view that when educational interventions are accompanied by other important

factors, such as road safety; vehicle quality and safety; and even signalisation, policy, legislation, law enforcement, and so forth, it could improve safe behaviour.

Similarly, Modipa (2022:444) concluded that law enforcement agencies enforce laws, partner with stakeholders, road safety promotions, and traffic authorities to empower road users with in-depth knowledge, skills and attitude about road safety. In the consideration of the strategies, the researcher focused on the three categories, as shown in Table 5.4.

Table 5.4: Summary of findings related to the strategies

No.	Human factor	Recommendations
1	Regulations	▪ Stricter requirements for obtaining a driver's licence (61.1%), ▪ Seatbelt usage compulsory for all occupants in the vehicle (55.6%), ▪ Zero BAC (53.7%), and ▪ Stricter speed laws (52.8%).
2	Enforcement	▪ Increased visibility of traffic officers at high-accident zones (75.9%), ▪ Increase the number of traffic officers (69.4%), ▪ Random testing for drunken driving (69.4%), ▪ Speed control at high-accident zones (68.5%), and ▪ Suspend driver's licences of repeat offenders (61.1%)
3	Education	▪ Road safety education part of school curriculum (67.6%), ▪ Regular educational campaigns (55.6%), and ▪ The most preferred medium to communicate educational messaging is social media (65%).

It is evident from Table 5.4 above that the top strategy recommendations from the three themes are as follows:

a) Regulations

There is a need for stricter requirements for obtaining a driver's licence (61,1%), and this is supported by Gicquel *et al.* (2017:7).

b) Enforcement

Secondly, from the enforcement perspective, a recommendation is to increase the visibility of traffic officers at high-accident zones (75.9%). Gössling (2017:2) believed that enforcement is a critical element of road safety, therefore, the visibility of traffic officers resulting in the enforcement of laws may persuade the public that breaking the law in future may well result in a penalty.

c) Education

Thirdly, from an educational perspective, a recommendation is that road safety education should form part of the school curriculum (67.6%), and the use of social media (65%) as a communication medium among this age group between 20 and 35 years. Alonso *et al*. (2016:10), Abdul-Wahab (2016:138) and Carthy *et al.* (1993b) also supported the importance of the use of social media.

5.3.3.1 Correlation findings among the strategies

a) Regulations

No correlation could be determined among the factors.

b) Enforcement

Random testing for drunken driving and suspending the driver's licence for repeat offenders have a strong positive correlation with (0.551). It may mean that if a person is found to be drunk, this may be a repeat behaviour, and it may be necessary to suspend the driver's licence. When considering the dangers of drunken driving (Crawford & McGrowder, 2008:183), it is clear that as the blood alcohol content increases, the risk of crash involvement increases dramatically due to increased impairment.

The increased visibility of traffic officers in high-accident zones, and increasing the number of traffic officers to improve visibility (0.430) have a moderate positive correlation. Gössling (2017:16) supported that visible and high levels of enforcement may be needed to persuade the public that breaking the law in future may well result

in a penalty. Therefore, increasing the number of traffic officers may result in the reduction of traffic accidents in high-accident zones.

According to Leedy and Ormrod (2016:232), speed controls at high-accident zones and random testing for drunken driving have a moderate positive correlation with (0.413).

c) Education

Regular educational campaigns and road safety education as part of the school curriculum has a moderate positive correlation (0.468). In addition, changes to driver training when acquiring a licence, and the introduction of refresher training have a moderate positive correlation (0.433).

In consideration of the literature, the summation is that the emphasis should be on training to ensure that there are competent drivers on the road. Alonso *et al.* (2016:2) indicated that road safety knowledge is an independent protective factor for RTIs and fatalities. The implementation of a combination of those interventions may contribute to a change in behaviour and an increased awareness in communities.

5.4 CONTRIBUTION OF THE STUDY

The current research study that this dissertation is reporting on sought to identify specific human factors relating to a particular age group. The human factors, as well as the strategies that can reduce fatalities among this age group, were identified from the literature. The results of this study could assist policymakers to develop programmes for this specific age group between 20 and 35 years and pass laws that can address the legislative-related gaps as identified. The theoretical contribution made by the research is highlighted below.

The research study found that the main human factors that are contributing to fatalities among youth aged 20-35 years are drunken driving, speeding, disregard for traffic lights, overtaking and not wearing a seatbelt. The following are some of the critical measures that can be implemented:

- It will be important for the government to increase the number of traffic officers to increase visibility at high-accident zones.

- Government should ensure that they set enforcement targets that promote law enforcement for moving violations. The observation from this study is that while there is a high focus on drunken driving and speeding, moving violations, such as disregard for traffic lights (ignoring a red robot), do not necessarily get the same attention from an enforcement perspective.
- In the South African context, there are laws pertaining to seatbelt usage by all car occupants. However, the literature review indicated that on average people do not wear seatbelts. Hence, the government must implement educational programmes on the risks associated with not wearing seatbelts. This may take the form of a programme, such as the implementation of a marketing campaign using social media influencers, to make it uncool not to wear a seatbelt.
- The level of knowledge of car drivers has been raised as one of the most important aspects of improving road safety. Governments should improve training for those acquiring driver's licences by implementing continuous learning, for example, when a person renews their licence, they should be required to undergo testing on their understanding. Also, the importance of safe driving should be included as part of learning for high school children to ensure they grow up with an understanding of the importance of being safe, whether you are a driver, passenger, pedestrian or cyclist, and the associated dangers of driving that may lead to a fatal car crash.

5.5 LIMITATIONS OF RESEARCH

Although this study was conducted with an emphasis on the research design and methodologies in addressing the research objectives, some study limitations were identified, and thus informed the recommendations for future research. Therefore, the findings of this study should be considered but with the understanding of the limitations that have been recorded.

The first limitation was that the study was conducted within the South African context and with specific traffic officers and crash investigators from the RTMC. The findings might not be generalised to the bigger traffic officers' group in other provinces.

The second limitation is related to the use of a non-probability sampling method, namely, convenience sampling. The limitation of using convenience sampling is that

samples may be unrepresentative of the population. However, an effort was made to ensure that the sample characteristics are of the target population. Therefore, the results of this study are still significant within the transport sector.

The use of a questionnaire resulted in the third limitation. The questionnaire was printed and delivered to the respective offices to be completed by the Traffic Officers. Due to the outbreak of coronavirus (Covid-19) around the world, and the resultant lockdowns, the collection of data took longer and some of the traffic officers could not complete the forms due to illness. However, the use of the questionnaire did provide a high representativeness capability for this specific target group due to them working on the road, and not often being in the office. This would have made it difficult to conduct a qualitative study.

The fourth limitation was that the sample included a large proportion of traffic officer respondents. The findings were more skewed towards this large sample group.

The fifth limitation was that the research was based on the perceptions of traffic officers and crash investigators. It may be necessary in future research to gather the views of the target group themselves. Despite these limitations, the study does provide important practical insights and lays a theoretical foundation for future studies.

5.6 RECOMMENDATIONS FOR FUTURE RESEARCH

To better understand the implications of these results, future studies could address why the specific age group is drawn to speeding, drunken driving and overtaking. In addition, future studies may further consider the analysis of other factors that are not limited to human factors to take the study further. Lastly, the researcher did not focus on causality, further research is needed to determine the causes of, and effects of the relationships.

As the identified positive correlation between the different factors differs, this might require that further research be undertaken to assess the relationships between the factors, and whether there is cause and effect.

Finally, it is also important to further examine the degree of overlap between speeding and drunk driving behaviour, and the common and unique factors that contribute to each. There is a need to change drivers so that speeding and drunk driving behaviour are viewed as risky behaviours that can lead to fatality or fatalities.

5.7 CONCLUSION

In this chapter, conclusions are drawn according to the results as set out in Chapter 4. Furthermore, recommendations were derived from the results. The purpose of this study was to understand the perception of traffic officers and crash investigators in relation to the human factors that contribute to road crash fatalities among the youth. The study further sought to determine the strategies that can be implemented to address the problem.

The table below details the section in which it will reflect the research study area of focus and the section in which it was addressed.

Table 5.5: Research objectives and section they are addressed

Topic: Assessment of human factors as a main contributory factor to youth-related road fatalities and countermeasures to address the problem		
Item	**Description**	**The section where the research objectives are addressed**
Problem statement	The problem is the high road fatalities in SA.	Chapter 1 refer to Section 1.2
Research objectives	To gather information on which human factors lead to increases in fatalities among the youth between the ages of 20 and 35 years.	Chapter 2 refer to Section 2.3 Chapter 4 refer to Section 4.4.1 Chapter 5 refer to Section 5.3.1
	Research objective 1 To determine which factors are perceived to be the most frequent contributors towards road fatalities among the youth between the ages of 20 and 35 years.	Chapter 4 refer to Sections 4.4.1.1 Chapter 5 refer to Section 5.3.2
	Research objective 2 To recommend possible strategies to reduce fatalities among the youth aged 20-35.	Chapter 2 refer to Section 2.4 Chapter 4 refer to Sections 4.4.2, 4.4.3 and 4.4.4 Chapter 5 refer to Section 5.3.3
Type of research	Quantitative research	Chapter 3 refer to Section 3.5
Method to collect data	Structured questionnaire	Chapter 3 refer to Section 3.6
Data analysis	Excel and SPSS	Chapter 3 refer to Section 3.10
Population	Traffic Officers and Crash Investigators	Chapter 3 refer to Section 3.7
Sampling method	Convenient sampling	Chapter 3 refer to Sections 3.7.1 and 3.7.2

Topic: Assessment of human factors as a main contributory factor to youth-related road fatalities and countermeasures to address the problem		
Item	**Description**	**The section where the research objectives are addressed**
	The sample: • Crash Investigators: 6 (100% of the population) • Traffic Officers: 19 (100% of the population)	
Time horizon	Cross-sectional time horizon. The study will be undertaken over a period of three months.	Chapter 3 refer to Section 3.8
Validity and reliability		Chapter 3 refer to Section 3.11; on validity - Section 3.11.1 and reliability - Section 3.11.2 Chapter 4 refer to Sections 4.5 and 4.6
Ethical consideration		Chapter 3 refer to Section 3.13

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APPENDIX A:
DATA COLLECTION QUESTIONNAIRE

PART A: Demographics

This section will gather information regarding your area of specialisation, experience and age.

Please **circle** the appropriate option that reflects your response.

1. Your job title/occupation

Traffic Officer	1
Crash Investigator	2

2. Please indicate the number of year(s) you have been in the job title/occupation selected above

0-3 years	1
4-7 years	2
8-10	3
11-15	4
16 years	5

3. Please indicate the age group applicable

20 years	1
21 -30	2
31- 40	3
41-50	4
51-60	5

PART B: Human factors

This section provides a list of human factors that have been identified by research into the topic. As a respondent, you are required to indicate which human factors you perceive contribute to fatalities among the youth on a scale of 0% (never) -100% (always).

4. Select the percentage (%) for each of the human factors listed below on their contribution to road fatalities amongst the youth aged 20 to 35 years.

No	Human Factor	Never	Very rarely	Rarely	Occasionally	Frequently	Always
		0%	20%	40%	60%	80%	100%
4.1	Speeding	1	2	3	4	5	6
4.2	Drunken driving	1	2	3	4	5	6
4.2	Distracted driving	1	2	3	4	5	6
4.4	Fatigue	1	2	3	4	5	6
4.5	Jaywalking	1	2	3	4	5	6
4.6	Distracted walking	1	2	3	4	5	6
4.7	Overtaking	1	2	3	4	5	6
4.8	Not wearing a seatbelt	1	2	3	4	5	6
4.9	Disregarding traffic signs	1	2	3	4	5	6
4.10	Turning into incoming traffic	1	2	3	4	5	6
4.11	Driver losing control of vehicle	1	2	3	4	5	6

PART C: Key strategies to address the problem

This section gathers information on key strategies you believe can be implemented to address the problem under investigation, namely, high fatalities among the youth aged 20-35. Specific statements are provided, and you are required to indicate to what extent you agree with the statements where 4 means strongly agree and 1 means strongly disagree, in accordance with your view on Traffic Regulation, Enforcement and Education.

5. Please **circle** the appropriate option that reflects your response.
   .

TRAFFIC REGULATION					
No.	**Statement**	**Strongly disagree**	**Disagree**	**Agree**	**Strongly agree**
5.1	Stricter speed laws	1	2	3	4
5.2	Zero blood alcohol concentration (BAC) for drivers	1	2	3	4
5.3	Seatbelt usage compulsory for all occupants in the vehicle	1	2	3	4
5.4	Stricter requirements for obtaining a driver's licence	1	2	3	4
5.5	Increase the amount of fines	1	2	3	4

Additional comments:

Please indicate any other regulations that you believe can contribute to a reduction in road fatalities among young people.

……

……

……

……

6. Please **circle** the appropriate option that reflects your response.

ENFORCEMENT					
No.	**Statement**	**Strongly disagree**	**Disagree**	**Agree**	**Strongly agree**
6.1	Increased visibility of traffic officers in high-accident zones	1	2	3	4
6.2	Increase the number of traffic officers to improve visibility	1	2	3	4
6.3	Random testing for drunken driving	1	2	3	4
6.4	Suspend driver's licence for repeat offenders	1	2	3	4
6.5	Speed controls at high-accident zones	1	2	3	4

Additional comments:

Please indicate any other methods that can be used during the **enforcement** of road safety issues related to the youth between the ages of 20 and 35 years, not mentioned above.

……

……

……

……

7. Please **circle** the appropriate option that reflects your response.

EDUCATION					
No.	**Statement**	**Strongly disagree**	**Disagree**	**Agree**	**Strongly agree**
7.1	Change driver training when acquiring a licence	1	2	3	4
7.2	Introduction of refresher training for drivers	1	2	3	4
7.3	Regular educational campaigns	1	2	3	4
7.4	Road safety education part of school curriculum	1	2	3	4

8. Please give your opinion on the **best** method (one) to educate youth on road safety, by placing a **circle** next to the method you perceive to be the best.

Social media	1
TV Programmes	2
Radio	3
Print (Newspapers/Magazines)	4
Newsletters	5
Leaflets	6
Pop-up advertisements on social media apps (e.g. YouTube, games etc.)	7
TV advertisements	8

Additional comments:

Please indicate any other methods that can be used during the **education** of the youth between the ages of 20-35 years on road safety issues, not mentioned above.

……

……

APPENDIX B:
REQUEST FOR PARTICIPATION

UNISA university of south africa

Participation Information Letter

Assessment of human factors as a main contributory factor to youth related road fatalities and countermeasure to address the problem

Dear Prospective Participant

My name is Motselisi Juma and I am a graduate student at the University of South Africa studying towards a Masters degree (MCom) in Business Management. I will be collecting data on the perceptions of traffic officers and crash investigators on the human factors that contribute towards fatalities among the youth and possible strategies that can be implemented to address the problem under investigation. You have been selected to participate in the study. I am hereby requesting that you complete the attached questionnaire titled: Perception of traffic officers and crash investigators on human factors as a main contributory factor to youth related road fatalities and countermeasure to address the problem.

There is no compensation for responding to the questionnaire. The participation is voluntary, and you may withdraw your participation at any time. It is also anonymous thus your name will not be required. The electronic responses to the questionnaire will password protected, and hard copies will be archived in a locked cabinet.

The data will be analysed, and all the information collected will be destroyed after a period of five years according to the Unisa ethics policy. The information will only be used for this research study and not for any other purposes. The research findings may, however, be published in scholarly journals and other communication media to communicate the findings.

The questionnaire consists of the following sections:

- Part A: This section will gather information in relation to your area of specialisation, experience and age.

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www.unisa.ac.za

- Part B: This section provides a list of human factors that have been identified from literature. You will be required to indicate which human factor you perceive to contribute to fatalities on a scale of 0% (never) -100% (always) contribute.
- Part C: This section gathers information on key strategies you believe can be implemented to address the problem under investigation which is high fatalities among the youth aged 25-35. Specific statements are provided, and you are required to indicate to what extend you agree or disagree with the statements in accordance to you view on Traffic Regulation, Enforcement and Education.

Thank you for taking the time to assist me in my research endeavours. The data collected will provide useful information to answer the research question of this study.

If you require additional information or have questions pertaining to the study, please contact me Motselisi Juma at 079 433 3924, or motselisi2@gmail.com and my supervisor Prof. AS Tolmay, etolmaas@unisa.ac.za, Tel: 012 429 4739 during office hours. If you are not satisfied with the manner in which this study is being conducted, you may report (anonymously if you so choose) any complaints to the supervisor as per the detail provided above.

Yours Sincerely

Ms. Motselisi Juma

Researcher

079 433 3924

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APPENDIX C:
CONSENT LETTER

Researcher: Motselisi Mofokeng.

UNISA university of south africa

Questionnaire: Assessment of human factors as a main contributory factor to youth-related road fatalities and countermeasures to address the problem

CONSENT TO PARTICIPATE IN THIS STUDY

Research title:

Assessment of human factors as a main contributory factor to youth related road fatalities and countermeasure to address the problem

---

I, …… …….. (respondent name and surname), hereby consent that I will participate in the research study. The following has been provided and explained by the researcher:

- That participation is voluntary and at any stage may without prejudice, withdraw my consent and participation in the research.
- A participation information letter was provided which I read and were given the opportunity to ask any questions to the researcher relating to the study.
- The research is for academic purposes and the results may be produced in an article format and in any other research publications.
- There are no risks involved in participating in this project, the information gathered will be treated confidentially and no personal information will be required.
- The information will be stored in a secure area for 5 years and destroyed thereafter.

Participant's name and surname	**Date**	**Signature**
Motselisi Juma		
Researcher's name and surname	**Date**	**Signature**

.

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APPENDIX D:
RTMC APPROVAL LETTER

Road Traffic Management Corporation

Physical Address
Eco Origin Office Park, Block F
349 Witch-Hazel Street
Highveld Ext 79, 0157
Centurion, Gauteng
South Africa

Email: info@rtmc.co.za
Tel: (012) 999 5200
Fax: (012) 991-0371

Postal Address
Private Bag X147
Pretoria, 0001

The Road Traffic Management Corporation (RTMC) is an Agency of The Department of Transport and a Member of the United Nations Road Safety Collaboration

Eng. Ntombizodwa Mnguni
Tel: 012 999 5202
Email: NtombizodwaM@rtmc.co.za

Head of faculty
University of South Africa
Preller Street, Muckleneuk,
Pretoria,
0002

To whom it may concern

1. This is to confirm that Motselisi Juma, Student number 4231 0717, has been granted permission by the Road Traffic Management Corporation (RTMC) to access road crash data and to undertake a questionnaire study among traffic officers and crash investigators.

2. The research study as indicated shows that Ms. Juma will be collecting data among RTMC employees. As the Corporation, it is expected that the data that is collected should not in any anyway compromise the personal information of the participants and must be stored in a secure manner.

3. The information should only be used for the intended research study.

4. Once the research study is finalised we look forward to receiving a copy of the research. And we wish Ms. Juma all the best and believe this will make a meaningful contribution to the Organisation.

Kind Regards

Adv. Mathosini Msibi
Chief Executive Officer
Date: 12/03/2020

Board of Directors: Mr Z Majavu CD(SA) (Chairman), Ms P Manqele, Ms T Mdluli, Mr T Kgomo, Prof. M Mphahlele, Ms T Thankge, Dr E Thebe, Mr J Motsatsing*
Chief Executive Officer: Advocate MS Msibi
Company Secretary: Ms S Petse
*Departmental Representative

APPENDIX E:
SIGNED CONFIDENTIALITY LETTERS

Statistician

UNISA university of south africa

CONFIDENTIALITY CLAUSE BETWEEN

Student: Motselisi Precious Mofokeng (4 2310 717)
AND
The Statistician: Dion van Zyl

Research title:

Assessment of human factors as a main contributory factor to youth related road fatalities and countermeasure to address the problem.

The research code of ethics mandates that confidentiality should be maintained throughout data collection, data analysis and reporting. As an Statistician I understand that I have access to confidential information. By signing this statement, I am indicating my understanding of this responsibility and agree to the following:

- I understand that all information obtained or accessed by me in the course of my work is confidential. I agree not to divulge or otherwise make known to unauthorized persons any of this information, unless specifically authorised to do so.
- I understand that names and any other identifying information about study sites and participants are completely confidential.
- I agree to use the data solely for the purpose stipulated by the client.
- I agree to maintain the confidentiality of the data at all times and keep the data in secure, password protected location.
- I agree to shred all hard copies of data in my possession on completion of the project. All electronic copies will be permanently deleted from the hard drive of my computer upon completion of this project.

Dion van Zyl	2020/05/12	
Printed name (Statistician)	**Date**	**Signature**
Motselisi Precious Mofokeng	2020/05/12	
(Researcher)	**Date**	**Signature**

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Editor confidentiality letter

UNISA university of south africa

CONFIDENTIALITY CLAUSE BETWEEN

Student: Motselisi Precious Mofokeng (4 2310 717)
AND
Editor details: Retha Burger

Research title:

Assessment of human factors as a main contributory factor to youth-related road fatalities and countermeasure to address the problem.

The research code of ethics mandates that confidentiality should be maintained throughout data collection, data analysis and reporting. As an Editor I understand that I have access to confidential information. By signing this statement, I am indicating my understanding of this responsibility and agree to the following:

- I understand that all information obtained or accessed by me in the course of my work is confidential. I agree not to divulge or otherwise make known to unauthorized persons any of this information, unless specifically authorised to do so.
- I understand that names and any other identifying information about study sites and participants are completely confidential.
- I agree to use the data solely for the purpose stipulated by the client.
- I agree to maintain the confidentiality of the data at all times and keep the data in secure, password protected location.
- I agree to shred all hard copies of data in my possession on completion of the project. All electronic copies will be permanently deleted from the hard drive of my computer upon completion of this project.

Retha Burger **Printed name** (Editor)	28 May 2020 **Date**	**Signature**
Motselisi Precious Mofokeng (Researcher)	2020/05/28 **Date**	**Signature**

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APPENDIX F:
ETHICAL CLEARANCE

UNISA university of south africa

COLLEGE OF ECONOMIC AND MANAGEMENT SCIENCES
DEPARTMENTAL ETHICS REVIEW COMMITTEE
OPERATIONS MANAGEMENT

Date: 07 July 2020

NHREC Registration # : (if applicable)
ERC Reference # : OPS/2020/001

Name : MP Mofokeng

Student #: 42310717

Dear Ms MP Mofokeng

Decision: Ethics Approval from 07 July 2020 until 07 July 2025

Researcher(s): Motselisi Precious Mofokeng
Department of Operations Management
College of CEMS
Email address: 42310717@mylife.unisa.ac.za or
Motselisi2@gmail.com

Supervisor(s): Prof AS Tolmay Prof S van Antwerpen
Department of Operations Management
CEMS
E-mail Address: etolmaas@unisa.ac.za / vanans@unisa.ac.za
Tel number: 012 429 4739 / 012 429 4988

Assessment of human factors as a main contributory factor to youth related road fatalities and countermeasure to address the problem

Qualification: DFOPS93

Thank you for the application for research ethics clearance by the Unisa Department of Operations Management Ethics Review Committee for the above-mentioned research. Ethics approval is granted for 5 years (**see period mentioned above**).

*The **low risk application** was **reviewed** by the Department of Operations Management:*

The proposed research may now commence with the provisions 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 should be communicated in writing to the Department of Operations Management Ethics Review Committee.

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APPENDIX G:
DECLARATION OF PROFESSIONAL EDIT

Retha Burger
B.A.(H.E.D.)
tel : 012 807 3864
cell : 083 653 5255
fax : 012 807 3864
e-mail : retha@skillnet.co.za
Independent Skills Development Facilitator

Dear Ms Juma

This letter is to record that I have completed a language edit of your dissertation entitled, "Assessment of human factors as a main contributory factor to youth-related road fatalities, and countermeasures to address the problem".

The edit that I carried out included the following:

-Spelling
-Grammar
-Vocabulary
-Punctuation
-Pronoun matches
-Word usage
-Sentence structure
-Correct acronyms (matching your supplied list)
-Captions and labels for figures and tables
-Spot checking of 10 references

The edit that I carried out excluded the following:

-Content
-Correctness or truth of information (unless obvious)
-Correctness/spelling of specific technical terms and words (unless obvious)
-Correctness/spelling of unfamiliar names and proper nouns (unless obvious)
-Correctness of specific formulae or symbols, or illustrations

Yours sincerely

Retha Burger

23 January 2023