STRATEGIES TO ENHANCE COMPLIANCE OF HEALTH AND SAFETY STANDARDS AT THE SELECTED MINING INDUSTRIES IN LIMPOPO PROVINCE, SOUTH AFRICA: OCCUPATIONAL HEALTH NURSE'S PERSPECTIVE

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[redacted]

THESIS

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DECLARATION

I Livhuwani Muthelo hereby declare that my thesis for the degree **"Strategies to enhance compliance of health and safety standards at the selected mining industries in Limpopo Province, South Africa: Occupational Health Nurse's Perspective"** for the degree Doctor of Philosophy in Health Care Sciences at the University of Limpopo, the degree has not been submitted previously at this or any other university. The research work reflected in the report is my work in design and in its execution, including reference materials used in the report that has been duly acknowledged.

Signature:  Date: 15 December 2021

DEDICATION

This thesis is dedicated to my late parents Mr. Richard Mafangambiti and Mrs. Musundwa Sophia Ramalivhana, for convincing and motivating me that education has been the key to success since childhood.

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ABSTRACT

Background: The health and safety of the miners in the South African mining industry are guided by the regulations and standards which are anticipated to promote a healthy work environment and fatalities. It is of utmost importance for the miners to comply with these regulations/standards to protect themselves from potential occupational health and safety risks, accidents, and fatalities.

Purpose: The purpose of this study was to develop and validate strategies to enhance compliance with the Health and safety standards within the mining industries of Limpopo province in South Africa.

Methods: A mixed-method exploratory sequential research design was adopted. The population consisted of 5350 miners. Purposive and total sampling was used to select the participants in the qualitative strand and stratified random sampling in the quantitative strand. Semi-structured interviews were conducted among the occupational health nurse practitioners and the health and members of the health and safety team. Thematic analysis was used to generate an understanding of the interviews. In the quantitative strand, a survey was conducted using a self-administered questionnaire. Data were analysed using SPSS version 26.0. A descriptive statistical test was used in the analysis of data including frequencies, means, and standard deviation. Cronbach's alpha test was used to measure internal consistency.

Results: The integrated results revealed that there are diverse experiences related to health and safety standards compliance among the mineworkers. The main findings were challenges related to leadership compliance and also related to the cost of maintaining safety, Miner's behaviour-related challenges; the impact of non-compliance on the overall health of the miners was also described, the conflict between production and safety. As a result, strategies to enhance compliance of health and safety standards at the selected mining industries in Limpopo province, South Africa were developed.

Conclusion: Health and safety compliance in the mining is not just mere compliance with regulations and standards but a culture that warrants the miners and organization

to take responsibility for their behaviour and actions towards health and safety. Thus taking responsibility for your well-being and other miners.

Keywords: Perceptions, Compliance, Health and Safety, Legislation, Standards, Miners

DEFINITION OF CONCEPTS

Compliance

According to Bistobing (2015), compliance is a state of following established guidelines or specifications or the process of becoming so. In the mining industries, compliance shall mean the correct practice of the employees and the organization following the health and safety standards in the selected mines, Limpopo Province.

Culture

Culture is the values, beliefs, underlying assumptions, attitudes, and behaviors shared by a selected cluster of individuals or society (Heathfield, 2018). In the context of this study, culture shall mean attitudes, beliefs, customs, and behaviors shared by the employer and employees within the selected mines.

Health

Health refers to the condition of the best physical, psychological, social, and spiritual welfare for the individual, together with the absence of illness or frailness (World Health Organisation, 2014). In this study, health refers to the mine employees' condition of physical, emotional, and social well-being.

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Miners

A miner is an individual who works in the mines to acquire minerals like coal, jewels, or gold (Cambridge dictionary, 2015). For the purpose of this study a miner shall refer to the (artisans, mining engineers, geologists, health and safety personnel, mining managers, engineering managers, mine surveyors, machine operators, and drivers) in the selected mine.

Safety standards

Safety standards are standards designed to ensure the safety of products, activities. Safety is the person’s state of being free from risks, internal or external (Hattingh & Acutt, 2016). For this study, safety shall refer to the absence of risks and hazards in the selected mine in Limpopo Province.

Health and Safety

Health and safety seek advice from the laws, rules, and principles that are meant to keep individuals safe from injury or illness at work and in public places (Cambridge dictionary, 2015). For this study, health and safety shall refer to the regulations, policies, and standards which are available to protect and guide the employees and the organizations in the selected mines, Limpopo province, to work in a healthy and safe environment.

Health and Safety Compliance

Health and Safety compliance is the extent to which staff adheres to health and safety standards, procedures, legal obligations, and needs. It is also associated with the degree of absence of accidents and incidents within the geographic point (Kleyn & Du-plessis, 2016). For this study, health and safety compliance shall mean the degree to which the employees in the selected mines adhere to health and safety standards, procedures, regulations, and requirements in the selected mines of the Limpopo Province in South Africa.

Strategies

Strategies are plans of action designed to achieve a long-term or overall aim (Cambridge dictionary, 2015). For this study, strategies shall mean a plan of intervention strategies to enhance compliance with the health and safety standards in the mining industry.

Occupational health nurse

The Occupational Health Nurse (OHN) is a registered nurse who practices under relevant nursing legislation, codes of ethics, practice, standards, workplace policies, and procedures, and other legislation applicable to the workplace and holds a qualification in occupational health recognized as such by the South African Nursing Council (SANC) as referred to in the Nursing Act 33 of 2005 (Department of Labour of South Africa, 1993). For this study, occupational health nurses shall refer to a registered nurse who practices following relevant nursing legislation, codes of ethics, practice, standards, workplace policies and procedures, and other legislation

applicable to the workplace and holds a post-basic qualification in occupational health which is recognized by SANC.

LIST OF ABBREVIATIONS

ABBREVIATION	MEANING
BBS	Behaviour-Based Safety
CTF	Cultural Transformation Framework
DMR	Department of Minerals and Energy
H & S	Health and Safety
ILO	International Labour Organization
MHSA	Mine Health and Safety Act
MMR	Mixed-Method Research
MHSC	Mine Health and Safety Council
NIHL	Noise-Induced Hearing Loss
NIOH	National Institute of Occupational Health
NUM	National Union of Mineworkers
OHN	Occupational Health Nurse
OHNP	Occupational Health Nurse Practioner
OHS	Occupational Health and Safety
OHSC	Occupational Health and Safety Committee

OHSMS:	Occupational Health and Safety Management Systems
OMP	Occupational Medical Practioner
SMS	Safety Management System
PGMs:	Platinum Group Metals
PPE	Personal Protective Equipment
SA	South Africa
SANC	South African Nursing Council
SPSS	Statistical Package for the Social Sciences
UK	United Kingdom
USA	United State of America
WHO	World Health Organization

CHAPTER 1

OVERVIEW OF THE STUDY

1.1. INTRODUCTION AND BACKGROUND

The majority of health and safety authorities in mining companies worldwide agree that the major causes of mine accidents and fatalities are unsafe conditions, poor management, and especially non-compliance with the health and safety standards (Kleyn & du Plessis, 2016; Tibane & Niemand, 2017). As said by Vassem, Fortunato, Bastos, and Balassiano (2017), the high incidence rate of accidents in the mining industry requires the understanding of interpersonal relations in the employment context (organization), the individual factors (beliefs, attitudes, and behavior) that contribute to non-compliance with health and safety standards. The implementation of occupational legislation and standards is perceived as a major challenge due to a lack of knowledge of occupational legislation by the miners, and adherence is thus impaired (Mogale & Mogotlane, 2018). Therefore, to ensure compliance with health and safety standards, Occupational Health Nurse Practitioners (OHNP) are the frontline in the promotion and protection of the miners' well-being at the workplace. It is the responsibility of the OHNP to develop and implement preventative measures that can mitigate the risks (Michell, 2011).

Globally, there is evidence of models and theories to mitigate the high incidences and fatalities in the mining industries. However, there is still a gap in the literature on the management of compliance with the health and safety legislation (Jacinto, Guedes, Soares, Fialho, Antão, & Silva, 2011; Salguero-Caparrós, Pardo-Ferreira, Martínez-Rojas & Rubio-Romero, 2020). Sanmiquel, Rossell, and Vintró, Freijo (2014) study in Spain highlighted that most of the lost time injuries in the mines are caused by ineffective health and safety system management. Also, according to Dragan, Georges, and Mustafa's (2017) study in Canada, organizational factors such as the culture of the management focusing on performance and efficiency and neglecting safety play a key role in creating conditions for triggering major accidents.

While there are comprehensive laws regarding health and safety standards and systems to ensure compliance in African countries, their adherence is generally weak and under-resourced in many organizations (Kheni & Braimah, 2014; Mustapha, Aigbavboa &Thwala**,** 2015). Poor coordination of activities in many organizations, lack of specific health and safety regulations, and undesirable compliance with relevant H&S legislation were cited as the major problems leading to poor safety compliance (Kheni & Braimah, 2014; Mustapha, Aigbavboa & Thwala, 2015).

Health and safety standards are the fundamental rights that are justiciable socio-economic rights (Shibambu, 2017). Consequently, poor enforcement and implementation of health and safety measures in the South African (SA) mining industry have harmed the social and economic growth since the mining sector is a central sector that is used to accelerate SA social-economic growth (Shibambu, 2017). South African mining industries are well known for their diverse mineral resources such as gold, platinum, coal, and chrome (Pyoos, 2010). Though the SA mining industries are well regulated, holding the leading positions in the production of numerous mineral resources, their culture is characterized by a strong focus on production. Moreover, the production pressure appears to lead to an increase in injuries, resulting in a decrease in production (Masia & Pienaar, 2011). A qualitative study conducted by Muthelo, Malema, and Mothiba (2019) in the platinum mine of Limpopo Province found that injuries were due to poor implementation of health and safety legislation and standards. Furthermore, they found that non-compliance with safety standards among mineworkers was caused by the culture of being accustomed to the hazards at the workplace.

The study by Qian and Lin (2016) identified numerous factors that influence the mining organizations to adopt the Occupational Health and Safety (OSH) strategies to improve current practices. Such factors included a lack of resources, skills, and knowledge. The following strategies for health and safety were proposed for adoption by the mining organizations: the safety risk management system and the behavior-based safety programme.

Safety Management Systems (SMS) mainly focus on improving health and safety performance in the mining industry. The main aim of SMS is to ensure that hazards

are identified earlier by putting effective measures of control in place (Årstad & Aven, 2017). Safety training programs that use alternative teaching strategies such as pictograms, illustrations, and hands-on training opportunities are important in SMS, especially in addressing challenges related to the language barrier in health and safety compliance (De Jesus-Rivas, Conlon & Burns, 2016). The adoption of the SMS by the mining industries is important for the management of safety risks (Zwetsloot, Kines, Wybo, Ruotsala, Drupsteen & Bezemer, 2017). Such safety risks are inclusive of all the structures, accountabilities, policies, and procedures. Zwetsloot et al. (2017) emphasized the need to integrate safety risk systems to build a strong safety foundation (Zwetsloot et al., 2017).

On the other hand, it is more important for policymakers in the mining industry to establish policies that are easy to adopt and take into account occupational safety and health strategies. The policies should incorporate local miners' associations and cooperatives to build capacity to make mining regulation effective, seeking to achieve such goals as the protection of natural resources, good health, and safety standards (Fuisz-Kehrbach, 2015; Mutemeri, Walker, Coulson, & Watson, 2016). Effective safety strategies can be implemented through safety control and corrective action to avoid or reduce workplace risk, including Behaviour Based Safety (BBS) (Blair, 2017).

Behaviour-Based Safety influences safety behaviour first and hopes to change attitudes to align with the dominant safety behaviours through cognitive dissonance. The BBS approach aligns safety behaviours with workers' attitudes (Beus, 2015). The other useful method is the safety culture change approach that combines the organizational safety programs to strengthen OSH strategies. Safety culture change programs are broad organizational programs that continuously improve safety management (Zivkovic & Ivanova, 2016). In the context of this study, the strengths, controversies, weaknesses, and gaps in compliance with the health and safety regulations/standards were explored, aiming to develop strategies to enhance health and safety compliance in the mining industry. Furthermore, occupational health nursing has an opportunity to provide guidance on compliance with the health and safety standards and assist mining organizations in creating a safer and more productive work environment.

1.2. PROBLEM STATEMENT

In South Africa (SA), various legislations were introduced to assist in the transformation and “improvement of the safety standards in the mining sector (Shibambu, 2017). The introduction of the legislation in SA aimed to improve health and safety performance with more emphasis on adherence to mine standards. In 2016, the chamber of mines signed a declaration of actions pledge as a change to improve the mining industry occupational health and safety to zero harm by 2024 and to generate a culture change in an industry that will transform the behaviour of people at all levels (Chamber of Mines, 2016).

However, the high increase in sub-standard practices indicated that the policies implemented in the SA mining industry have not led to the desired result (Kleyn & du Plessis, 2016). Sub-standard practices compromise the effectiveness of any safety measures, devices, or procedures that have been put in place. They create a weak spot in the system that is bound to fail with the slightest interference. Standards and safety are very closely related. They are necessary to maintain the safety of underground employees and necessary to maintain the safety of underground employees and improve current safety practices (Kleyn & du Plessis, 2016). There seems to be a need to understand the current culture and the need to change. An investigation into what causes employees to engage in sub-standard acts and how to change the behaviour at all levels of the organization is required within the SA mining industry.

The SA mining industry is under the spotlight with an increase in accidents and fatalities. For example, in SA, the death of miners' increased from 51 cases in 2017 to 71 in 2018 during the same period, 51 in 2019, 60 in 2020, and 60 in 2021 February (NUM, 2021; Dludla, 2018). In Limpopo Province, which is one of the highest contributors of the mining minerals in the South African economy, in July and October 2018, Phalaborwa reported six cases, De Beers Venetia with one case, and Thabazimbi with two cases of mine accidents fatalities (Simelane, 2018; Casey, 2018). The unions accused SA mining industries of pushing for production over the safety of

miners which suggests that the occupational health safety of miners is neglected within the mining industries (Casey, 2018).

Occupational health safety principally implies the non-appearance of any occupational diseases or injuries. Therefore, it is the responsibility of the OHN to guide management and employees on the occupational legislative requirements aiming to safeguard legal compliance at the workplace (Hattingh & Acutt, 2016). Additionally, occupational health nurses have a responsibility to promote the health, safety, and well-being of the employees at the workplace. Against this background, the researcher developed an interest in exploring the influences of non-compliance from both the organizations and employees and developing strategies to enhance compliance with the health and safety standards.

1.3. RESEARCH QUESTIONS

The following research questions guided the study according to the three phases:

Phase 1 :

- What is the occupational health nurse's perspective regarding compliance with health and safety standards by the organization and miners?
- How do miners and the organization comply with the health and safety standards?

Phase 2:

- What are the main strategies to be adopted by the mining industry to enhance organizational and miner practices towards compliance with the safety standards in Limpopo province?

Phase 3:

- How can the strategies to enhance organizational and miners practices towards compliance with the safety standards be validated?

1.4. PURPOSE OF THE STUDY

The purpose of the study was to:

- Develop and validate strategies to enhance compliance with the health and safety standards within the mining industries of Limpopo Province in South Africa.

1.4.1. Objectives of the study

The objectives of the study were achieved according to the phases outlined below in table 1.1.

Table 1.1: Objectives according to different phases

Phases	**Objective**	**Methodology**
Phase 1: Situational analysis	• To explore the occupational health nurse and the health and safety team perspective regarding compliance with health and safety standards of miners and organizations at the selected mining industries. • To explore and describe miners and organizational practices related to compliance with health and safety standards in the mining industry.	• Purposive and total sampling method was used to select participants in the qualitative strand. • A mixed-method sequential exploratory design enabled the researcher to broadly explore and describe the organizational and miners factors that influence compliance with the health and safety standards in the mining industry, Limpopo Province, South Africa. • Purposive sampling was used to select the mine, while the respondents were selected

		using stratified sampling in the quantitative strand. • Data were collected using semi-structured one-on-one interviews and a self-administered questionnaire. • Qualitative data were/was analysed using thematic analysis, and quantitative data were analysed through SPSS.
Phase 2: Development and description of strategies	• Develop and describe strategies to enhance compliance with health and safety standards in the mining industry.	• The strategies were developed using the analysed data from the qualitative phase, health and safety records, and the quantitative phase of the study. • The development process was guided by the study results, World Health Organization (WHO) Healthy Workplace Framework model. and cultural framework model. The occupational health and safety mining legislations, standards, and guidelines on compliance also guided the strategies development. • The developed strategies were described, and the justification and recommendations in each strategy were documented.

Phase 3: Validation of the strategies	• Validate strategies to strategies to enhance compliance with health and safety standards in the mining industry.	• Strategies that were described in phase 3 to enhance compliance with the health and safety standards were validated using the Delphi technique. Delphi technique involves a group of experts in the field sharing their insights in an anonymous way that would stimulate thinking and help bring consensus to an issue (Ogbeifun, Agwa-Ejon, Mbohwa & Pretorius, 2016). • To secure the understanding and insights of topical experts, consultation was done with the experts in mining health and safety, such as the mineral resource department, health and safety managers, and mining council. Thereafter the proposed intervention strategies with action plans and recommendations in each strategy will be distributed for validation.

1.5. OVERVIEW OF RESEARCH METHODOLOGY

The study was conducted in 3 Phases: 1, 2, and 3.

Phase 1:

A mixed-method research approach was adopted to gain an understanding of the health and safety standards among the OHNP, H & S team members (safety officers and safety representatives), and the miners at the selected mining industry. The approach also assisted the researcher in achieving complementary results by using the strengths of the qualitative method to enhance the quantitative method. The sequential exploratory design, which involved a two-strand project, was applied wherein the researcher collected qualitative data in the first strand and analysed the results. Thereafter, the results were used to build on the second quantitative strand. The results of both strands guided the development of strategies to enhance compliance with the health and safety standards within the mining industry.

1.5.1. Qualitative strand of the study

The qualitative strand consisted of eight OHNP, and 12 members of the H & S team Purposive sampling was used to select the participants until data saturation which was reached on participant number 20. The pilot study was conducted among five participants (one OHNP and three H & S team members). The pilot study assisted the researcher to refine the sampling strategy and the final data collection tool. Data for the main study was collected by the researcher through semi-structured one-on-one interviews using an interview guide. Twenty in-depth interviews were conducted amongst eight OHNP, and 12 members of the H & S team members in the selected mine. The thematic, descriptive coding technique to analyse data, which comprises eight integrated steps, was followed. Four themes and nineteen sub-themes emerged from this strand and were used to inform the development of the quantitative data collection instrument.

To ensure trustworthiness, credibility, confirmability, dependability, and transferability were adopted in the study. For example, credibility was ensured by a good rapport established during a prolonged engagement with the participants on the interviews that lasted for about 30 to 45 minutes. These encouraged the participants to be open and describe their lived experiences in detail. To ensure confirmability, the interview recordings and the transcripts were reviewed by the supervisor and the co-supervisor, who are experienced, qualitative researchers. Dependability was ensured by describing the research process in detail, enabling a future researcher to repeat the work, if not necessarily to gain the same results. At the same time, transferability was ensured by providing a sufficient thick description of the research process to allow readers to have a proper understanding by providing a sufficient thick description of the research process to allow readers to understand properly. The qualitative strand will be discussed in detail in Chapter 4.

1.5.2. Quantitative strand of the study

In the quantitative strand, the population consisted of 5350 miners in the selected mine. Stratified random sampling was used to select respondents, which involved dividing a population into smaller groups known as strata. The strata were formed based on the mineworker's shared attributes, e.g. culture and different categories. A random table that included all the categories in each stratum was generated, and every third person was selected from the generated table. In this strand, data were collected and guided by the results of the initial qualitative strand. Data were analysed using descriptive statistics to calculate the categorical variables (frequencies/counts and percentages). SPSS version 26.0 was used to run various tests such as Cronbach's alpha to test the internal consistency. Pearson correlation test was used to assess the relationship between all items and their proposed latent variable.

Validity and reliability were ensured by using various methods to collect data to obtain true information, such as questionnaires and one-on-one interviews in the mines. Validity and reliability will be discussed in detail in Chapter 4.

1.5.3. Paradigm perspective

The research paradigm concerns the research's source, nature, and knowledge development (Bilau & Witt, 2018; Saad, 2016). The use of paradigm guided the researcher to select the relevant methods in positioning and reporting the study. The following perspectives of the research paradigm were applied: pragmatism, dialectics, epistemology, and ontology. The research paradigm will be discussed in detail in Chapter 4. In the context of health care research, a researcher's paradigmatic positioning relates to their understanding of the nature of knowledge (their epistemological standpoint) and of reality (their ontological standpoint).

1.6. INTEGRATION OF QUALITATIVE AND QUANTITATIVE RESULTS

Phase 1

A mixed-method exploratory design was applied. The researcher started by collecting qualitative data and the results were used to develop the questionnaire for the quantitative phase. Thereafter integration and interpretation of data were made by connecting the quantitative data to draw insights into information gained from the qualitative results (Berman 2014; Fetters, Curry & Creswell, 2013). The following integrated results emerged:

- An outline of different experiences related to health and safety standards compliance among the miners and the mining organization,
- The significant role of policies/ standards and communication channels regarding safety compliance,
- The value of compliance is not recognized by the documentation or filling system,
- The role of miners and organizations in ensuring safety culture,
- The significant role of safety officers and occupational health nurse practitioners in promoting compliance in the mine.

More details about the above-listed findings are provided in Chapter 6 of the study.

1.7. DEVELOPMENT OF THE STRATEGIES

Phase 2

Phase 2 of this study was used for the development of strategies to enhance compliance with health and safety standards. The development of strategies was guided by the findings of both quantitative and qualitative strands, the World Health Organization Healthy Workplace Framework, and the cultural transformation model which guided this study. More details will be discussed in Chapter 7.

1.8. VALIDATION OF STRATEGIES

Phase 3

Phase 3 of this study involves validating the developed strategies, which were guided by the Delphi technique. The proposed strategies covered recommendations from four experts in occupational health during Delphi validation rounds to ensure reliable strategies.

1.9. SIGNIFICANCE OF THE STUDY

The importance of this study is to give the premise to the plan of a successful health and safety strategy, which tends to explicit the health and safety needs that will at last lift the challenges in mining organizations. The results can assist the mining council policymakers in developing appropriate strategies and or allocating resources to implement the strategies developed in this study.

Promoting occupational health and safety at the workplace has several benefits for society, the mining organizations, and the miners, including families. Moreover, the findings of the study may assist the mining industry in overcoming the burden of accidents and injuries due to non-compliance.

Financial benefit: The cost of an occupational accident, illness, injuries, and fatalities in the mining sector contribute substantially to organizational costs through reduced

productivity resulting from employees being absent due to injuries and also compensation.

Legal/regulatory benefit: Courts and regulatory bodies increasingly recognize organizations as responsible for protecting the employees.

Ethical benefit: Most organizations affirm the obligation to ensure the health and safety of their employees.

Family benefit: Workplace injuries and accidents can lead to loss of life, disability associated with stress, and anxiety, which can lead to a strained relationship with family and friends.

1.10. ETHICAL CONSIDERATIONS

Health science research depends on ethical standards that advance and guarantee respect for every human subject and secure their wellbeing and freedom (Masic, Hodzic & Mulic, 2014). More importantly, the bill of rights protects the rights of all people in South Africa and upholds the autonomous values of freedom, human dignity, and equality (Constitution of RSA, 1996). This study adhered to the following ethical standards and principles: ethical clearance, permission to conduct the study, informed consent, confidentiality and anonymity, right to privacy, Principle of Justice/non-discrimination, and the principle of beneficence. More details will be discussed in Chapter 4.

1.11. CHAPTER SUMMARY

Chapter 1 Outlined the overview of the study, introduction, and background, the problem statement, the purpose of the study, the research questions, the objectives of the study, research methodology, qualitative and quantitative strand, population and sampling, data collection, data analysis, measures to ensure trustworthiness, validity, and reliability, integration and interpretation of qualitative and quantitative results, the development and validation process of the proposed strategies, the significance the

study and the ethical considerations. The next chapter will discuss the literature review.

1.12. OUTLINE OF THE THESIS

The organization of chapters is presented in table 1.2.

Table 1.3 Organization of the chapters

Chapter	Task
Chapter 1: Introduction and background	• An overview of the study and the arrangement of the thesis. • The problem statement on the current challenges related to the state of non-compliance with the health and safety strategies in the SA mining industry with a high rate of accidents, injury, and fatalities. • Research questions and the objectives of the study • Methodology (qualitative and quantitative strand), population and sampling, data collection, data analysis, measures to ensure trustworthiness, validity, reliability, and the study's significance.
Chapter 2: Literature review	• Expands on the reviewed literature related to the title of the study and the theoretical framework which guided the study. • Included the methodology which was used to review the literature which was used to analyse the state of compliance in the SA mining industry and the steps which were followed. • The following themes emerged from the reviewed literature: Global laws, legislation, and standards on health and safety compliance within the mining industry; the state of compliance with the health and safety legislation in the African mining industry. Compliance with health and safety legislation in the south African mining industry; negative outcomes of non-

	compliance; adopting a broader health and safety management strategy and strategies to improve the health and safety of mineworkers.
Chapter 3: Theoretical framework	• The theoretical framework which guided this study. Who healthy framework model and the modalities that guide health and safety judgments, decisions, and actions are outlined.
Chapter4: Research Methodology	• Summary of the research methodology which was used in the current study. The chapter was arranged as the research paradigm, research design, study setting, pilot study, qualitative strand, measures to ensure trustworthiness, quantitative strand, validity and reliability, and ethical considerations were also discussed.
Chapter 5: Presentation of the results	• The chapter discusses in detail the results of phase 1 of the study, which is the situational analysis. The objective of phase 1 (qualitative strand was to explore and describe miners and organizational practices related to compliance with health and safety standards in the mining industry. Furthermore, the OHNP, members of H & S team (safety officers and safety representatives) perspectives regarding compliance with health and safety standards of employees and organizations in the selected mining industries were also explored. These objectives were achieved through in-depth one-on-one interviews using an interview guide and through a questionnaire in the quantitative phase
Chapter 6: Integrations and interpretation of the results	• The chapter focuses on interpretation and integrating the qualitative and quantitative results. This chapter also interprets the integrated results of the WHO healthy framework model, which guided this study.
Chapter 7: Development of the strategies and validation of the strategies	• The development of the strategies was guided by the findings of both quantitative and qualitative phases and the World Health Organization Healthy Workplace Framework, and the cultural transformation model. The researcher also referred to the

	current legislation (MHSA, OSHA, and guidelines to develop current strategies.
Chapter 8: Summary, Conclusion, and Recommendations	• The summary of the research findings, the proposed recommendations that can be applied by different stakeholders to enhance compliance with the health and safety strategies. The study limitations and conclusions that were drawn from the theories and literature are outlined.

CHAPTER 2

LITERATURE REVIEW

Chapter 1 outlined a brief overview of the study and how the chapters were organized. This chapter presents the literature that the researcher reviewed to understand what was already known about the title. The chapter is divided into four sections, namely: introduction, aims and objectives, material and methodology, and chapter summary.

2.1. INTRODUCTION

The mining sector is classified as the most dangerous work and customarily ranks within the top 3 three occupations related to diseases and fatal accidents (Smith, Ali, Bofinge & Collins, 2016; Kane-Berman, 2017; Beth, 2018). The complete health of the miners includes physical, social, and psychological protection from injury and any occupational disease (Qasim, Bashir, Anees, Ghani, Khalid, Hanan, & Malik, 2014). At the same time, safety is associated with the physical mining environment and interventions done to reduce exposure to risk (Qasim et al., 2014). Within the context of this review, the authors are concerned that if mining remains unsafe, how can occupational health practitioners improve and make sure a healthy and safe workplace? Smith et al. (2017) highlighted the necessity for mining corporations to accommodate international and national safety and health laws. Still, there's a requirement to implement preventative strategies to accommodate those standards and laws and ensure compliance.

In Africa, though several African states have comprehensive laws regarding health and safety standards and hours of labour, systems to make sure compliance - their observance is usually weak and under-resourced in several organizations (Mustapha, Aigbavboa & Thwala**,** 2015; Kheni & Braimah, 2014). According to Bocoum (2016), a lot is still toned to be done to carry mining practices. Policies, regulatory capacity, and services associated with mine health need to be massively progressed, with a setup of a standardized carrier shipping model domestically and nationally (Bocoum, 2016; African Union, 2009).

The SA mine health and safety council have introduced pointers for compliance with the Mine Health and Safety Act (29 of 1996). However, the high rate of sub-standard performance has shown that accessible rules and policies have not led to the anticipated result (Kleyn, & du Plessis, 2016). Positively safety rules are necessary to form a healthy and safe work atmosphere, but it is significant to explore the social relations within the employment context (organization), the individual factors (beliefs, attitudes, and behaviour), and also the cultural processes that contribute to non-compliance with health and safety standards of the mining trade (Vassem et al., 2017). Given these gaps, there is an obligation to identify how to enhance compliance with health and safety standards. Muchiri (2009) emphasized the necessity and the duty for the occupational health and safety professionals, employers, workers, agencies, and alternative stakeholders to perpetually develop and implement multi-faceted OSH ways. Within the context of this review, compliance shall refer to the staff's proper practice and the organization following the health and safety standards within the mining industry (Vassem et al., 2017).

2.2. AIM AND OBJECTIVES OF LITERATURE REVIEW

This review aims to analyze the present state of compliance within the South African Mining industry's health and safety regulations/standards and highlight the importance of implementing preventative strategies through the occupational health clinic. The review provides insights about the improvement of the part of health and safety legislation standards. In addition, this review intends to create clear links between the studies and also the health and safety legislation activities. It will make conclusions, confirm any controversies, weaknesses, and gaps about compliance in the mining industry and generate information on the world strategies that may be used to enhance compliance and make proper health and safety atmosphere within the mining industry. This review adds worth to existing electronic databases through the integration of analysis results.

2.3. MATERIAL AND METHODOLOGY

The review adopted the systematic review technique that enabled the reviewers to discover and investigate the evidence of qualitative and quantitative research, government and private documentation, and also the laws bearing on occupational health and safety compliance. The subsequent systematic steps as outlined by Ramdhani, Ramdhani, and Amin (2014) were applied to cut back literature-review errors and bias and to supply a clear, structured, and comprehensive summary of the obtainable literature. The adopted steps are presented in Figure 3.1 as suggested by Ramdhani et al. (2014) and Hempel, Xenakis and Danz (2016).

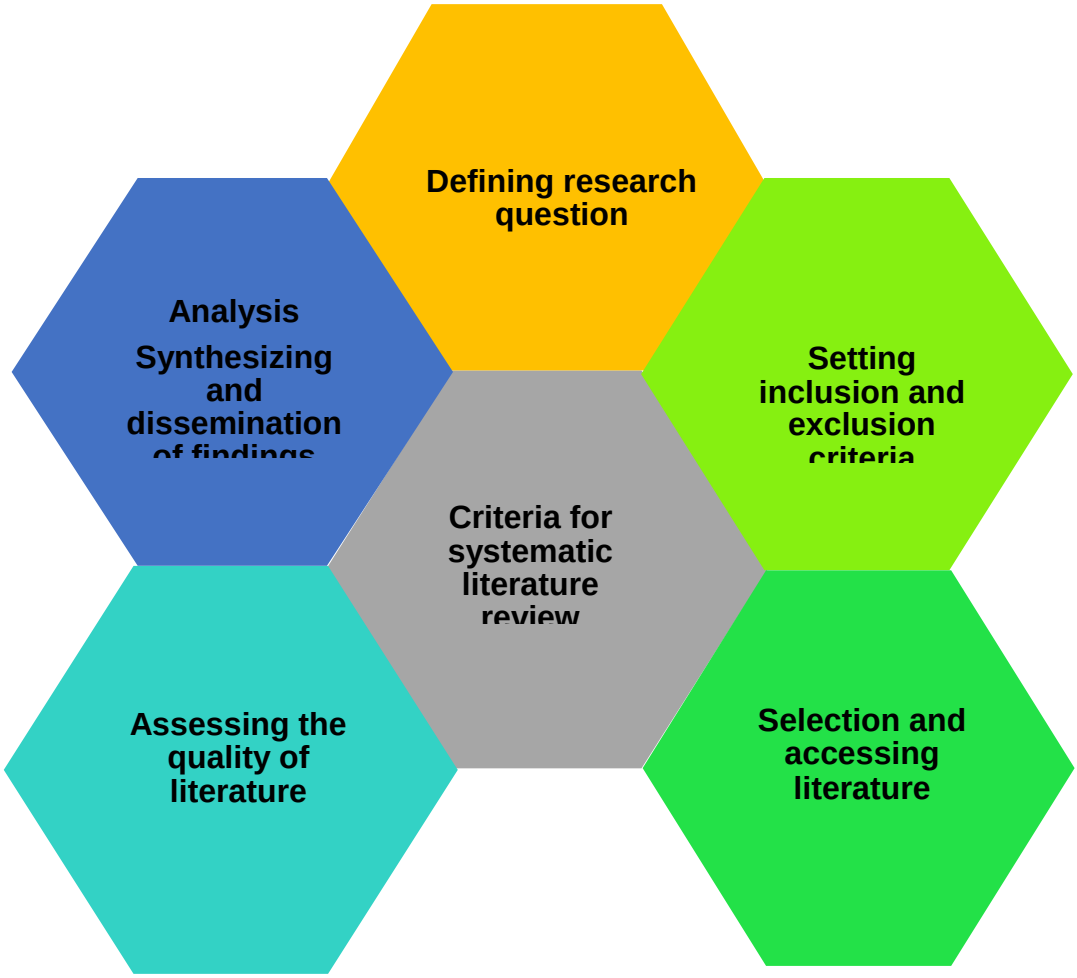


Figure 3.1*:* Systematic review steps adopted from (Hempel, Xenakis & Danz, 2016; Ramdhani et al., 2014).

Step 1: Defining the research question.

According to Hempel, Xenakis, and Danz (2016), it's necessary to outline the inquiries to be addressed in occupational safety and health systematic review to identify the aim and scope of the review. Additionally, forming inquiries can orientate the reader about the information looked up in the review. The researcher provides an orientation to the reader by defining and examining the research question. The examination of a research question was illustrated through the conversation with the supervisor and co-supervisor, meeting with the occupational health specialists to affirm that the audit has significance to genuine difficulties. The examination question was: What is the current situation with compliance to the health and safety guidelines /principles among the SA mining exchange. What are the procedures to be created to affirm compliance of the health and safety enactment/norms among the SA mining industry?

Step 2: Setting for inclusion and exclusion criteria.

Shamseer, Moher Clarke, et al.(2015) laid out that setting for incorporation and prohibition measures guarantees that the survey is led in a coordinated manner. Also, it accommodates the straightforwardness of how the qualities and restrictions were surveyed. Furthermore, the conceptual model in the current study guided the researcher through the review to explore the defined study question. The PICO (Population, Intervention, Comparison, and Outcome) format was followed to guide concept mapping (Aslam & Emmanuel, 2010). The conceptual model defined the population, which was the mining occupational health practitioners, safety representatives, occupational health clinics, miners, the mining organizational and the mining management, interventions, in this case, was the legislation, standards, and the preventative strategies that guide the employees to comply with the health and safety.

Table 2.1: Key Search terms

Occupational health and safety-related search terms	Mining health Medical surveillance, Mining safety, Occupational health, Safety behaviour Safety culture
Health and safety compliance search terms	Adherence Legislations
Occupational health search terms	Occupational health practitioners, Health and safety representatives, Occupational diseases, Occupational injury, Accidents, Safety culture
Mining health strategies related to search terms	Prevention levels, Occupational health interventions

Step 3: Conduct a literature search.

The online database literature search enclosed a mixture of South African and international government OHS legislation, policies, standards, reports from the labour departments and international labour workplace, the qualitative, quantitative, and mixed-methods scientific journal articles, and conference proceedings. Seven databases are enclosed PUBMED, EBSCOHOST, SEMATIC SCHOLAR, GOOGLE SCHOLAR, domain EDU, SAFE WORK AUSTRALIA. Gray literature, including conference proceedings, dissertations, theses, government information, and committee

reports, was retrieved from searches in the web of SCIENCE, ILO, WHO. HSELINE, NIOSHTIC, and from OSH UPDATE.

The search strategy adopted Boolean operators combined sets of keywords, using AND/OR terms to select articles and reports (Coughlan, Cronin & Ryan, 2013). The terms from the subsequent seven categories were accustomed to search the articles and grey literature (Prevention, Compliance, Health and Safety, Occupational Health Practitioner, Standards, Legislation, and Mining Industries) as listed in Table 2.1 above. To ensure quality review, all enclosed articles, and reports obtained when databases were integrated, were scrutinised to remove duplicate articles while providing identified extra articles by content from the specialists. Secondary sources, including textbooks and review articles and descriptions by someone aside from the first investigator, were removed (Coughlan et al., 2013).

The researcher reviewed only studies published between 1994 to July 2021 within the English peer-reviewed journal, report, or websites were reviewed to identify gaps within the compliance of the health and safety within the mining industry. Moreover, abstracts were not solely enclosed. The studies enclosed explored the compliance on Health and Safety and the preventative strategies for health and safety within the mining industry. In addition, the studies that reported on the present state of compliance with the health and safety legislation and standards, the role of occupational health clinics and practitioners in promoting health and safety within the mining industry, and also the occupational interventions/strategies to reinforce the compliance were reviewed as well.

Step 4: Analyse, synthesize and disseminate the findings.

The studies which have been protected were clustered and prepared by using ideas, which emerged as themes. To offer enough substance to a topic, standards from at least three articles had been required. Five thematic domains emerged from the literature. The following six thematic domains emerged from the literature: Global laws, legislation, and standards on health and safety compliance within the mining industry; African countries mining health and safety compliance literature; health and safety compliance literature within the South African mining industry; Legislations;

preventative strategies to improve the health and safety compliance within the mining industry and occupational health practitioners role in improving health and safety standards compliance. Figure 2.2 present the processes which were followed during the review process.

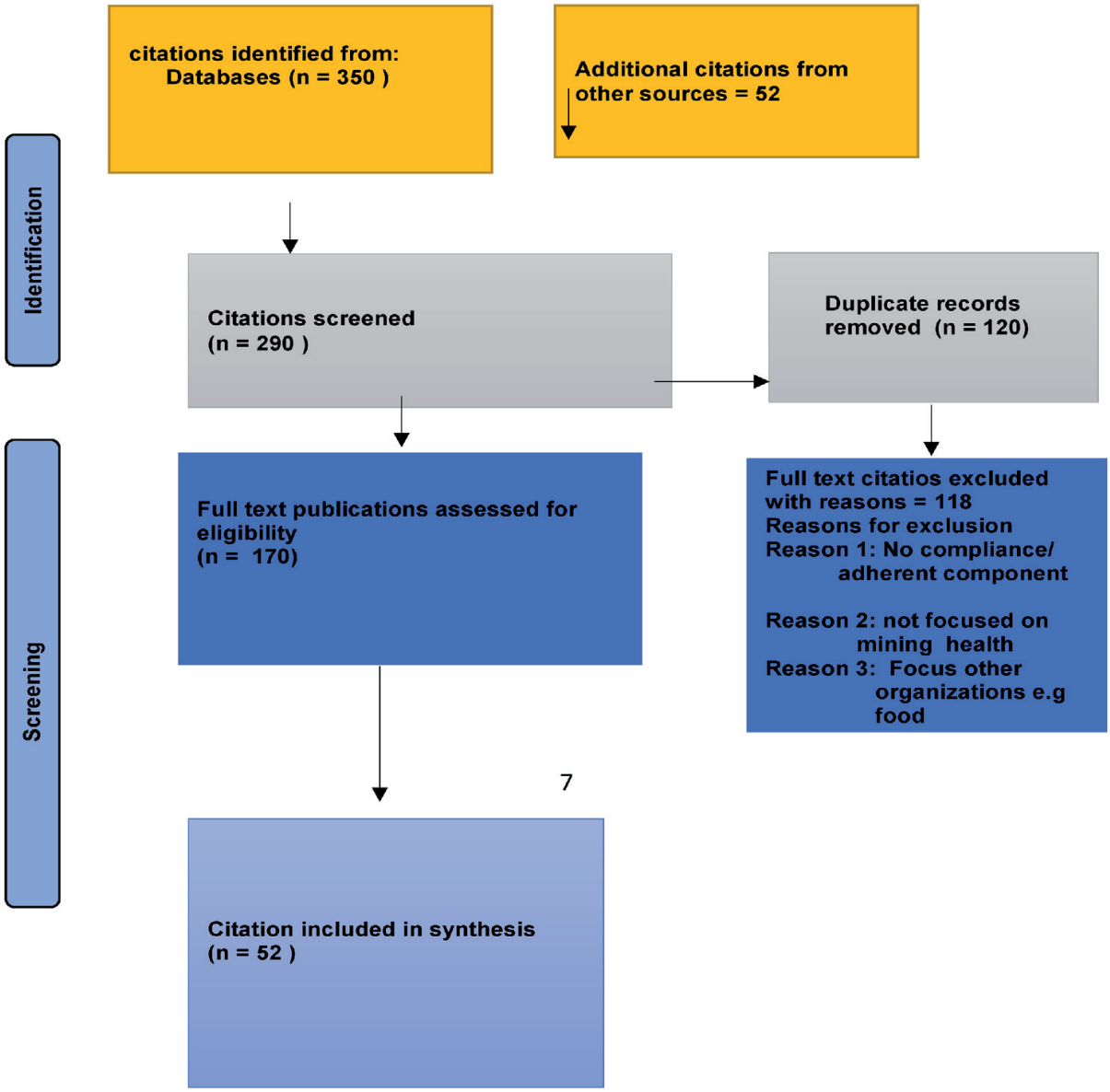


Figure 2.2: Prisma flow diagram for the scoping review process

Theme 1: Occupational health and safety compliance in mining

Health and Safety compliance is the volume to which personnel adheres to health and safety standards, techniques, jail responsibilities, and wishes. Furthermore, it

accomplice diploma absence of injuries and incidents within the geographic component (Kleyn & Du-plessis, 2016). The majority of mine fitness and safety government international agree that the fundamental causes of mine accidents and fatalities are dangerous conditions, terrible control, and mainly non-compliance with the health and protection standards (Kleyn & du Plessis, 2016). Vassem et al. (2017) documented that the excessive incidence charge of accidents inside the mining enterprise calls for immediate intervention. For example, the information of interpersonal family members within the employment context (corporation) and the individual factors (beliefs, attitudes, and behaviour) that contribute to non-compliance to health and safety standards within the mining industry (Vassem et al., 2017) could be significant. On the opposite hand, the venture with the implementation of occupational legislation and requirements is that miners' understanding of occupational regulation is confined and adherence is, as a result, impaired (Mogale, & Mogotlane, 2018). Therefore, to ensure that compliance with fitness and safety requirements is adhered to, the occupational health practitioners must increase cognizance of health risks that impact the people's health and safety, as well as the measures that can mitigate the dangers (Michell, 2011).

The SA mining industry is under the spotlight with increased accidents and fatalities. In 2019 SA reported a total of 2406 injuries and 51 deaths in the mining industry (Minister Gwede Mantashe Mine Health and Safety statistics, 2019). This is a serious concern considering that In 2016, the chamber of mines signed a declaration of actions pledge as a change to improve the mining industry occupational health and safety to zero harm by 2024, aiming to generate a culture change in an industry that will transform the behaviour of people at all levels (Chamber of mines, 2016).

Theme 2: Global laws, legislation, and standards on health and safety compliance within the mining industry

Occupational health and safety standards play an important role in guiding all the miners on health and safety-related issues, focusing more on prevention. However, though there are available standards, injuries and occupational diseases remain a challenge worldwide. The literature revealed that globally in every 15 seconds, a miner dies (Hatting & Acutt, 2016; Pilusa & Mogotlane, 2018). World Health Organization (WHO) outlined occupational health and safety as 'the advancement and maintenance

of the most significant level of physical, mental and social health of miners in all occupations by preventing health risks and controlling danger and the adaption of work to miners and their positions (Mogale & Mogotlane, 2018). Furthermore, it is of utmost importance to note that a safe and healthy working environment influences the quality of life at the individual level to substantial impacts on public health at the societal level (Mogale & Mogotlane, 2018).

Globally, the health and safety of the miners have raised serious concerns. In the United States (US), the former chief executive director of the upper big branch coal mine was sentenced to a year in prison for the death of 38 miners who were killed after a coal explosion related to non-compliance (Wagner, 2016). He was convicted for a workplace safety violation by putting profits of the company ahead of the safety of miners and creating a culture of non-compliance within the organization (Wagner, 2016). Dragan, Georges, and Mustafa's (2017) study in Canada indicated that cultural factors within the organization, especially from the management focusing on performance and efficiency and neglecting safety, plays a key role in creating conditions for triggering major accidents (Dragan, Georges & Mustafa's, 2017). More particularly from the administration with more emphasis on the execution and productivity and dismissing the safety and wellbeing of miners.

Different countries have laws and regulations in place at the workplace to protect the health and safety of individuals in their occupations. Occupational health and safety laws across nations share many similarities highlighting that the health and safety of employees must be secured through the assessment, analysis, adjustment, and reducing the risks and hazards for illness and injury at the workplace (Mojapelo, & Kok, 2017); Luchini, & London, 2014). Occupational health and safety compliance shapes the required behaviour in the workplace. Furthermore, compliance is linked to the safety culture in the organization, which is believed to shape employee behaviour through expectations (Lingard, Blismas & Cooke, 2011).

Statute law may uphold extra obligations, start explicit obligations, and structure government bodies with the power to direct work environment wellbeing and medical problems. Reinforcing the wellbeing controller is required to uphold the authoritative approaches (Mabika, 2018; Spada & Burgherr, 2016). Such drives can save the

existence of mine accidents and occupational diseases in both developed and undeveloped countries (Spada & Burgherr, 2016). United Kingdom (UK) is one of the created nations with a fruitful record of the mine's well-being and safety practices. As indicated by Uyanusta Kucuk and Ilgaz, wellbeing and safety laws in the UK have been in existence for more than 200 years (Uyanusta Kucuk & Ilgaz, 2015).
Moreover, the laws came because of political reactions to social issues emerging from the unsettling influences of the industrial revolution (Uyanusta et al., 2015). Among other enactments, the mines and safety act 1954 was the broadest safety enactment in the UK. The demonstration set down legal obligations on mine chiefs and offered.

Theme 3: African countries mining health and safety compliance literature

Helpless coordination of health and safety standards, absence, and unwanted degree of consistency with significant H&S enactment is a serious subject that needs extensive consideration (Kheni & Braimah 2015; Mustapha, Aigbavboa & Thwala, 2014). The greater part of the African nations is known for deprived safety and health practices (Baum, Sanders, Fisher & Anaf, 2016). Quilan (2015) noted that low-pay nations in Africa and Asia have recorded raised paces of injuries and fatalities contrasted with created nations related to low compliance of safety standards. At the same time, it has been assessed that 54000 fatalities related to occupational accidents happen in Sub-saharan Africa yearly compared to the 16000 fatalities in Europe and America. Boniface, Maseru, Munthali, and Lett (2013) study results on occupational injuries and fatalities in Tanzania highlighted the requirement for improving health and safety principles systems in the mines.

Theme 4: Health and safety compliance literature within the South African mining industry

The South African mining industry does not have a good reputation for health and safety due to recurrent accidents and fatalities. One of the largest mining companies in SA with a major interest in both platinum and gold mining (Sibanye) outlined that one of the causes of fatalities was non-compliance by miners and management as people try to take shortcuts (Casey, 2019; Kane-Berman, 2017). On the contrary, the union representatives within the mining industry blame the high pressure to reach

production targets which contributes to miners remaining unsafe (Kheni & Braimah, 2014).

The South African mining Act, 1996 (Act 29 of 1996) was endorsed to improve health and safety performance, and great emphasis was placed on adherence to mine standards. Furthermore, different types of legislation were passed to assist in the transformation, and these include; “improvement of the safety standards in the mining sector, among others, the Skills Development Act of 1998 (SDA), Broad-Based Black Economic Empowerment Act, 2013 (BBEEA), (Minerals Petroleum Resources and Development Amendment Bill 2013 (MPRDAB), Compensation for Occupational Injuries and Diseases Act, 1997 (COIDA), Occupational Diseases in Mines and Works Amendment Act, 2002 (ODMWAA), Labour Relations Act, 1996 (LRA), Basic Conditions of Employment Act of 1997, Mining Charter 2010, and the Constitution of the Republic of South Africa, 1996”.

The Society for Mining, Metallurgy, and Exploration (SME) Mining Engineering Handbook expresses that all mining tasks must adhere to local, provincial, and governmental guidelines that indicate mine health and safety guidelines and norms, environmental protection, and work relations. The nature, degree, and toughness of these guidelines, at last, administer the mining activity (Guild, Ehrlich, Johnston & Ross, 2001).

Lack of emphasis on the promotion of health of mine-workers made the Commission endorse and improve the state of the safety standards in the mining sector. Among others, the enactment of a new Mine Health and Safety Act 29 of 1996 (hereinafter referred to as MHSA). The Act (MHSA) has established a council known as the Mine Health and Safety Council (MHSC), which contemplates the status of health and safety in the mining sector, recommends policy and legislation, commission’s research, and offers useful advice to the Minister of Mineral Resources.

The Department of mineral resources and energy South Africa is responsible for promoting and regulating the minerals and mining sector in SA. Furthermore, the Department also has the responsibility to ensure that all the mining companies in SA follow and comply with the health and safety legislation. They also have an obligatory role in taking action when the mining companies do not implement and comply with

the regulations. Laws and standards. The mineral resource department can close/terminate the mining activities or take the mining companies to the Court of Justice if they fail to comply. The following regulations guide all the mines in SA on health and safety.

- **Mine health and safety act (MHSA, ACT NO 29 OF 1996)**

The MHSA regulates the mining sector, focusing on the health requirements in the mining industry.

- **Objectives of the Act**

The goals of this act are to accommodate the wellbeing of the workers and different people at mines: support consistent with the standards of health and safety; take into account the execution of health and safety measures; accommodate suitable frameworks of the employee, employer, and state participation in health and safety matters; build up three-sided delegate organizations to audit enactment, advance wellbeing and upgrade appropriately designated research; accommodate compelling observing frameworks and assessments, to guarantee that there are examinations and requests to develop health and safety further; advance preparing and HR improvement; manage businesses' and workers' obligations to recognize hazards and prevent, control and limit the danger to health and safety; settle in the option to decline to work in hazardous conditions, and to offer impact to the public worldwide law commitments of the Republic identifying with mining health and safety (South Africa, 1996).

- **The role of the occupational medical practitioner (OMP) in ensuring the health and safety of employees in the mine**

Section 13 of MHSA outlines the legal requirement for all the mining organizations in SA to have an OMP, either full-time or part-time. The OMP has legal duties and ethical duties when ensuring the overall health of the miners (Hatting & Acutt, 2016; South Africa, 1996; Guild et al., 2001). They play a major role in preventative medicine, determining the fitness and ensuring that every person in the mine (both the employer

and the miners undergo medical surveillance. Medical surveillance is a scheduled program that includes medical examinations, conducting different tests depending on the miner's job, including audiometry, spirometry, and vision screening. The purpose of medical surveillance is to ensure that all the miners are fit to perform their duties without endangering their health and safety.

Medical problems that may arise due to workplace exposure are also identified (Hatting & Acutt, 2016; South Africa, 1996). The occupational medical practitioner must ensure that the medical surveillance must be suitable and be planned in such a way that it affords the miners to gain knowledge that can be used to the information that employees can use to eradicate, govern and reduce risks and hazards related to health and safety (Hatting & Acutt, 2016; Guild et al., 2001). This is achieved through continuous health education providing information to the miners relaxed to their medical results, e.g. education related to audiometric test results on hearing loss. Medical surveillance includes the following types of medical examinations:

• Pre-placement/baseline medical examination

It is a legal requirement for all mining organizations to conduct a pre-placement examination before the miner can be appointed and placed in a job. The examination assists in assessing the miner’s suitability for the position applied and the work environment To be exposed to. More importantly, pre-employment is also done to ensure the safety of the miners and others, ensuring that the new employee does not pose a risk (Hatting & Acutt, 2016).

- **Periodic medical examination**

This examination is done every year or six months, depending on the miner's risk. The examination also did if the exposure risk increases or deterioration is noted in the test results when the miner is transferred from one department to another after being involved in a serious injury or sickness (Hatting & Acutt, 2016).

• **Exit medical examination**

This examination is performed before the miners leave their current employment. It s a legal requirement for the miners to produce their exit fitness certificate to their new

employer. The exit medical examination safeguards the organization against future medical claims. The records are kept for 40 years (Hatting & Acutt, 2016).

- **The occupational health and safety act (OHS act No 85 of 1993) was amended by the occupational health and safety amendment Act (OHS act NO 181 of 1993).**

- **The objective of the act**

The target of the demonstration is to accommodate the wellbeing and safety of miners at work, particularly regarding the utilization of apparatus (South Africa,1993). Moreover, the Act accommodates the safety of miners against dangers to wellbeing and safety emerging from or regarding the exercises of people at work. This act recognized settled an advisory council on occupational and safety (South Africa,1993).

- **The role of health and safety representatives in ensuring compliance**

All the mines must appoint a health and safety team, including health and safety representatives, where there are 20 or more employees. Whereas if the mine has 100 or more miners, the health and safety committee should be established. The health and safety representatives have the following major roles to play in ensuring the safety of the miners:

• Review health and safety measures whether they are effective or not
• Identifying possible hazards and the occurrence of incidents
• They represent all the miners concerning health and safety and investigate all the complaints related to the safety of miners.
• They do workplace inspections to identify potential health and safety risks
• They participate in the inspection of the mine by the inspectors and provide safety-related information when needed.
• They form part of the health and safety committee and participate in the internal health and safety audit.
• They also investigate health and safety accidents (Hatting & Acutt, 2016); South Africa, 1993).

- **Occupational health practitioners role in health and safety standards compliance**

According to the Mine Health and Act (29 of 1996), all organizations must employ a practitioner who is in the position of qualification in occupational medicine recognized by the Interim National Medical and Dental Council of South Africa or the South African Interim Nursing Council (Guild, Ehrlich, Johnston & Ross, 2001). The occupational health practitioners are the largest single group of the multidisciplinary health care team at the workplace. Therefore, OHN is the frontline in protecting and promoting the health of the working population.

The occupational health practitioner is gifted in injury or diseases preventative skills and interventions. The OHP might recognize the requirement for, survey, and plan mediations to alter working conditions, frameworks of work, or change working practices to decrease the danger of exposure to hazards (WHO, 2001). Moreover, OHP experts are skilled in thinking about factors like human conduct and habits about real working practices. They additionally team up in the origination, and rectification of work factors, decision, and quality of protective equipment, protection of miners from injury and illnesses, just as giving guidance in issues concerning the assurance of the climate (Hatting & Acutt, 2016; WHO, 2001). The OHP is in a close relationship with the workers and is involved with the management. They are in a decent situation to distinguish early changes in unsafe working practices, recognize miners challenges over health and safety, and present these to management in an independent objective manner can be the catalyst for changes in the workplace that lead to primary prevention by presenting these to the executives in a free target way can be the motivation for changes in the work environment that lead to essential counteraction (WHO, 2001).

The occupational health professionals inform on a wide reach concerning medical problems, and especially on their relationship to working capacity, wellbeing, and safety at work or where alterations to the work or workspace can be made to assess the changing wellbeing status of representatives (Hatting & Acutt, 2016). In many regards, organizations are not exclusively worried about just those conditions that are

straightforwardly brought about work. However, they need occupational health professionals to assist with attending to any wellbeing related issues that might emerge that may impact the miner's participation or execution at work, and numerous representatives like this degree of help being given to them at the work environment since it is so advantageous for them (Boniface et al., 2013). Specifically, the improvement of medical care administrations for miners at the workplace. With regards to this survey, the OHP plays a significant part in guaranteeing the health and safety of the miners through primary, secondary, and tertiary avoidance (WHO, 2001)

Theme 5: Health and Safety preventative strategies

Different scholars have acknowledged that there is a gap in the literature on the management of compliance with the health and safety strategy. Moreover, scholars have also raised a concern that the impact of legal non-compliance is even more scarce in the literature (Salguero-Caparrós, Pardo-Ferreira, Martínez-Rojas, Rubio-Romero 2020). Previous research done by Tibane and Niemand (2017) on challenges experienced by employees relating to safety compliance emphasized the importance of the development of strategies to reduce safety threats caused by poor compliance as a result of unsafe acts. It is therefore questionable that besides the availability of safety regulations and the miners being aware of the dangers, what could be the rationale behind poor compliance with the health and safety standards (Masia & Pienaar, 2011; Shivambu, 2017).

The strategies are aimed at preventive and treatment mediations. Precaution mediations are typically presented to every one of the excavators helping them to take on well-being conduct and sound way of life unconstrained and without incidental effects fuming them to search for help. On the other hand, Bagherpour et al. (2015) argue that preventive strategies need to be applied before the incidents, but preparative adjustments must be implemented both before and after the occurrence. Preventive interventions, accordingly, are named as a primary, secondary, or tertiary counteraction. Preventative strategies are normally offered to all the miners assisting them to adopt a safe behaviour and healthy lifestyle spontaneous and without side effects seething them to look for help. More importantly, the literature revealed that compliance with health and safety law involves the development and implementation

of an effective health and safety preventative system and building a positive health and safety culture at work (Smith, Morrow & Ross, 2015). Preventive mediations, thusly, are named as primary, secondary, or tertiary prevention (Smith et al., 2015).

- **Primary preventive strategies**

In occupational health primary, preventative strategies are aimed at eradicating risks and exposures at the workplace before they occur. This level of prevention is important because the effect has not yet occurred the extent of the risk is visible (Lowry, 2011). In the occupational health clinic, primary prevention focuses on health promotion and protection within the context of a safe and healthy work environment (Hatting & Acutt, 2016). This is achieved through continuous health education, conducting medical surveillance, and monitoring of chronic diseases, thereby enhancing employees' morale and maintaining optimal health. However, in the mining sector, the following health promotion programs are essential to promote good health and to prevent occurrences of accidents and diseases, this may include such elements as continuous health education on health and safety-related topics such as noise-induced hearing loss, chronic disease monitoring, and management, accident prevention, the importance of personal protective equipment's, medical surveillance to identify and prevent the occurrences of health-related illnesses that might be caused by the work environment. Part of primary prevention is the assessment of health risks, this is achieved through continuous inspection by the occupational health practitioners and the safety team to identify and observe the work environment and working practices that might put the miner's health at risk (Usrey, 2017; WHO, 2001).

More importantly, the health promotion activities have the potential to change the miner's health practices, such as choice of a healthy diet, exercising more frequently to prevent occurrences of chronic diseases. Additionally, the primary prevention activities have the potential to reduce the incidence of injuries and accidents because miners will be having more knowledge on health-related risks that might endanger their lives. Implementing an educational and training programme in the mine with a specific focus on creating a culture of safety among miners and more focus on safe working conditions can help overcome the challenges of non-compliance (Smith, 2015). Moreover, since the mining environment is considered hazardous, all mining

organization needs to conduct medical surveillance as a primary preventative strategy as stipulated by the Mine Health and Safety Act (29 of 1996). The medical surveillance is done before employment, annually or bi-annually, and when the miner leaves the company, this is done according to the exposure levels in a different occupation, and remedial actions are initiated based on the fitness status.

- **Secondary prevention**

In secondary prevention, the main aim of occupational health is to diminish the impact of sickness or injury that has effectively occurred (WHO, 2001). Additionally, this level of prevention emphasizes reinforcement and decreases the reaction to the occupational disease or illness caused by the mining environment, thereby intensifying resistance through the provision of treatment (Lowry, 2011). This is achieved by distinguishing and regarding illness or injury at the earliest opportunity to end or slow its progression, encouraging safety strategies to prevent re-injury or recurrence, and implementing programs to return people to their original health and function to prevent long-term problems (Smith, 2015). The secondary interventions include a regular medical examination and screening tests such as audiometry, spirometry, and vision screening. During the screening process, once the deterioration is identified, further interventions such as referral to the specialist and recommendations for the removal of a miner to the occupation, which will not have a further effect on the identified problem, are done. The chronic disease management program also forms part of the primary prevention strategy by constantly monitoring compliance through blood pressure and blood glucose monitoring to ensure compliance. Moreover, secondary prevention also included the advocacy to place a miner in a suitably modified work so injured or ill workers can return safely to their jobs (Smith, 2015).

- **Tertiary prevention**

In occupational health, tertiary anticipation intends to diminish the effect of a continuous sickness or injury that has enduring impacts. This is finished by assisting individuals with overseeing long-haul, frequently complex medical issues and injury (for example, ongoing sicknesses, long-lasting impedances) to work on however much

as could reasonably be expected their capacity to work, their satisfaction, and their future (Smith, 2015). Secondary prevention activities in the mining environment include a Hearing conservation program to support and rehabilitate those who have already lost their hearing due to noise exposure. These activities include modification of personal protective equipment, job placement to a less noisy area zone. The miners are also referred to different specialists such as the audiologist, occupational speech therapy for rehabilitation purposes. This assists the miners in adapting to new jobs and also in their changed health status so that they can cope.

2.4. CHAPTER SUMMARY

This chapter included the methodology which was used to review the literature and the steps which were followed. The following themes emerged from the reviewed literature: Occupational health and safety compliance in mining; Global laws, legislation, and standards on health and safety compliance within the mining industry; African countries mining health and safety compliance literature; Health and safety compliance literature within the South African mining industry and Health and Safety preventative strategies were presented.

CHAPTER 3

THEORETICAL FRAMEWORK

3.1 INTRODUCTION

The previous chapter discussed the reviewed literature to understand what is already known about the topic. This chapter will outline the theoretical framework which guided the study. The study was guided by the World Health Organization Healthy Workplace Framework and the Cultural Transformation Framework.

A theoretical framework guides the research path and offers the foundation for establishing its credibility (Adom, Hussein & Agyem, 2018). Additionally, the theoretical framework serves as the research's focus and is linked to the research problem under study. Moreover, the theoretical framework assists the researcher in considering alternative theories that might challenge their perspective, thereby enriching the study's strengths (Adom et al., 2018). The World Health Organization (WHO) Healthy Workplace Framework model and the Cultural Transformation Framework guided this study.

3.2. THE RATIONALE FOR THE ADOPTION OF TWO FRAMEWORKS TO SUPPORT THE STUDY

The study was guided by the WHO Healthy Framework and the Cultural Transformation Framework, and both frameworks emphasize the importance of the mining organizations to create a safe and healthy workplace. However though both frameworks are focused on ensuring health and safety, the application of both framework concepts enabled the researcher to build arguments in the study. For example, the WHO healthy framework outlines the value of the employer in ensuring that the mining environment is safe and healthy. At the same time, the cultural framework maintains that a healthy workplace can be maintained by developing activities that will transform the mind-set of the miners always to be safety alert, thereby creating a safety culture in the workplace. The two frameworks complemented each other and enabled the researcher to build an argument, discuss the findings, and also develop strategies.

3.3. WORLD HEALTH ORGANIZATION HEALTHY WORKPLACE FRAMEWORK MODEL.

The WHO healthy framework model was developed by the WHO occupational health and/or safety professionals, scientists, and medical practitioners, to provide the scientific basis for a healthy workplace framework (Burton, 2010). The model stresses the importance of the interrelationships between work, health, and miners and interventions in workplaces that can make a positive difference in both the health and wellbeing of workers and the productivity of the mining organization (Burton, 2010). Since the study's objective was to develop and validate strategies to enhance compliance with health and safety in the mining industry, the researcher adopted a WHO healthy framework to guide the study. The adoption of this framework directed the researcher in recognizing the practices, conduct, insights, social qualities, and difficulties experienced in accomplishing health and safety consistency. Moreover, the system directed the exploration interaction, organizing, and planning data collection.

3.3.1. WHAT IS A HEALTHY WORKPLACE?

A healthy workplace is an environment in which the miners and managers collaborate to use a continual improvement process to protect and promote the health, safety, and wellbeing of all employees (WHO, 2010). In the context of this study, a healthy workplace refers to a mining environment that aims to continuously improve and protect the health, safety, and wellbeing of all the miners through compliance with the health and safety standards. This reflects that occupational health practitioners are responsible for collaborating with the management and miners to ensure a healthy workplace. This is done through identification, conception, and correction of health and safety issues, choice of individual protective equipment, prevention of industrial injuries and diseases, and providing advice in matters concerning the protection of the environment (Burton, 2010).

The model suggests the importance of mining organizations to create a healthy workplace. How can this be achieved? Through the collaborative examination of all the components creating unsafe workplaces and accidents due to non-compliance

with the health and safety standards. Additionally, the model explicitly focuses on the close interrelationships of the production, miners' health and safety, the organizational and legal costs, behaviour and practices, factors influencing compliance by religion, politics, economics, worldview, environment, cultural values, experiences, language, gender, and others, more importantly, miners health and safety (Burton, 2010).

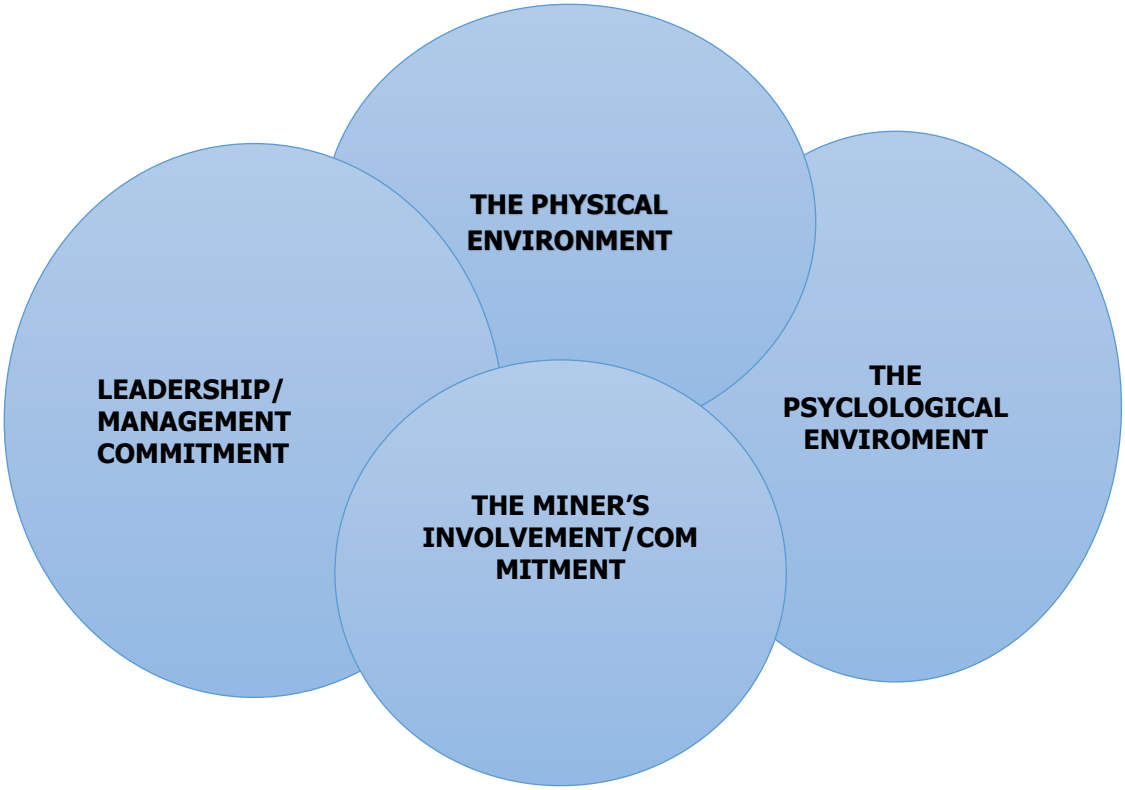


Figure 3.1*:* Four avenues of the healthy workplace model adopted from Burton (2010)

3.3.2. FOUR AVENUES OF THE HEALTHY WORKPLACE MODEL

The WHO healthy framework recognizes the following four avenues of impact' that ought to be thought of and addressed by associations to establish a workplace that advances, upholds, and ensures the psychological, physical, and social prosperity of the miners: The physical mining environment, psychosocial work environment, The miner's involvement/commitment with their work and safety compliance and leadership/management commitment (Burton, 2010).

3.3.2.1. The physical mining environment

Mining is categorized as the most dangerous work environment, which involves both mechanical and chemical processes. Miners are exposed to various gases, substances, and chemicals that might be dangerous to their health. Furthermore, the environment is confined to poor ventilation. Exposure to all these hazards can affect the physical or mental safety, health, and well-being of workers also cause long-term physical injury and illness (Smith, 2013; Burton, 2010). Occupational hazards damage workers and adversely affect business activities by loss of revenue and rising operational costs (Leitão & Greiner, 2016; Yilmaz & Alp, 2016). The WHO healthy model will guide the study in identifying the environmental factors contributing to non-compliance which results in accidents, injuries, and occupational diseases. According to the Occupational Health and Safety Act, no 85 of 1993, the hazards in the workplace must be recognized, assessed and controlled through a hierarchy of controls that includes elimination or substitution, engineering controls, administrative controls, and personal protective equipment.

3.3.2.2. The psychosocial work environment

According to the WHO healthy framework model, a psychosocial environment refers to the mining organization's culture, attitudes, values, beliefs, and practices for ensuring safety workplace (Burton, 2010). Anger, Elliot, Bodner, Olson, Rohlman, Truxillo, and Montgomery (2015) outlined that miners' mental health status coupled with trust and responsibility can lead to successful occupational safety and health system. The mining industry is a hazardous environment; therefore, several stressors and hazards can affect the psychosocial work environment, such as poor work organization. For example, problems with production demands, time pressure, decision latitude, reward & recognition, workloads, support from supervisors, job clarity, job design, job training, and poor communication. Furthermore, other workplace stressors that might affect mental and emotional being include lack of policies and practices related to dignity or respect among the miners; harassment & bullying; discrimination based on HIV status; intolerance for diversity of sex, ethnicity, sexual orientation, religion; lack of support for healthy lifestyles (Anger et al. (2015).

The psychosocial environment can also be affected by the command & control management style (e.g., lack of consultation, negotiation, two-way communication, constructive feedback, respectful performance management); inconsistent application and protection of basic worker rights (legislated employment standards for contracts, maternity leave, non-discriminatory hiring practices, hours of work, time off, vacation time, OSH rights, etc.) (Burton, 2010).

3.3.2.3. The miner's involvement/commitment with their work and safety compliance

The healthy framework model identifies the miner's participation as a key precondition of successful health and safety management and a major contributing factor in reducing occupational diseases and injuries (Burton, 2010). The miner's involvement comprises the activities, expertise, and other resources that the mining organization engages in, affecting the physical and mental health, safety, and well-being of miners and their families. The mining organization may be involved with the community providing support and resources in the following ways:

- Giving each miner hands-on and appropriate instruction, taking account of their skills and professional experience, in each case defining the objective to be achieved in terms of ability to perform a specific function;
- Providing training involving the acquisition of knowledge and know-how to be applied in a specific job and corresponding to the qualifications required;
- this may consist of initial training for entry to a particular trade or profession or adaptive training associated with a modification of the workstation, the introduction of new methods, or a transfer to another job;
    - Giving refresher courses to update the knowledge acquired through training; providing further training, enabling workers to acquire new knowledge, supplement existing knowledge, or specialize in a particular area by acquiring more detailed knowledge.

Encouraging and allowing miners to volunteer for non-profit organizations during work hours. Going beyond legislated standards for minimizing health and safety risks and finding other ways to minimize the occurrences of accidents. Working with the surrounding community planners to build and ensure the practicality and safety of bike paths, sidewalks, public transport systems, and improved security (Burton, 2010).

These WHO healthy frameworks emphasize that the collaboration between mining organizations, leadership, and miners can influence the health status of not only the individual miners but also the organization as a whole, in terms of its efficiency, productivity and competitiveness, and sustainability of enterprises/ organizations, and thus to the national economy of countries and ultimately to the global economy (Burton, 2010). The application of this model provided a systemic framework to develop and validate strategies to enhance compliance with the Health and safety standards within the mining industries of Limpopo province in South Africa, using the following four avenues of the healthy workplace model.

3.3.2.5. Leadership/management commitment

The way leaders define safety affects its application in the workplace and provides an opportunity to influence positive outcomes for workers, managers, and the organization (de Jager, 2018). Mining and quarrying leaders should enforce compliance with safety and health rules and regulations to minimize workplace accidents and improve at-risk behaviours. Consistency in applying and enforcing safety standards remains a key concern to the mining and quarrying industry (Muir, 2016).

Managers need to craft systematic, team-based techniques and identify, assess, and control unacceptable risks to people, assets, the environment, and production making working places safe (Uyanusta & Ilgaz, 2015). Such development and application of risk assessment methods can positively change safety management (Chu, Jain, Muradian, & Zhang, 2016; Cui et al., 2015). Müezzinoğlu (2015) concluded that leaders either disregarded safety and health at the workplace or lacked strategies and commitment. Getting safety and health skills is vital for industry managers because prevention is achievable by implementing strategies to reduce exposure to hazards (Blair, 2014).

3.4. CULTURAL TRANSFORMATION FRAMEWORK

The Cultural Transformation Framework (CTF) also guided this study. This section will cover the following: the origin, the objective of CTF, and the major concepts of the framework.

3.4.1. The origin of the Cultural Transformation Framework (CTF)

The Cultural Transformation Framework (CTF) is a support framework that was commissioned by the Mine Health and Safety Council (MHSC) of South Africa, aiming to change the thinking, thus transforming the minds of miners to be cautious and alert on safety in their workplace. Moreover, the framework suggests that the academics and researchers in the field of safety and health should conduct studies that, in the end, support the mining industry that improves the safety and well-being of miners, more importantly creating the culture of safety (Changing minds, Changing mines final report 2010).

3.4.2. The objective of the Cultural Transformation Framework (CTF)

The Cultural Transformation Framework provides and guides mining organizations to continuously improve methodologies to deal with the health and safety of the miners. The CTF emphasizes the importance of the mining organizations and the safety team to create a safety culture that is aware of the risks, behaviour that compromises the health and safety of the miners (Changing minds, Changing mines final report, 2010). Moreover, the CTF also aims to transform the SA mining industry in achieving world-class OHS outcomes. The question is from this framework as an occupational health team, how we then ensure that the health and safety in SA mining continuously improve to be of the best class. Applying the CTF guided the researcher in identifying the practices, behaviour, perceptions, cultural values, and challenges encountered in achieving health and safety compliance. Additionally, the framework guided the research process, structuring and designing the interview guide and the questionnaire. Thereafter the proposed strategies were developed and validated.

The CTF identified the urgent need for critical need and commitment of SA mining organizations to improve health and safety, more importantly adopting the culture of being safety-minded. This framework places the responsibility of the occupational safety team and practitioners together with the organization and the involvement of the miners to continuously develop interferences to improve the health and safety of the miners. Poor safety interventions and compliance compromise the miners' well-being, resulting in occupational illness, injuries, and fatalities. More importantly, the CTF emphasizes the need for the mining industry to ensure that all the miners' dignity and respect are maintained by ensuring a zero-harm environment (Changing minds, Changing mines final report, 2010).

3.4.3. Pillars of the Cultural Transformation Framework

Drawing back to the objectives of the study, the following pillars were identified from the Cultural Transformation Framework.

3.4.3.1. Regulatory Framework

Different scholars have cited the lack of specific and relevant regulations as a significant challenge in achieving health and safety, leading to poor implementation and adherence in South Africa (Kheni & Braaiman, 2014; Mustapha et al., 2015; (Mogale & Mogotlane, 2018). The Cultural Transformation Framework indicates that mining organizations should design and review the regulations, standards, policies that are meaningful to the context-specific to the experiences in their settings/environment (Changing minds, Changing mines final report, 2010). According to the study conducted by de-Jager (2018) in South Africa, the value of health and safety is not seen in the health and safety posters, regulations, and policy on the walls but is seen in the application. Thus both management and miners must be seen to live the values and lead by example.

3.4.3.2. Leadership

The commitment and how safety is defined and applied by the leaders/managers and supervisors can influence the safety outcomes and the behaviour of miners. The

mining organization needs to develop a leadership programme that will transform and assist the leaders in adopting the safety culture leading by example and speaking the ZERO HARM talk. Moreover, the programme should also focus on releasing time for the leaders to be involved in health and safety activities in their departments. More importantly, empowering the miners through involving them in all the activities such as policy formulation and decision making (Changing minds, Changing mines final report, 2010).

3.4.3.3. The Adoption of common best practice of OHS

It is important for the mines to monitor compliance with the standards and legislation and adopt the best OHS practices to manage health and safety issues (Zungu, 2016). Best practices can be adopted through addressing, seeking, and listening to the miner's concerns and giving them feedback. Moreover, the occupational health team must be prepared to go back to the drawing board if the new efforts to improve safety have failed (Hermanus, Coulson & Pillay, 2015).

3.4.3.4. Bonuses and performance incentives

The mining organizations should strive to implement ZERO HARM Bonuses and performance operations bonus systems. In the context of this study, this can be achieved by ensuring that the bonus system must not send a message to the miners that production is more important than their overall well-being and safety. Health and safety indicators should be available to determine the ZERO HARM. Regular evaluation should be done to determine the bonus and incentive system and to ensure that the miners understand how the system is applied and the fairness (Changing minds, Changing mines final report, 2010).

3.4.3.5. Health and safety co-ordination and support through capacity building

The health and safety practitioners are the main drivers of the safety system through coordination of safety activities such as conducting safety training or safety talks that aims to capacitate the miners with knowledge related to health and safety in their

different departments. They also offer support to the miner's advice on safety-related issues.

3.4.3.6. Risk management

Risk management must be implemented through the elimination of risk from the source and investigation of incidents from the root causes have confidence in that risk management can be improved through reviewing the incident investigation system to move away from the blaming and pointing fingers culture and investigation of incidents to determine the root causes (Changing minds, Changing mines final report, 2010). Moreover, establishing and strengthening that the miner's rights to refuse unsafe work is respected.

3.4.3.7. Safety and production

Literature reveals that in SA, there is perceived conflict between safety and production, with some organizations' culture demonstrated by a strong focus on production while compromising the health and safety of miners (Masia & Pienaar, 2011). The perceived conflict between production and security poses a high risk in achieving the ZERO HARM initiative and ensuring the miners' well-being. The CTF model emphasizes the importance of the mining organization and its structure always to remember that safety and production are not competing for objectives but an outcome of the work well done (Changing minds, Changing mines final report, 2010).

3.4.3.8. Implementation of the CTF

To effectively implement the CTF, the mining organization and its health and safety team must ensure that there are improved health and safety strategies in place. Such strategies must involve the integration of multiple dimensions such as the conduct of the leadership towards safety and health, proper and effective safety management system, technology, and the miner's behaviour towards safety. The pillars of the CTF models are presented in figure 3.2.

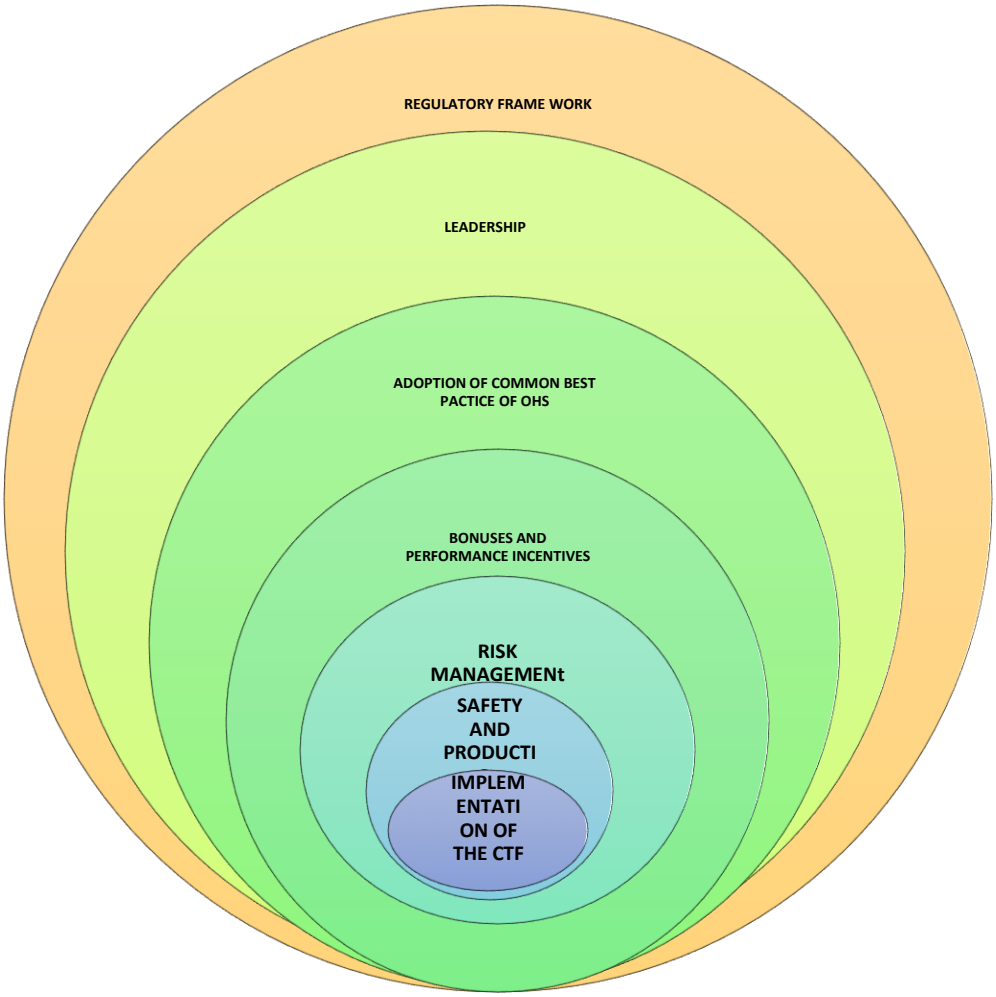


Figure 3.2: The Cultural Transformation Framework pillars

3.5. CHAPTER SUMMARY

Chapter 3 outlines the theoretical framework that guided the study. The World Health Organization Healthy Workplace Framework model was discussed, its origin and importance, the four avenues (physical mining environment, psychological work environment, involvement/commitment with work and safety compliance, and leadership/management commitment. This chapter also presents the Cultural Transformation Framework, its origin, the aim, and the major identified outcomes from the framework. Chapter 4 will outline the research methodology.

CHAPTER 4

RESEARCH METHODOLOGY

4.1. INTRODUCTION

The previous chapter (3) presented the theoretical framework which guided the study. The current chapter presents the overview of the research methodology, which was organized as follows: The strength and weaknesses of qualitative and Quantitative research, Research Paradigm, Study setting, research design, qualitative strand, population and sampling, data collection, data analysis, measures to ensure trustworthiness, quantitative strand: population and sampling, data collection, data analysis, validity, and reliability how ethics were maintained, and bias was described.

4.2. RESEARCH METHODOLOGY

The research methodology is the theory and analysis of undertaking research. It justifies the procedural framework applied in producing research data and analysis in generating knowledge (Bilau, Witt & Lill, 2018). In this study, methodology refers to the procedures/ logical sequence which was used to conduct the whole research project. The current study adopted a Mixed-Method Research (MMR) methodology. Zhang (2014) encouraged health science researchers to apply Mixed-Method Research (MMR) to develop health intervention strategies. This research project aimed to develop and validate health and safety compliance strategies,

A Mixed Methods Research (MMR) allows the researcher to combine elements of qualitative and quantitative research approaches for breadth and depth of understanding and corroboration (Creswell & Plano-Clark, 2011; Zhang, 2014). This approach attempts to address the research questions that call for real-life contextual understandings, multi-level perspectives, and socio-cultural influence (Zhang, 2014). Furthermore, it assists the researchers to compensate for the weaknesses of one method through the strengths of the other and also to enrich the validity and reliability of the results **(**Creswell, 2014; Bentahar & Cameron, 2015). According Lewis- Hickman (2015), the researcher have a responsibility to understand the strengths and weakness of each research method~~,~~ as this ~~will~~ assist in evading difficulties in the research process.

4.2.1. The strength and weaknesses of qualitative and Quantitative research

Both qualitative and quantitative research methods have played important roles in this research project. However, each method had its strengths and weakness.

4.2.1.1. Qualitative research strengths

Maxwell (2013) posits that qualitative research work with the universe of meanings, motives, aspirations, beliefs, values, and attitudes, which corresponds to a deeper space of relationships, processes, and phenomena. The qualitative research approach allows the researcher to collect detailed information about human behaviour provides the researcher with detailed information about human behaviour, emotion, and personality characteristics. It is through the use of the approach that the researcher deepened the researcher's understanding of various dimensions of the research problem from the in-depth and illustrative information obtained through one-on-one interviews. Through qualitative research, a broad range of approaches with a wide variation in concepts, assumptions, and analytic rules was applied (Vaismoradi, Jones, Turunen & Snelgrove, 2015).

The use of qualitative research permitted the researcher to determine the miners, inner experience on health and safety as a whole and also comprehend how behaviour, attitude, and meaning are made through the mining culture (Rahman, 2017). More importantly, the semi-structured one-on-one interview allowed the researcher to interact with the participants directly and capture their feelings and expressions. The researcher was able to describe in detail the miners and the organizational practices, motives, behaviour, and attitudes toward compliance with health and safety compliance.

4.2.1.2. Qualitative research weakness

Creswell (2015) outlines that in qualitative research interviewer can influence the participants. Also, the researcher might enforce his or her cultural, social, and personal identity when interpreting the participant's experience (Vandestoep & Johnston, 2009).

In this study, this was avoided through the use of triangulation (qualitative and quantitative methods) to manage biases. Scholars have argued that the stakeholders/policymakers frequently use quantitative research, and it was also reported that quantitative orientations are frequently given more regard than qualitative (Sallee & Flood, 2012; Rahman, 2017). Literature reveals that the use of a qualitative research approach might raise ethical issues more, especially because of intimate relationships during interviews where personal matters are discussed and recorded (Rahman, 2017).

4.2.1.3. Quantitative research strengths

The quantitative methodology was adopted to obtain accurate and reliable measurements that allow statistical analysis. Through *this* approach, the researcher was able to describe and test the relationship between dependent and independent variables. It also allowed the researcher to examine the causes and effective interactions between the variables (Grove, Gray & Burns, 2015). More importantly, the quantitative approach enabled the researcher to generalize data collected in phase 1 (qualitative data) across the miners and organization to describe and develop the strategies to enhance compliance with health and safety standards.

4.2.1.4. Quantitative research weakness

Rahman (2017) noted that the inability to discover deeper underlying meanings and explanations attached to a certain action or behaviour is one of the limitations of quantitative research. Furthermore, there are trends in quantitative research where only a snapshot of the problem under study is presented, not giving a full picture and understanding of the phenomenon (Rahman, 2017). However, in the current study, the use of the triangulation method assisted the researcher in understanding the meaning and understanding of miners on health and safety compliance through individual interviews.

4.2.2. Research Paradigm

The research paradigm is concerned with the source, nature, and knowledge development in the research (Bilau et al., 2018; Saad, 2016). It assists the researchers

to recognize and deciding on the suitable method by which research can be conducted, as well as adding knowledge and answering related research questions (Bilau et al., 2018; Saad, 2016). In this study, the use of paradigms offered a framework for the researcher to help guide the decisions during the inquiry process. This study was rooted in the following perspectives of the research paradigm used in MMR: Pragmatism, dialectics, and ontology.

4.2.2.1. Pragmatism

Pragmatism often underpins most mixed methods research. It places primary importance on the research question (Shannon-Baker, 2015). Furthermore, pragmatism is used to evaluate different aspects of the research problem. Since the researcher adopted the MMR, pragmatism allowed her to take a position in evaluating different aspects related to miners and mining organization practices in health and safety standards compliance. Pragmatism also guided the researcher in the development and reporting of the strategies through the integration of both qualitative and quantitative research methods.

4.2.2.2. Dialectics

As per Shannon-Baker (2015) a dialectic perspective brings together two or more paradigms in ‘‘respectful dialogue’’ with one another throughout the research process. The use of dialectics assisted the researcher in creating a dialogue between qualitative and quantitative data, which was achieved through collecting the qualitative data, which then guided the researcher in the development of the quantitative data collection tool (Creswell & Plano Clark, 2011). The dialectics perspective emphasizes that the researcher should focus on the new understanding that arises in the study instead of joining the two methods. It is through the adoption of the dialectic paradigm that the researcher gained further understanding of the phenomenon.

4.2.2.3. Ontology

Ontology refers to assumptions about the nature of reality (Saad, 2016). Ontology is associated with ontological assumptions that shape how the researchers see and study research objects. From this viewpoint, the ontology guided the researcher throughout the study based on the realities of the attitudes and practices related to

safety compliance in different selected contexts. Realism focuses on two major concerns: it attempts to encourage reality as being the truth, such that once the reality has been shown, it is independent of the way the human mind thinks about it (Creswell & Plano Clark, 2011). Secondly, realism strives to develop an understanding of human behaviour (Saad, 2016). This perspective guided the researcher to understand and describe human behavioural factors about compliance with the health and safety standards. This was achieved through asking real-life experience questions.

4.2.3. Study setting

The study was conducted in the selected mine which is an open cast based in the Mopani district, Limpopo Province. The mine produces phosphoric acid and phosphate-based granular fertilisers for local and international markets. Moreover, the mine has an on-site occupational health clinic that caters to the well-being of the miners.

Limpopo Province is situated in the Northeast of South Africa and is made up of five districts, namely: Vhembe, Mopani, Capricorn, Sekhukhune, and Waterberg. Mining in Limpopo yields important quantities Coal, Platinum, Diamonds, phosphate, Iron core, Chromite, Antimony, and Andalusite (Limpopo Province Freight Data Bank, 2012). The province has 41% of South Africa's Platinum Group Metals (PGMs), 90% of South Africa's red granite resources, approximately 50% of the country's coal reserves, the biggest diamond mine (Venetia), copper mine (Palamin), one of the major iron-ore producing mines in South Africa (Kumba) and the biggest vermiculite mine in the world (Foskor) (Limpopo Province Freight Data Bank, 2012). Districts in Limpopo Province are presented in figure 4.1.

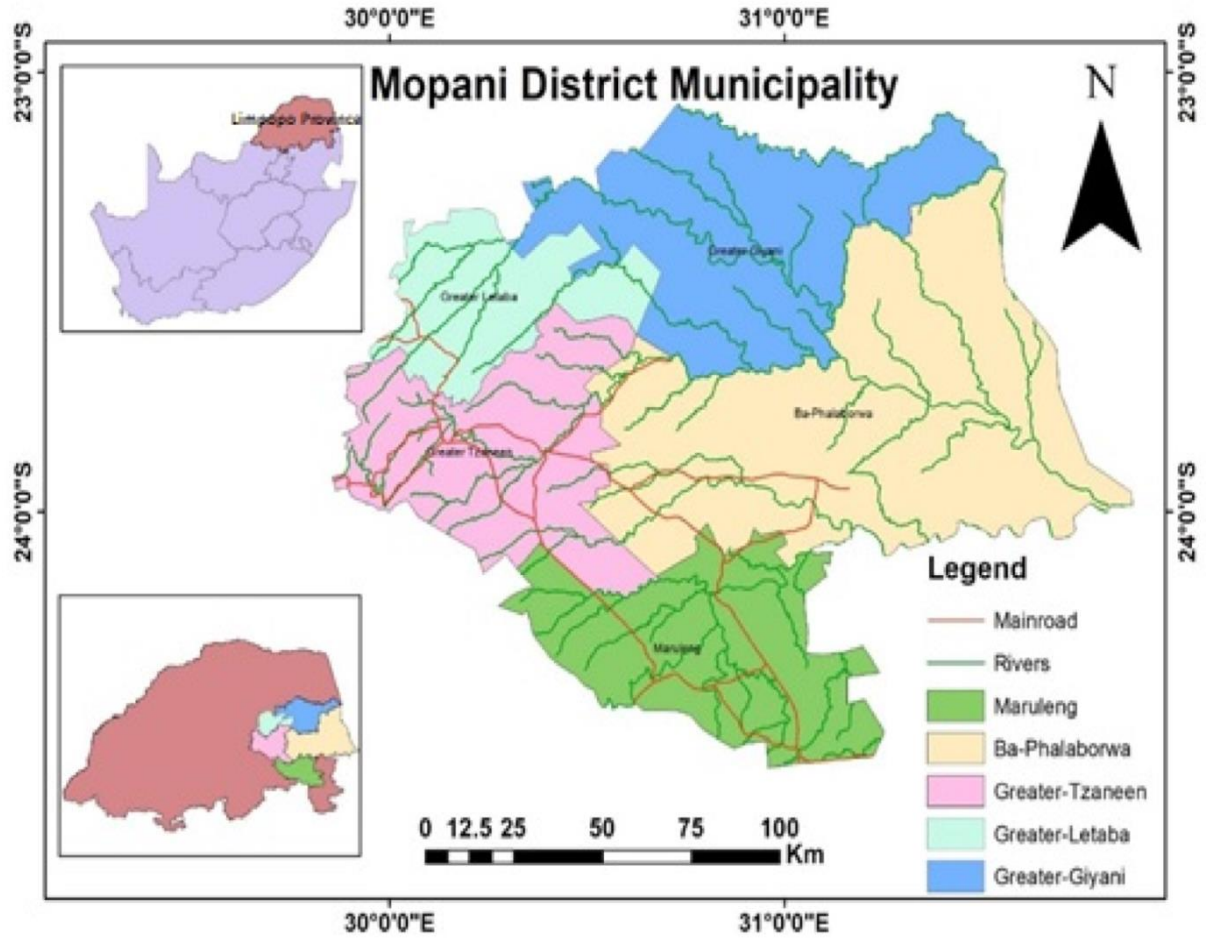


Figure 4.1. Map of Mopani district (2016)

4.2.4. Research design

The study adopted the mixed-method sequential exploratory design. The exploratory sequential research design involved a two-strand project in which the researcher collected qualitative data in the first strand, analyses the data, and then used the results to plan (or build on) the quantitative strand (Creswell, 2014). The purpose of this de.sign is to identify a larger range of topics and how individuals frame their understanding around a particular event through the qualitative strand to develop a questionnaire wherein the codes become variables, themes become scales, and the quotations become survey items (Creamer, 2018). The exploratory design allowed the researcher to broadly explore and try to establish how far the miners and the organization go in terms of complying with the health and safety standards and ultimately suggesting strategies for compliance. The sequence of steps followed in

sequential exploratory design is unpacked in figure 4.2. As suggested by Bentar & Creamer (2015).

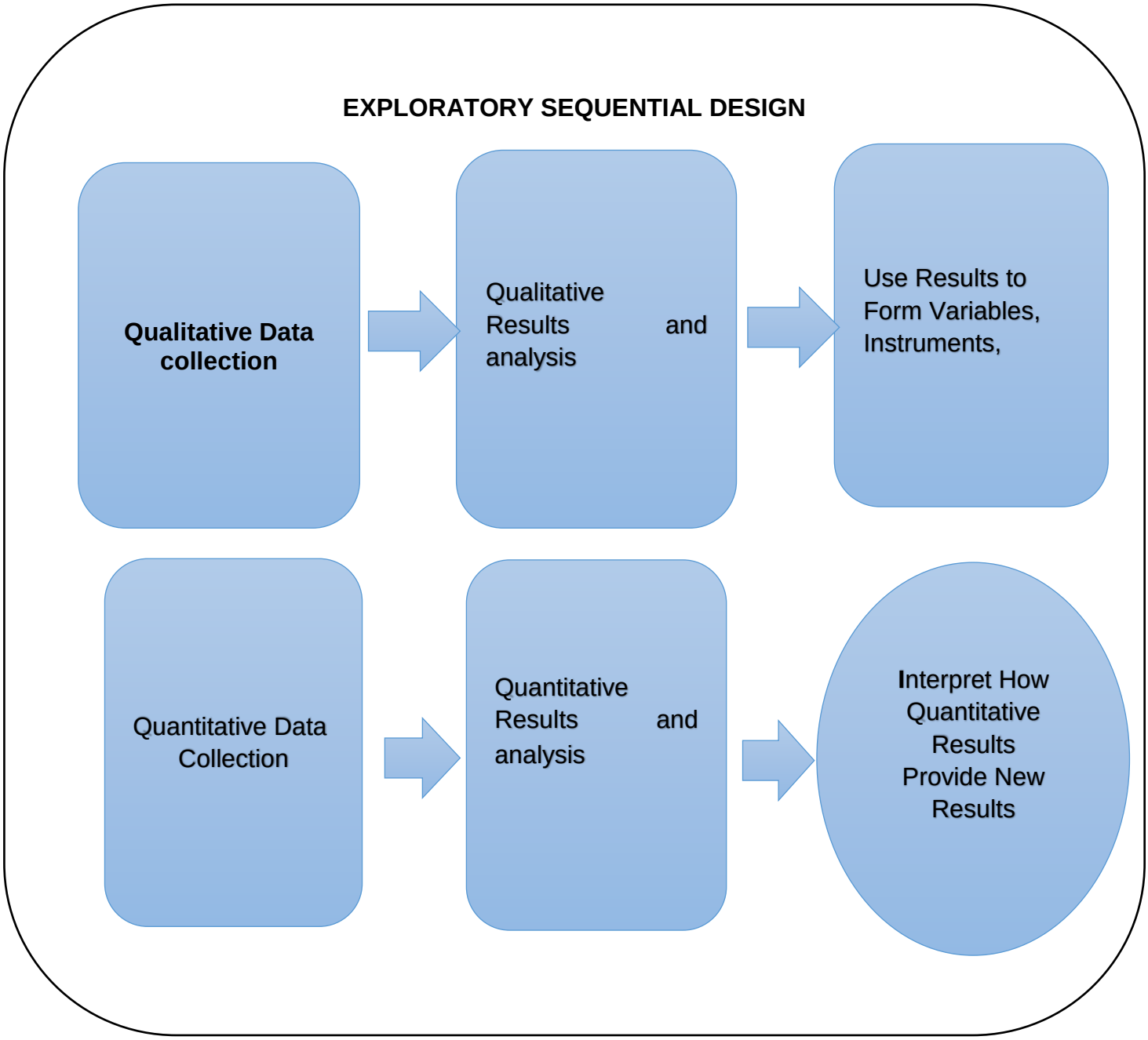


Figure 4.2: Graphical presentation of mixed exploratory design adopted from Bentar & Creamer, 2015.

4.2.4 Population

According to De Vos, Strydom and Fouché (2011), the population is the total persons, events, and case records with which the research problem is concerned. Grove, Grey, and Burns (2015) describe the accessible population as the portion of the target population to which the researcher has reasonable access. A target population is the complete group of people or objects that are of interest to the researcher and meet the criteria the researcher is interested in (Asiamah, Mensah& Oteng-Abayie, 2017). In this study, the population consisted of 5350 miners in the selected mine in the Mopani district. The occupational health nurses working in the on-site clinics and occupational health and safety teams were also included. Table 4.2 present the data collection approaches used in the quantitative and qualitative strands of the study

Table 4.1: Data collection approaches used in qualitative and quantitative strand

Approach	**Qualitative strand**	**Quantitative strand**
Population (Who)	Occupational health nurse practitioners, Safety officers, and Safety representatives.	Miners (artisans, mining engineers, geologists, health and safety personnel, mining managers, engineering managers, mine surveyors, machine operators, and drivers)
Sampling Method (Type)	Non-probability purposive and total sampling	Stratified random sampling
Sample size (how many)	Data saturation reached at participant number 20	300 respondents
Instrument (how)	Interview guide	Self-administered questionnaire
Analysis	Thematic qualitative analysis	SPPSS Version 22.0

4.2.6. Qualitative strand of the study

Creswell and Plano-Clark (2011) outlined that mixed-method research should proceed along the quantitative and qualitative strand. The current study commenced with a qualitative strand aiming to understand the mining organizational and miners' cultural influences towards compliance with health and safety standards through the interpretation of spoken and written words, perceptions, and feelings (Grove, Burns & Gray, 2013). The use of a qualitative research method enabled the researcher to obtain rich, in-depth data about real-life health and safety compliance in the mines. Additionally, through qualitative research, the researcher was able to understand the contextual and miners' behaviour and attitudes concerning compliance with health and safety standards. Furthermore, the use of specific structured questions with an interview guide assisted the researcher in developing the instrument for the quantitative strand.

4.2.6.1. Sampling

Polit and Beck (2018) describe sampling as the process of selecting a portion of the population to represent the entire population. A non-probability heterogeneous purposive and total sampling method was used to select the participants in this study. Purposive sampling involves recognizing and selecting people or groups of individuals that are especially familiar with or experienced with a phenomenon of interest (Creswell & Plano Clark, 2011). Whereas in total sampling, the researcher selects everyone in a population who shares a common interest (Brink, 2017). During purposive sampling, the researchers use their knowledge about the population to select relevant sample members with knowledge about the problem being studied (Polit & Beck, 2018). Purposive and total sampling was used to select occupational health nurses, safety officers, and safety representatives as they are the key players in ensuring health and safety.

4.2.6.1.1. Sampling of the mines

Purposive and convenience non- probability sampling was used to sample the selected mine in the Mopani district. Bhattachagie (2012) defined convenience sampling as a technique in which a sample is drawn from that part of the population that is readily available or convenient. However, Polit and Beck (2018); Green and Thorogood (2014) outlined that a representative sample is necessary for the generalization of the results across the entire population. In the current study, an attempt was to not generalize the results but to attain a broad contextual understanding and establishment of how far the miners and mining organization in each district of Limpopo go in terms of compliance and ultimately suggests the strategies for compliance. But due to the strain in obtaining permission to conduct the study in different districts mines of Limpopo Province, only one mine was conveniently sampled.

4.2.6.1.2. Sampling of the employees in the selected mines

A non-probability purposive and total sampling method was used to select the participants. According to Schuft (2012), purposive sampling helps in identifying and involving key participants out of the entire population who have better knowledge, understanding, and information about the matter being studied to get as much relevant and valuable information for the research as possible. Purposive and total sampling was used to select occupational health nurses, safety officers, and safety representatives. They were considered to be best placed to provide descriptions of the real situations concerning aspects related to health and safety in each district, and only those who gave consent to participate in the study were selected. Grove et al. (2015); Patton (2015) posits that qualitative in qualitative research, the emphasis is on the better understanding of the participant's experiences and attach the meaning rather than the sample size. Thus the sample size in this study was determined by data saturation, and verification of information was reached at participant number 20. Data saturation happened when the researcher obtained rich and concise information on the lived experiences of the participants (Grove et al., 2016; Englander, 2012). Besides, when there is a detailed and high quality of data, fewer participants are required to gain an understanding of the phenomenon (Grove et al., 2015; Patton,

2015). Therefore the study results can only be evaluated based on the quality and content of data but not on the sample size.

4.2.6.1.3. Inclusion criteria

Patino and Ferreira (2018) posit that the establishment of inclusion criteria is important in the study to maintain high-quality research procedures. It also identifies the key participants from the targeted population to answer the research question. The study included one mine, which permitted to conduct of the study. All the OHNP and the H & S team members who were willing to participate who had more than one year of experience as they were expected to have experience and could describe the practices related to the compliance with health and safety standards during the period of employment were included in the study.

4.2.6.1.4. Exclusion criteria

Exclusion criteria include characteristics of the targeted population that might give inaccurate information during data collection or has other conditions that could affect their health during data collection (Patino & Ferreira, 2018). Safety officers, safety representatives, and occupational health nurses with less than one year of experience were excluded because of the shorter period of exposure in the selected mine.

4.6.3. Recruitment of participants

De Vos et al. (2011) emphasized the importance of obtaining permission f in a chosen research field from the relevant authority before performing research activities. Before the recruitment of the participants, written permission to conduct the study was granted from the selected mine (see Appendices D Page 167). Thereafter recruitment of participants was done through the assistance of the occupational health clinic manager. The researcher explained the study purpose, different categories of participants targeted for the interviews, and also how and when the interviews will be conducted was outlined. This was followed by the introduction of the researcher to the participants, where the aim of the study was explained. Furthermore, the voluntary nature of participation and the freedom to withdraw at any time. Individual appointments with the participants were prearranged at the participants' convenience

in terms of place and time for conducting the interviews (Leedy & Ormrod, 2014). Individual appointments with the participants were pre-arranged at the participants' convenience in terms of place and time for conducting the interviews (Leedy & Ormrod, 2014). According to Grossoehme (2014), the researcher should establish a working relationship with participants for qualitative research to be successful. Grossoehme (2014) recommended consistent communication between researcher and participants and that the researcher should as well maintain principles of the investigator's responsibility to the participants. Jamshed (2014), concurred by Grossoehme (2014), adds ethical investigation and honest responses as an important component of a qualitative multiple case study. Once a prospective participant agreed to participate in the study, used phone calls and electronic communication as means of communication to confirm the dates and times for the interviews. According to Shrurink and Fouche (2011), the participants must choose the research venue which is convenient and comfortable to them, and it might differ from one participant to another. In this study, the research venue was the occupational health clinic which was the preference of all the participants.

4.2.6.2. Pilot study

A pilot study is referred to as a small-scale of a complete survey for a particular research instrument such as a questionnaire or interview guide (Janghorban, Roudsari & Taghipour, 2014). The Pilot study was aimed to explore and understand how far the miners and the organization go in terms of complying with the health and safety standards and ultimately suggesting strategies for compliance. The pilot study was done in the selected mine, and 4 participants participated. These participants were not part of the main study. The pilot study assisted the researcher in identifying problems and barriers related to participants' recruitment and assessing the acceptability of the interview guide (Janghorban et al., 2014). During the pilot study, the barriers such as the availability and accessibility of the participants were identified. These barriers assisted the researcher to refine the sampling strategy of the mines to convenience sampling and to improve the final data collection tool wherein the researcher had to develop an open-ended questionnaire for participants who were not accessible due to safety restrictions in the mine instead of conducting one-on-one interviews. Furthermore, the researcher also identified that the interview guide for the mine

workers must structure differently with those of the health and safety and the union representatives.

4.2.6.4 Data collection

Data was collected by the researcher through semi-structured one-on-one interviews using an interview guide from October 2019 to March 2020. The researcher is a qualified and experienced OHNP. Therefore all the pre-conceived ideas were written down before the commencement of data collection to avoid/prevent influence or to impose own understanding (Polit & Beck, 2012). Creswell (2014) describes interviews as an important approach to accumulating significant data needed for qualitative analysis of the phenomenon under study. Through one-on-one interviews, the occupational health nurse practitioners and the safety team were able to explain their feelings, thoughts, and experiences about health and safety compliance in their workplace.

Polit and Beck (2018) outlined that the researcher has to prepare a written topic guide, ask questions, and encourage participants to talk freely and tell the stories in their own words. The design of the interview guide was guided by the mine health and safety policy, regulations, and guidelines that guide the miners and the mining organizations on compliance with the health and safety standards. Additionally, consultation was done with the occupational health practitioners. One central question was asked in the same manner to all the participants *"Can you describe your experience regarding health and safety compliance in this mine" (Refer to appendix* Probing questions were asked as a follow-up from the interview guide to gain clarity. According to Babbie and Mouton (2011), probes are more frequently required in eliciting responses from open-ended questions. Probing questions assisted the researcher in gaining clarity to deepen responses from the participants and to improve the quality of data. Moreover, follow-up questions on the interesting story were done and assisted the researcher in establishing the level of compliance by both the miners and the organization with the health and safety standards. More importantly, the responses ultimately suggested strategies for compliance.

Since the research data is irreplaceable, the proceedings of the interviews were captured using a voice recorder as a backup tool with the permission of the participants. The permission to record the interview proceedings was obtained from the participants. Field notes were taken to record non-verbal cues that cannot be captured through a voice recorder. The interviews were conducted in a private room for 30 to 45 minutes until data saturation was reached at participant number 20.

The following communication techniques were used to facilitate the interview proceedings from de Vos et al. (2011):

- Paraphrasing was done to confirm the significance of what the participants had said. The interviewer rehashed what the member said in a way that would sound natural to her.
- Verbal reactions were embraced, for example, during the interviews to guarantee the participant that she was tuning in and had an interest in the thing they were saying. For example "Alright", "mm-mm", "I see" .
- Clarification was sought by requesting the participant's further explanation on proclamations that were not satisfactory, for example, "you appear to say."
- Reflections were done to obtain more done and to verify the participants meaning
- The participants were encouraged to participate throughout the interviews by praising them for giving them the strength to continue, for instance, "That is fascinating."
- A reflective summary was done, the researcher summed up the members' thoughts, considerations, and sentiments that were expressed to affirm that she got what the members were saying. This was additionally done to animate the members to give more data, for instance, "Would you say you are saying that there is a training available?

4.2.6. Data analysis

Data were analyzed using thematic analysis. Thematic analysis is a technique that is used for the identification, analysis, and reporting of patterns/ themes within qualitative data (Vaismoradi, Turunen & Bondas, 2013). Cautield (2019) assumes that thematic

analysis is more applicable when analyzing qualitative data more especially in exploring views, opinions, knowledge, experiences, or values. The adoption of thematic analysis assisted the researcher to describe and explore the lived experiences of the occupational health team concerning compliance with health and safety standards. The following thematic analysis steps were applied:

- **Familiarising with data**

The researcher transcribed data by reading all the transcriptions of the interview sessions and writing down all the ideas as they came.

- **Preparation**

The researcher immersed herself in the data through analysis of the interview transcriptions obtaining the sense of whole by selecting the most interesting information concerning the research problem.

- **Generating initial codes**

The researcher coded the interesting features of the data systematically across the entire data set, collating data relevant to each code. A list of all topics was compiled, and similar topics were grouped and formed into columns;

- **Searching for themes**

The list of categories was reduced by grouping the topics related to each other. The abbreviations for each code were arranged alphabetically. The codes were collated into potential themes. Data belonging to each category was assembled in one place, and a preliminary data analysis was performed.

- **Reviewing themes**

Existing data were inspected according to the themes and sub-themes. Checking if the themes work concerning the coded extracts and the entire data set, generating a thematic map.

- **Defining and naming themes**

Ongoing analysis for refining the specifics of each theme and the

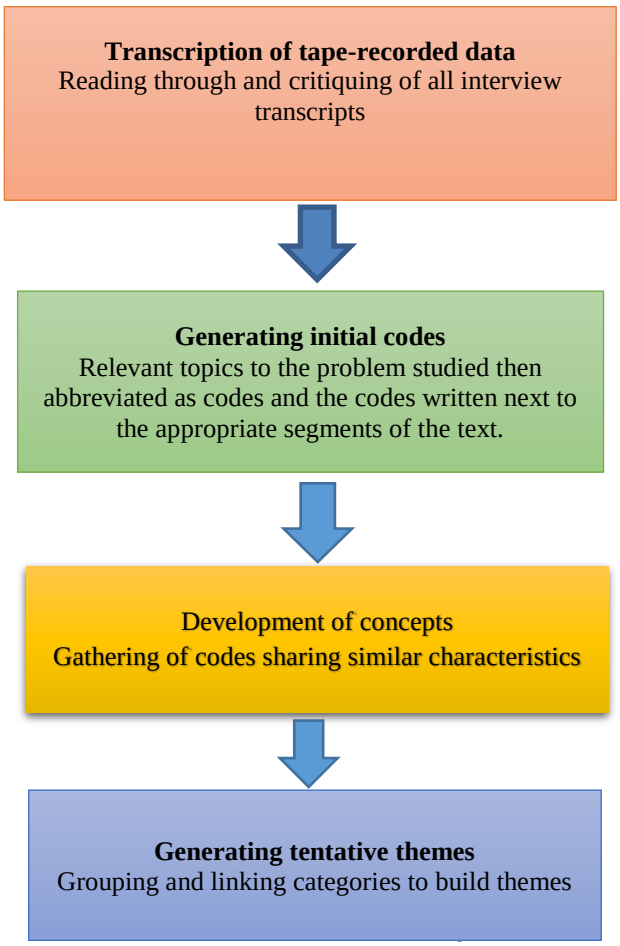
overall story that the analysis tells, generating clear definitions and names for each theme were done.

- **Organizing**

Open coding was done, and categories were created with codes grouped under higher-order headings. The general description of the research topic, formulating a general description of the research topic through generating categories and subcategories.

- **Producing the report**

The final themes for analysis were validated through sending data (voice recorder and field notes) to an independent coder, who is an experienced qualitative researcher, and the meeting was arranged with the independent coder to agree on the final themes and sub-themes. Figure 4.1. present the schematic diagram of the steps followed during thematic analysis.



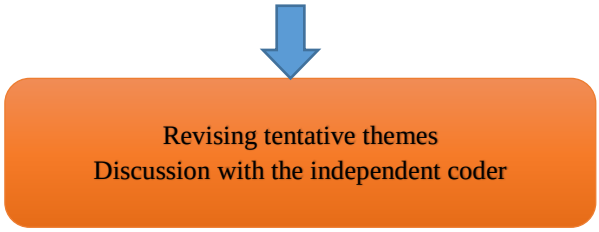


Figure 4.1:Schematic diagram outlining the steps followed during qualitative data analysis.

4.3. MEASURES TO ENSURE TRUSTWORTHINESS

Trustworthiness reflects the truth-value of qualitative research and determines whether the researcher has established confidence in the truth of the findings with the participants (de Vos et al., 2011). To ensure that the findings of the study can be accepted as true, the researcher applied the following four principles as suggested by Lincon and Guba 1985 cited by (de Vos et al., 2011) Credibility, transferability, dependability, and confirmability.

4.3.1. Credibility

According to Shannon-Beker (2015), credibility is outlined as the trust that can be cited in the truth of the study findings. Credibility is about whether or not the research findings represent believable information drawn from the participants' original data (Shannon-Beker, 2015). Existing literature outlined that the application of credibility demonstrates the researcher's ability to assure confidence in the truth of the findings of this research project, with particular reference to the participants and the context in which the research happened (Gunawan, 2015). Table 4.2 Describes how credibility was applied.

Table 4.2: Criteria for application of credibility

Credibility	Method of application

Prolonged engagement	• Each interview lasted for 30 to 45 minutes in the field. This improved the trust of the participants, and it also provided the researcher with a greater understanding of miners and organizational culture in all the selected mines.
Triangulation	• Different types of participants were interviewed to obtain diverse and rich data on health and safety compliance. These included the following categories: OHNP, H & S team to obtain rich information on health and safety compliance in the mining industry. • The use of the mixed method allowed the researcher to collect data through semi-structured interviews and also by the use of a questionnaire.
Debriefing	• The researcher had frequent (monthly) debriefing meetings with the supervisor and co-supervisor • The meetings ensured the credibility of the study through continuous discussion of the research project, identifying and drawing attention to the possible flaws of the study. • The meetings also provided the researcher with a sounding board for the researcher to examine the ideas and interpretations in line with the objectives of the study. This provided the opportunity for the researcher to refine the research methods, develop a greater explanation of the research design, and strengthen arguments in the light of the comments from the supervisors.

Member checks	• Data were verified with the participants. This provided an opportunity for them to add more information and correct the misinterpretation.

4.3.2. Transferability

Transferability is the generalization of the study findings to other situations and contexts (Shannon-Baker, 2015).The researcher facilitates the transferability judgment by a potential user through 'thick description' and purposeful sampling (Shannon-Baker, 2015). Table 4.3 describes how transferability was applied.

Table 4.2: Criteria for application of transferability

Transferability	**Method of application**
Thick description	• The researcher provided a sufficient thick description of the research process to allow readers to have a proper understanding. This included the description of the mine which was purposively selected (Table 1) and their geographical locations; the purposive and total non-probability sampling technique outlining the justification for including the OHNP and the H & S team the total number of participants who participated in the study; different methods which were employed in data collection; the total number of interviews which were conducted and the time frame which was from November 2019 to November 2020
Outlining the study limitations	• The study limitations and restrictions such as difficulties in accessing the respondents, some of the mining companies refusing to give consent for the study, and

	differences in the safety culture in each mine were also outlined.

4.3.3.3. Dependability

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Dependability involves participants evaluating the findings and the interpretation and recommendations of the study to make sure that they are all supported by the data received from the informants of the study (Cohen, Manion, & Morrison, 2011). Table 4.4 Describes how dependability was applied.

Table 4.3: Criteria for application of dependability

Dependability	Method of application
Outlining the research processes	• The study research process was documented in detail, thereby enabling a future researcher to repeat the work, if not necessarily to gain the same results. Thus, also allow the future researcher to assess the extent to which proper research practices have been followed. This included describing the research design and the implementation process, the operational detail of data gathering, addressing the details of what was done in the field.
	• An audit trail was conducted by clarifying the steps taken in the research process to ensure that the study adhered to the philosophical underpinnings and also by sending copies of voice recorders, field notes, and transcribed data to an experienced qualitative independent coder.

4.3.3.4. Confirmability

Confirmability is the neutrality or the degree to which the findings are the product of the study, not the biases of the researcher (Polit & Beck, 2018). Table 4.2 Describes how confirmability was applied.

Table 4.4: Criteria for application of confirmability

Confirmability	Method of application
Member checking	• The researcher conducted member-checking with study participants or similar individuals to researchers to examine the overall accuracy of the study and verify data results.
Use of paradigms	• The researcher acknowledged the research paradigms which outlined the source, beliefs underpinning decisions, nature, and knowledge development in the study (Shannon-Beker, 2015)
Data-oriented approach	• Data-oriented approach wherein the researcher collected qualitative data first, which was used to develop the questionnaire for the quantitative strand.

4.4. QUANTITATIVE STRAND OF THE STUDY

In this strand, a quantitative research method was used to emphasize the collection of numerical data. Quantitative research generates statistics through the use of large-scale survey research, using methods such as questionnaires or structured interviews (Showkat & Parveen, 2017). Gray, Grove & Burns (2015) explained quantitative research as a formal objective, systemic study process to describe and test the relationship and examine cause and effect interactions among variables. The study

adopted a mixed-method approach. Therefore the justification for using the quantitative research method was to compensate the results of the qualitative strand to gain a complete understanding of the influences of employees and organizational cultural beliefs and practices on compliance with health and safety standards. The results of the study are presented in descriptive and quantitative forms.

4.4.1. Population and sampling

Bhattacharjee (2012) defined the population as all people or items (unit of analysis) with the characteristics that one wishes to study. In this strand, the population consisted of all the miners in the selected mining organization. The target population was 5350 miners in the selected mine. Garson (2012) described sampling as a method of selecting a small number of components from a bigger population. Additionally, the selection was made in a manner that can be used to make a representation of the whole population using stratified sampling.

4.4.2. Sampling of the mines

Initially, the researcher planned to conduct the study in all the 5 districts in Limpopo Province using the systematic random sampling strategy to ensure the representation of the study population of mines. This was going to be done by generating a random table that included all mines in each district was to be generated on excel. Therefore, the mines were going to be systematically selected in each district from the drawn table, including each 3rd mine in the table. However, due to the complications related to Covid-19 and difficulty in obtaining permission to conduct the study in differenmines of Limpopo Province, the researcher ended up using the non-probability purposive and convenience sampling method. The researcher only sampled 1 selected mine, which conveniently granted permission to conduct the study.

4.4.3. Sampling of the miners

Stratified random sampling was used to select respondents. This method of sampling involves the division of a population into smaller groups known as strata. The strata were formed based on the mineworker's shared attributes (Nickolas, 2018). Dividing the sampling frame into strata allowed the researcher to sample miners proportionately

based on the size of each category per department (Bhattacharjee, 2012). A random table that included all the categories in each stratum was generated, and every third person was selected from the generated table. Furthermore, the sample for each category was determined by using the proportion of each category to total miners in the selected mine.

4.4.3.1. Sample size

In a quantitative strand, the sample size was calculated using Slovin's formula (1960). According to (Stephanie, 2018) Slovin's formula allows a researcher to sample the population with a desired degree of accuracy.

n = Number of samples/ sample size

N = Total population

e = Error tolerance

The target population size was 5350 miners who are exposed to mining hazards, e.g. miners, artisans, mining engineers, operators, electricians, shift bosses, team leaders, winch operators, health and safety personnel, mining managers, engineering managers, and mine surveyors. The sample size in each of the selected mine was determined by using the proportion of each category to total production miners at a company.

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

Sample size

n = 5350 /1+ 5350 × (0.05) (0.05)

= 372 respondents

4.4.2.1. Inclusion criteria

The study focused on the selected mine in Mopani district Limpopo province South Africa. All miners who are exposed to mining hazards and have more than one year of experience were included in the study as they were able to describe the practices

related to compliance with health and safety standards during the period of employment.

4.4.3.3. Exclusion criteria

Miners exposed to hazards with less than one year of experience and office-based employees such as secretaries and human resources were excluded because they were not exposed to hazards.

4.4.4. Data collection

In a quantitative strand, data were collected by the researcher and 3 field workers from January 2021 to April 2021. A self-administered questionnaire which was developed based on the results of the qualitative strand was used. The field workers were trained for two days on the use of the data collection tools and data collection procedures to be followed when collecting data from human beings. The field workers were remunerated and paid by the University of Limpopo Capacity Development funding.

Babbie and Mouton (2011) outlined that in self-administered questionnaires, respondents will be asked to complete the questionnaires themselves. The contents of the questionnaire were developed by conducting a literature review and through the results of a qualitative strand. At the same time, the technical construction of the questionnaire will be done with the assistance of the university statistician. The self-administered questionnaires were translated into the languages understood by the respondents, namely: Sepedi, Tshivenda, and Xitsonga. The field workers assisted the respondents who could not read or write by reading and answering the questionnaire according to their responses. Data were collected for four months (January to April 2021) in a private room. The questionnaire is structured into different sections, namely:

- Section A: Demographic information
- Section B: Health and Safety regulation standards and regulations
- Section C: Leadership influences on health and safety compliance
- Section D: Political, economic, technological, and environmental influence on health and safety compliance

- Section E: The effect of miners cultural beliefs on health and safety compliance

4.4.4.1. Pre-testing of the questionnaire

Pre-testing of the questionnaire was conducted in one district for both qualitative and quantitative strands. According to Grimm (2010), pre-testing a questionnaire is essential to reduce errors associated with surveys in research. Bhattacharjee (2012) also outlined that the pre-testing assists the researcher in detecting potential problems in research design and/or instrumentation (e.g. whether the questions asked is intelligible to the targeted sample) and to ensure that the measurement instruments used in the study are reliable and valid measures of the constructs of interest. Pre-testing assisted the researcher to determine the practicability of the study and testing the reliability and validity of the questionnaire. From the selected mines, one mine was used, and a total of 40 respondents were randomly selected using probability systematic sampling, which was used in the bigger study. Pre-testing also assisted in the training of the field workers by enriching their understanding of the questionnaire and also on the data collection procedures.

4.4.4.2. Data analysis

Data was captured in a micro soft excel sheet for storage which was later imported to the Statistical Package for Social Sciences (SPSS) program Version 26.0 computer software. The onsite biostatistician was appointed to assist with the analysis. Descriptive statistics were used to calculate the categorical variables (frequencies/counts and percentages) and for the continuous variables by providing a summary of data in the form of mean, median, and mode. To measure internal consistency for the measurement scale, Cronbach's alpha was adopted. Cronbach alpha test will be explained in detail under reliability.

4.4.2.1. Validity and Reliability

Singh (2014) outlined that validity and reliability increase transparency and decrease opportunities to insert researcher bias in qualitative research. In the current study, the researcher ensured validity and reliability by using various types of methods to collect

data for obtaining true information, such as questionnaires and health and safety records in the mines.

4.4.2.2. Validity

According to Kalimba, Shukla, and Mbabazize (2016), validity is the process that involves examining and assessing each item in each of the instruments to establish whether the item brings out what it is expected to do. Furthermore, is the degree to which the results are truthful.

4.4.2.3. Content validity

Content validity refers to the extent to which the items or behaviors fully represent the concept being measured (Zamanzadeh, Ghahramanian, Rassouli et al., 2015). Content validity warrants that the questionnaire embraces a suitable set of items that captures the idea. Content validity was ensured through literature review and consultation with the health and safety managers and also with the supervisors to ensure that the questionnaire talks to the objectives of the study.

4.4.2.4. Face validity

Face validity refers to the degree to which a test appears to measure what it claims to measure (Leedy & Ormrod, 2014). To ensure face validity, the researcher submitted the questionnaire and consulted with the university statistician to ensure that the questionnaire is indeed measuring what it is designed to measure.

4.4.2.5. Reliability

Reliability is the extent to which a measure yields the same scores across different times, groups of people, or versions of the instrument (Haradhan, 2017). Yilmaz (2013) outlined that reliability is about the consistency, stability, and repeatability of the results. Additionally, the result of a researcher is considered reliable if consistent results have been obtained in identical situations but different circumstances. To ensure reliability, a pilot study was conducted with 10 respondents from the population to identify gaps in the designed questionnaire. The researcher also ensured reliability

by translating the questionnaires into the languages spoken and understood by the respondents.

Cronbach's alpha was used to measure internal consistency for the measurement scale. Cronbach's alpha is one of the most internal consistency measurements that affords a measure of the extent to which the items on a measurement scale or internal correlations of items (Haradhan, 2017). Cronbach's alpha is frequently viewed as a proportion of homogeneity. That is, huge alpha qualities demonstrate that the things are tapping a typical area. The scale in Cronbach's dependability test goes from 0 to 1. Scores that are near 1 demonstrate that the instrument has high dependability, while scores near 0 show that the unwavering quality of the instrument is exceptionally low (Haradhan, 2017). Cronbach's alpha test results are presented in chapter 5 of this study in table 5.1. The study variables for all items coefficient was greater than 0.7, which is considered as acceptable and satisfactory as specified by Haradhan (2017).

4.5. QUALITY ASSURANCE AND DATA MANAGEMENT

The field workers who were appointed to collect the quantitative data were trained to ensure quality and also to ensure that research ethics are known and adhered to. To enhance the completeness of data, field workers also ensured that all questionnaires were filled in full and that there was no missing information. The collected data were double-entered daily by both the researcher and the field workers as soon as the completed questionnaires were received. The two sets of records were compared, after which discrepancies were checked against the original questionnaire and corrected.

The researcher stored all of the research data and documents referring to the above-mentioned study in the locked cupboard in the office (Department of nursing Sciences), University of Limpopo. The researcher understands that the storage of the above-mentioned data and documents must be maintained for a minimum of 15 years from the commencement of the study, i.e. until the end of 2031. The electronic data was stored at the supervisor and co-supervisor participating computers as well as on memory cards as backups. The electronic data code is word-protected and only accessible to the researchers.

4.6. BIAS

According to Christopher, Pannucci, Edwin, and Wilkins (2011), bias is any tendency that prevents unprejudiced consideration of a question. Moreover, the researchers need to avoid bias because bias yields to the presentation of false findings with distorted impressions.

4.6.1. Selection bias

Selection bias occurs when there are logical differences between subsets of respondents included and additionally examined in a study with the end goal that the subset isn't representative of the target population investigated in the study (Pannucci & Wilkins, 2010). In a qualitative strand, bias was avoided by selecting the sample population using purposive, non-probability sampling. This purposive sampling technique allowed the researcher to carefully select the sample based on elements that are related to and would most aptly be able to answer the research question (de Vos et al., 2011). To minimize bias in a quantitative strand, stratified random sampling was used to select respondents where they were divided into strata. The respondents were randomly selected and had an equal chance to participate in the study.

4.6.2. Data collection bias

Bracketing was ensured by suspending the presuppositions, biases, assumptions, theories, or previous experiences to see or describe the phenomenon. The researcher wrote all preconceived ideas down before beginning with data collection. In a qualitative strand, the researcher avoided bias by not asking leading questions that influence the participants to answer in a particular manner. Additionally, interviews were conducted in languages spoken and understood by the participants. Whereas in a quantitative strand, the data collection tool was assessed for validity and reliability through pre-testing of a questionnaire to prevent measurement bias (Simundic, 2013). Moreover, bias was also avoided by training the field workers on the use of the data collection tools and data collection procedures to be followed when collecting data from human beings (Pannucci & Wilkins, 2010).

4.6.3. Data analysis and interpretation bias

Simundic (2013) noted that bias during data analysis occurs the researcher analyzes data in a manner that gives inclination to the ends for research speculation. In the current study, the voice recordings and the transcribed data were sent to the supervisor and co-supervisors who are experienced, qualitative researchers. From that point, a meeting was held, and an agreement on the topics and sub-topics recognized was reached. Data analysis and interpretation bias was avoided in a quantitative strand by appointing the onsite biostatistician during the proposal stage, where the data collection instrument was discussed aligning to the objectives of the study. The captured data in a Microsoft excel sheet was sent to the biostatistician for assistance with analysis and ensuring that proper statistical tests were used. Thereafter a meeting was held to discuss and conclude the results of the analysis. Data interpretation bias was also avoided by interpreting and drawing conclusions within the range of the observed data.

4.7. ETHICAL CONSIDERATIONS

Ethical principles guide researchers in meeting the needs and goals of research and the rights of participants. The following ethical standards were adhered to throughout the research project:

4.7.1. Ethical clearance process

To ensure ethical approval, the following steps were taken: The research proposal was developed in consultation with the supervisor and the co-supervisor, and it was submitted and presented at the departmental level. Thereafter the proposal was submitted and presented at the school of health sciences research committee. Upon approval by the school committee, the proposal was submitted and presented to the faculty of the higher degree committee. The proposal was then submitted to the Turfloop Research Ethics Committee (TREC: 219/2019) for ethical clearance.

4.7.2. Permission to conduct the study

A copy of the ethical clearance letter, together with the proposal of the study, was submitted to the Department of minerals and energy Polokwane who then referred the researcher to gain to obtain permission from each mine. The ethical clearance and the proposal were submitted to the mine management in each mine, and the permission to conduct the research was granted.

4.7.3. Informed consent

The researcher and the research assistants explained the purpose of the study, which was to develop and validate strategies to enhance compliance with the Health and safety standards within the mining industries of Limpopo province in South Africa. The respondents were told that participation in the study is voluntary and they can withdraw at any time with no penalty. The respondents were be made aware that they were not be forced to respond to questions that made them uncomfortable or violated their rights. Those have agreed to participate in the study were asked to sign a consent form.

4.7.4. Confidentiality and anonymity

According to Denzin and Lincon (2011), confidentiality must be assured as the primary safeguard to protect people's identities and unwanted exposure. To reduce the risk of losing confidentiality from the respondents, the in-depth interviews were conducted in a private room. Furthermore, to ensure confidentiality, the participants were informed that all the filled questionnaires and recordings were stored in a safe place, and only the researcher, research assistants, and supervisors had access to them. The researcher and the assistants informed respondents that their names would be kept anonymous by allocating numbers instead of their real names. Furthermore, the respondents were ensured that their participation and their views would not affect their work, and their names and views would not be mentioned to their employer or line managers.

4.7.5. Right to privacy

Privacy refers to the freedom of a person to determine the time, extent, and circumstances under which private information is shared or withheld from others (LoBiondo-Wood & Haber, 2010). In this study, the interviews and self-administered questionnaires were distributed in the private room one employee after each other to ensure privacy. Furthermore, all the filled questionnaires and recordings were kept under lock and key, and the soft copy was locked on the computer.

4.7.6. Principle of Justice/non-discrimination

Denzin and Lincon (2011) outlined that the principle of justice insists on a fair distribution of both the benefits and burdens of research. In the current study, systematic random and purposive sampling techniques were used to select the respondents and the selected mines. To ensure fairness, the interview guide was used to ask the same questions, in the same manner, questionnaire, and also in the four languages (English, Tshivenda, Sepedi, and Xitsonga, which are spoken and understood by the respondents.

4.7.7. Principle of beneficenc*e*

Beneficence actions refer to the duty of researchers to avoid harm to the respondents (Flick, 2014). The study questionnaire was carefully structured to avoid psychological harm. Those who had signs of distress during the interviews were immediately referred to the psychologist.

4.8. CHAPTER SUMMARY

Chapter 3 of the current study discussed the research methodology which guided this study in detail. A mixed-method approach with the exploratory design was applied. Research paradigm, study setting, population and sampling, qualitative and quantitative strand, ethical considerations, and bias are discussed. The next chapter will discuss the results of the study.

CHAPTER 5

PRESENTATION AND DESCRIPTION OF THE RESULTS

The previous chapter discussed the methodology and the designs applied when conducting the study. The study adopted an exploratory, sequential mixed-method design, which involves a two phases project in which the researcher collects qualitative data in the phase, analyses the data, and then use the results to plan (or build on to) the second phase quantitative strand. This chapter discusses in detail the results of phase 1 of the study, which is the situational analysis. The first objective of phase 1 was explore the OHNP and the H & S team perception regarding compliance with health and safety standards. The second objective was to explore and describe miners and organizational practices related to compliance with health and safety standards in the mining industry. Thereafter the results were integrated and interpreted.

5.1. QUALITATIVE STRAND

Semi-structured one-on-one interviews were conducted to explore and describe the OHNP and safety team perspectives and practices regarding compliance with health and safety standards. Thematic analysis was applied to analyse data, and four themes and their sub-themes emerged. The results of the interviews generated input for the quantitative strand.

Thematic analysis was used to generate an understanding of the interviews. Existing literature Vaismoradi et al. (2015) describe a theme as the core product of data analysis that yields practical results in the field of study. Similarly, McConnell (2019) characterized a theme as a reflection of the storyline, which underlines the meaning and understanding of participants at the interpretative level. A sub-theme is a sub-division that describes the meaning of themes extensively. In this study, the themes and sub-themes were developed using the thematic qualitative analytic method to explain, describe and explore the essence of the participant's experiences. The processes/steps followed to develop a theme were described in chapter 5 of the study. Four themes and their sub-themes emerged during data analysis, as outlined in Table 4.3. The themes and their sub-themes are discussed below. The findings of the study are supported by a direct quotation from the participants.

5.1.1. DESCRIPTION OF THE DEMOGRAPHIC CHARACTERISTICS OF THE PARTICIPANTS

Non-probability purposive total sampling was used to sample 5 OHNP, 10 health and safety officers, and 5 safety representatives. The gender of the participants included (13) males and five (7) females. Their ages ranged between 23 and 63 years. The highest educational qualification was at the university level (degree), followed by the college (diploma). Most of the participants had more than five years of working experience. The demographic characteristics of the participants are presented below in table 5.1 and 5.2.

Table 5.1: Demographic characteristics of Occupational Health Nurse Practitioners

Gender	Age	Years of experience
Males = 2 Females= 6	21 - 30 = 1 31 - 40 = 5 41 - 50 = 2	0 - 5 = 4 6 - 15 = 4 16 - 25 = 2

Table 5.2: Demographic characteristics of Health and Safety Team

Gender	Age	Occupation	Years of experience
Males = 8 Females = 4	21 - 30 = 4 31 - 40 = 6 41 - 50 = 2	Health and Safety officer= 7 Health and safety representative = 5	0 - 5 = 4 6 - 15 = 5 16 - 25 = 3

Table 5.3: THEMES AND SUB-THEMES

THEME	SUB-THEME
1. Description of diverse experiences related to health and safety standards compliance among the mineworkers	1.1. Compliance versus non-compliance by the miners 1.2. Challenges related to leadership compliance 1.3. Challenges related to cost of safety compliance 1.4. Diverse barriers influencing compliance 1.5. Description of the impact of non-compliance on the safety of mines 1.6. Existence of conflict between production and safety
2. The significant role of communication channels regarding safety	2.1. Diverse description of the existing policies and procedures 2.2. Existence of the gap between the policies and practice 2.3. Availability of different communication Platforms of health and safety 2.4. Improvement of training and induction programme 2.5. Perception regarding compliance which is recognized in the documentation and filling process.
3. Significant roles played by safety officers and occupational health practitioners in promoting compliance	3.1. Promoting the culture of safety compliance within the organization 3.2. Health promotion and compliance 3.3. Poor feedback and communication from the manager.

	3.4. Peer pressure leads to poor adherence to health instructions
4. Perceived health and safety measures that can be adopted.	4.1. Health and safety compliance support measures 4.2. Token of appreciation to boost the morale of the miners 4.3. Supervisors/ Leadership must lead by example 4.4. Suggestion on the role of unions in ensuring health and safety

THEME 1: DESCRIPTION OF DIVERSE EXPERIENCES RELATED TO HEALTH AND SAFETY STANDARDS COMPLIANCE

The occupational health clinic and the safety department have a responsibility to promote the health and safety, and wellbeing of the employees at the workplace. However, they have shared different experiences related to compliance with the health and safety standards. Table 5.4 below illustrate theme 1 and its sub-themes.

Table: 5.4: Theme 1 And its sub-themes

THEME	SUB-THEME
1. Description of diverse experiences related to health and safety standards compliance among the mineworkers	1.1. Compliance versus none compliance by the miners 1.2. Challenges related to leadership compliance 1.3. Challenges related to cost of safety compliance 1.4. Diverse barriers influencing compliance

	1.5. Description of the impact of non-compliance on the safety of mines 1.6. Existence of conflict between production and safety

Sub-theme 1.1: Compliance versus non-compliance

The existing literature describes safety compliance as the process when employees adhere to the available procedures for safe performance of responsibilities in a safe way, including the use of safety equipment (Saad, 2016). In this study, there is by all accounts an overall agreement among the three OHNP on the high rate of compliance with health and safety standards. However, the safety officers disagree with them. The OHNP stated that miners are aware of the health and safety rules, which contributes to a high rate of compliance. This is evident from the participants' experiences in clinical health and safety compliance. Below are extracts taken from the transcribed interviews.

Participant 1 OHNP: ***"****Compliance Is high because they know that if there is an injury in the mine, it will affect their salary and bonuses, and every employee is aware of the health and safety rules".*

Participant 2: OHNP: "*Mine management is very strict with health and safety compliance; they even encourage the employees to stop any contractor who is not complying or who is working unsafely. That is why there is safety induction for every employee or any contractor in this mine they are very strict there".*

Participant 4 OHNP: *"They are complying because they continuously implement procedures, Standards, and Quality practices and training is provided for qualifications people are being continuously assessed and taken in for improvement for training or any qualifications within a specific field".*

The safety officers seem to disagree with the OHNP on compliance. When they were asked to elaborate on their experiences regarding compliance, this is what they said:

Participant 16: Safety officer: *"I will say if I had to rate the state of compliance in this mine out of 10 I will give you 7. The reason I'm saying this is that currently where I'm working, you will find that the employees are working in a noisy area and they not wearing the earplugs. They are expected to do hazard identification risk assessment, we'll find that that is working and they didn't do their hazard identification. Sometimes you will find that they have completed the paperwork but they are not wearing those earplugs so it's a serious challenge".*

Participant 12 Safety officer: *"Though we've got procedures in place, we are now looking at the employer. The employees see themselves as their role models. Like, now we go to the plant, I expect you to wear your PPE, but you will find people like the general manager without wearing the PPE inside the plant, in that case, do you think employees will take safety seriously they won't".*

Participant 14 Safety officer: "*it's a challenge. Because we were dealing with people that I meet you deal with a person, you will have situations where people did not respond appropriately, or people do not do things. Okay, so I will also go back to issues when we get people who try to take shortcuts as much as there are procedures that could have been put upon that person or that team to continuously improve this and to do that, to have this in place. You do find situations where people neglect standards, people neglect rules that have been put in place.*

The extract indicates diverse experiences regarding compliance with health and safety from the OHNP and the safety officers. What emerges from the OHNP is that there are rules and procedures in place implemented, which results in a high rate of compliance. At the same time, the safety officers maintain that from their lived experiences, they have observed that there is still a need to improve compliance among the leaders and the miners. The World Health Organization (WHO) Healthy Workplace Framework model outlines that how the leaders/supervisors describe and behave concerning safety affects how it is applied by the miners in its application in the workplace. The sub-theme that follows describes the challenges related to leadership compliance.

Sub-theme 1.2: Challenges related to leadership compliance

The participants were concerned that the supervisors are the front liners who can influence the miners positively or negatively in complying with safety. However, in most cases, the supervisors seem not to lead by example by not complying with the health and safety standards in the line of duty. This is confirmed by the quotes below:

Participant 17 Safety officer: *Leadership is a problem yesterday I was doing an inspection I found the supervisor operating the machine without the standard license according to the system or COP, No one is allowed to operate that machine without a license, so the miners adapt to that wrong behaviour if the leader is doing that the rest will follow that. as a result, those employees adapt to that behaviour that compromises health and safety*

Participant 14 Safety officer: *"We do not get support from managers and supervisors. It's very difficult to enforce compliance because even the supervisors themselves are not complying. We usually give them reports after inspection but you will find that nothing is done with those reports instead they wait for an accident to happen so that they can act, which is very discouraging."*

Participant 19 Safety representative; "*Again, compliance must start from management, we must learn from them because they are the custodians of the procedures. So they must comply and also enforce compliance, not from that lower level which is what is happening. They need to commit themselves to what is in the paper is what they are supposed to be practical. So for now, there's nothing"*.

The extracts above suggest that leaders must lead by example and implement the policies and standards, thereby complying during their day-to-day practice. The results concur with the study done by Amponsah-Tawiah, Ntowi and Mensah (2016) in Ghana which revealed that the commitment of leadership in ensuring effective formulation and implementation of health and safety policies influence how the miners perceive adherence. Mabika (2018) emphasised the importance of leaders in the mining organization to lead by example because their behaviour can either have a negative influence on compliance with safety rules. The sub-theme that follows looks at the leadership challenges related to compliance. Sub-theme 1.3 will present the findings on the challenges experienced related to the cost of compliance.

Sub-theme 1.3: Challenges related to cost of safety compliance

Though safety is of high importance in protecting the well-being of employees, there are some costs involved in its compliance which are described by the participants as barriers in safety compliance. They further outlined that sometimes the organization is unable to implement some of the safety standards due to the costs which are involved. This is confirmed by the following quotes:

Participant 3 OHNP *"the challenges that are there is about the cost of maintaining safety. the company is not doing well and they are expected to meet certain standards e.g they are expected to buy quitter machines for noise control and they have very old machines and they are very expensive".*

Participant 11 safety officer: " *I think if there can be a certain level of capital or budgeting giving focus to safety, the Safety Department if they can be a level of support that can be given to the Safety safety Department, not only financially, but also the resources and also the resources, also, with the production side of things, being able to support the safety environment, I think that can help with compliance and improvement in the Safety Department so that they can be able to be effective in the working environment in terms of the services that they bring them to the workforce*

It would seem that, although the mines are aware of the standards, health, and safety guidelines, they struggle to procure the necessary safety equipment that is needed. From the participants' views, this is a result of a shortage of funds. One would assume that such funds are budgeted for as safety should be a priority for all mining activities. This raises serious questions about the general safety of miners. But also raises questions about other possible barriers influencing compliance. The study done by Shaw, Verna Blewett and Schutte's (2011) supports the results, they outlined that failure to invest in technology reduces the practicability of risk controls; and much lower social expectations of working conditions, of the mining labour market. The sub-theme that follows looks at these possible barriers.

Sub-theme 1.4: Diverse barriers influencing compliance

When describing their views on the challenges that could be contributing to safety non-compliance participants described behaviour and experience as one of the factors in achieving safety compliance

Participant 7 OHNP: "*The other challenges that the management is faced with includes behaviour when certain who are not complying, who work under the influence of alcohol or drugs but there is security department they are being tested regularly but you still have those certain people who are under the influence".*

Participant 16 Safety officer:" "*So now I've seen as behaviour like in terms of incidents in their life, most of the incidents when analysed, it was found that the root cause was a behaviour issue. For example, when a person is expected to follow the procedure you will find the person doing short cut, like using one hand instead of using both hands when operating the machine which can result in a serious injury".*

Participant 13 Safety officer: "*For instance, like last week, we had an incident where the guy was pushing for something supposed to wait for the belt to come to collect it. So he decided to push and it overpowered him. Then he fell after failing things falls on s the top of his head. So that's why I'm saying most of the accidents are due to behavior issues"*

The study revealed the barrier related to non-compliance, which included the working experience and the behaviour of the employees.

Participant 15 Safety officer: "*And continuous is a point where continuous improvement. So yeah, it's a problem. It's a challenge. You have people who will stay in this position for this amount of and will also resist to have changed or to resist to have any other improvement comments or implemented from that. It's a continuous thing that is improved*".

Participant 8 OHNP: *"The educational level has improved because most of the miners are young, and the experience counts a lot because the injuries are more in the*

younger ones because of the human behavior because you will find that they are under influence of alcohol"

The OHNP and safety officers perceive that the barriers such as work experience, educational level, and behaviour contribute to non-compliance with the safety standards. According to the guidelines for the South African Small-Scale Mining, it is of high importance for the mining organizations to strengthen positive behaviour to promote a health and safety culture that is crucial for risk control in your workplace (Zungu, 2016). The sub-theme that follows looks at the impact of these barriers on the overall health and safety of the miners.

Sub-theme 1.5: Description of the impact of non-compliance on the overall health and safety of miners

Compliance with occupational health and safety legislation is of paramount importance for the reduction of work-related injuries and diseases. The participants expressed the following sentiments about the effect of non-compliance:

Participant 4 OHNP" *Yes there is a relationship between non-compliance and the occurrence of diseases because recently we submitted section 1.5 investigation which was the noise-induced hearing loss of which when employees are on site remove the earplugs. After all, they can't hear each other well which affects the hearing. This is happening in a certain department I can say is human behaviour."*

Participant 2 OHNP"*The other day we had an injury where the miner lost his finger, when we investigate we found that employee was not fit to work, he was blocked to enter the mine due to uncontrolled chronic disease. He was referred to the nearest clinic instead he went inside the mine and work".*

It is evident from the quotes above that non-compliance with the safety standards can result in the occurrence of occupational diseases such as noise-induced hearing loss and also in the occurrence of injuries. Moreover, the participates also indicate that though there are measures in place, the miners still do not comply with health

instructions. The results concur with the study done by Boniface, Maseru, Munthali, and Lett (2013) in Tanzania which revealed that poor adherence to safety rules are the major contributor to occupational injuries and fatalities, therefore there is a need for improving health and safety principles systems in the mines. The sub-theme that follows looks at the existence of conflict between safety and production.

Sub-theme 1.6: Existence of conflict between production and safety

In this sub-theme, the participants were asked to describe their experiences and their role in ensuring the health and safety of the miners during production. The following quotations illustrate their responses:

Participant 13 Safety officer: ***"****When I look at safety, like here, we are seeing six different production lines. But it's quite surprising to find out that most of the time they strive to push production while compromising safety. For example, you will find that people are using the machine and the emergency stop is not working but they just tick so that they can work and reach the targets".*

Participant 16 Safety officer: "*So one of the biggest challenges for production is always in conflict with the Safety Department. Because obviously, in the safety department we prioritize safety first, but the production department will prioritize production. So it gives us quite a big challenge because now you have to fight with production people. At the end of the day, the challenge lies with the top management and the safety management, not being able to be on the same table to reach an amicable agreement that will ensure the smooth running of production which prioritizes safety."*

Participant 7 OHNP "*I believe in this mine though they are pushing production they have level safety rules. every person who enters the mine has to go through induction and also come to the clinic so we can check whether they are fit".*

Participants raised a concern that there is a need for the mine to prioritise safety first and overproduction. They further elaborate the issue of imbalance between production

and safety create conflict between safety and production. Tibane and Niemand (2017) argued that in most mining organisations production pressure has always been identified as the main fundamental cause of poor compliance by miners. Whereas Lim, Murray, Dowdeswell, Glynn, and Sonnenberg (2011) raised a concern that in most instances the miners are under pressure to meet the production pressure which results in "doing things faster" while compromising their health and safety. Theme two will present the role of communication channels on health and safety.

THEME 2: SIGNIFICANT ROLE OF COMMUNICATION CHANNELS REGARDING SAFETY

Participants shared different perceptions related to the current state of health and safety compliance in their workplace. Table 5.5 below shows 4 sub-themes that emerged from this theme.

Table 5.5: Theme 2 and its sub-themes

THEME	SUB-THEME
2. The significant role of communication channels regarding safety	2.1. Diverse description of the existing policies and procedures 2.2. Existence of the gap between the policies and practice 2.3. Availability of different communication Platforms of health and safety 2.4. Improvement of training and induction programme 2.5. Perception regarding compliance which is recognized in the documentation and filling process.

Sub-theme 2.1: Diverse description of the existing policies and procedures

Health and Safety in the mines are guided by the Mine Health and Safety Act (MHSA, Act no 29 of 1996), which provides the regulations for the protection of the health and safety of employees and other persons at mines. The following quotes describe the perception of the OHNP and the safety officers with regards to the knowledge and the availability of the policies and guidelines;

Participant 3 OHNP *"The mine falls under DMR which they come and does audits. There are also policies and procedures in place to guide on the health and safety compliance, and they are displayed in different work stations.".*

Participant 15 Safety officer *"The mine is regulated by DMR regulations which are based on compliance to mine health and safety act. Currently, the mine organizations comply with the health and safety standards which are regulated by MHSA"*

Occupational health nurse practitioners and the health and safety team were in agreement that in this mine, there are health and safety policies, guidelines, and regulations in place that guide the mines with regards to health and safety practices and compliance. Though there are policies and standards, there are gaps identified which are described in the sub-themes that follow.

Sub-theme 2.1: Existence of a gap between policies and practice

The participants raised a concern that although there are policies, regulations, and standards known by everyone in the mine, there is a challenge related to the practice or implementation of those policies.

Participant 15 Safety officer: "*The challenges are the Safety Department that we face as well. But it goes back to people not responding appropriately to safety standards that are in place, people neglecting procedures that we put in place"*

Participant 5 OHNP: "*Though the miners know that they are not supposed to go inside if they are not fit, they've created a culture of non-compliance or ignorance on it. But we monitor them and we have the working system that allows them to block someone*

who is not fit, they will come back to the clinic and we assess and refer when necessary and to give them the period, maybe a month before the eighth. If that person doesn't come here before the end of the gate, they don't allow it.

Participant 11 Safety officer: *The challenge is that even though people know the procedures, they want us to continuously remind them of the things that they need to do, which they're not doing right, And you'll find basic things such as your pre-start checklist that are not filled in correctly or they have been filled in just for record purpose".*

The study findings revealed that there is a gap between knowledge and practice of the health and safety standards. Thus there is still a need to improve the culture of compliance. According to Jacinto et al. (2011), the correct application of legislation in companies can prevent and control an undesired event, and even diminish its impact On the other hand Salguero-Caparros, Pardo-Ferreira, Martinez-Rojas, Rubio-Romero (2020) emphasised the need for the mining companies to shift from prescriptive standards and recognition of compliance and implement the assessment of how legal compliance affects means for day to day performance. The sub-theme that follows presents different communication platforms on health and safety.

Sub-theme: 2.3: Availability of different communication Platforms about practices and standards.

Narayan and Nair (2021) underscored the significance of powerful correspondence in health and safety concerning accomplishing a physical issue free work environment. The study participants were asked to describe how the mine communicates with miners on health and safety standards and policies. The quotes are as follows:

Participant 8 Safety officer: *"There are different types of levels of communicating line, we've got three areas we looked at before starting with the way the supervisors will prepare information that has been distributed by the communication board. So this can be the internet way or communications department, the state, each department will have an opportunity to print out the communication, and then take it down to the*

employees so that in their green areas, they're able to communicate with their subordinates. Now, you did talk about the current area and the other area is the intranet.

Participant 13: Safety officer: *And so some of the employees that have access to computers, and they will have access to those things, we've got the notice boards around every section. That goes, that's another means of communicating. We've got some web services, something that is being distributed any information incidents in agencies, that is also distributed alongside every department, director"*

The study results revealed that in this mine, different communication channels (notice board, computers, departments, and websites) play a vital role in safety compliance. . According to Dragan, Georges and Mustafa (2017), adherence to the health and safety standards/ policies is influenced by the practice of knowledge exchange systems and the degree of knowledge exchange in the organizational system, both within and between units. The sub-theme that follows looks at the communication channels through training and induction programmes that must be improved.

Sub-theme 2.4: Training and induction programme need improvement

With regard to training and induction, participants were concerned that there is a need to improve the facilitation of these programmes to improve compliance. The following quotes support this sub-theme.

Participant 17 Safety representative: *"There is a need to improve training through the introduction of different methods on occupational health and safety, first aid and hazard identification and risk assessment".*

Probing questions were asked to the participants to describe how the participant think training and induction can be improved, and the participant responded as follows:

"I think we must facilitate training in such a way that we must engage the miners in different activities such as drawing to accommodate those who learn slowly and also some don't understand English."

Participant 20 Safety representative: "*In this mining training is prioritized but even though the miners are trained they sometimes take short cuts and accidents occurs", I think it will be better if we can involve them in training by giving them different activities"*

Participant 13: Safety officer: ***"****Training is implemented, for example, if we have an incident, right, and it is found that people did not respond according to emergency procedures, for example, it will it can be it can be advanced that the employer is continuously taking those people in for training, and have them re-evaluated and just to ensure that they are competent, whatever task that they have implemented". But I think we can improve on the training by using their language because some are not educated".*

The current study revealed that the implementation of induction and training programmes remains a priority. However, there is a need for improvement on how it should be facilitated. The sub-theme that follows presents the regarding the recognition of compliance. In support of the findings of this study, Reddy et al. (2012) reported that regular training provides insight that encourages miners to comply with health and safety instructions such as the use of PPE. The Occupational Health and Safety Act no 83 of 1993 states that it is the responsibility of the employer to provide adequate information, instruction, and training on the risk and hazards and prevention how they can be prevented.

Sub-theme 2.5: Perception that compliance is recognized in the filing and documentation.

The Mine health and safety act outlined the importance of effective monitoring systems and inspections. However, in this mine, health and safety officers raised a concern that though safety inspections are done, the reports on the inspections are not implemented to correct the deviations, but they are used for filling purposes.

Participant: 10 Safety officer: *"I will say it is 50/50 we have those who are educated and have experience but they still do not comply. Since and of course, we'll find a person who was well educated, like an artisan who is working is expected to know. When you operate the machine you must first complete the checklist, but you will find*

that the same person who is educated when you do the inspection that he just ticked without checking the machine:"

Participant: 18 Safety representative: " *We randomly check the checklists, certain things need to be in place. And then when you do find someone that's about to operate an LTP or equipment, they will prioritize doing the ticking exercise but not prioritize doing the checking according to the checklist".*

Participant 9 Safety officer: "*So you will find that there's an operating the machine without doing proper inspection they only tick and at the end of the day, the resulting incidents and incidents are costing a lot of money.*

The role of safety officers in doing inspections to identify hazards seems to be ineffective. Thus the reports are not acted upon; instead, they are used for filling purposes. Theme three will focus on the role of the OHNP and safety officers in ensuring health and safety in the mine.

THEME 3. SIGNIFICANT ROLES PLAYED BY SAFETY OFFICERS AND OCCUPATIONAL HEALTH NURSE PRACTITIONERS IN PROMOTING COMPLIANCE

Occupational health nurse practitioners and the health and safety officers described their different roles in ensuring compliance with health and safety standards. According to (Hatting & Acutt, 2016; WHO, 2001), the OHP experts are skilled in thinking about factors, like human conduct and habits about real working practices. They additionally team up in the origination, and rectification of work factors, decision, and quality of protective equipment, protection of miners from injury and illnesses, just as giving guidance in issues concerning the assurance of the climate Table 5.6 Describes the sub-themes which emerged from this theme.

Table 5.6: Theme 3 and its sub-themes

THEME	SUB-THEME
3.Significant roles played by safety officers and occupational health practitioners in promoting compliance	3.1. Promoting the culture of safety compliance within the organization 3.2. Health promotion and compliance 3.3. Poor feedback and communication from the manager. 3.4. Peer pressure leads to poor adherence to health instructions

Sub-theme 3.1: Promoting the culture of safety compliance within the organization

The participants described their different roles in promoting the culture of safety compliance. They further described that improving compliance is a continuous process that needs to be improved constantly.

Participant 9 Safety officer *"You do find situations where people neglect standards, people neglect rules that have been put in place. It is a continuous ongoing thing where we try to improve that people want to just try to comply and to adhere to all safety standards that are put in place. So it's also an ongoing improvement process in terms of that training is also improved among the employees to continuously implemented. To this culture of working, that the way compliance or safety compliance.*"

Participant 6 OHNP: *"In the clinic, my responsivity is to ensure that everyone in the mine is safe and also ensuring that their work environment does not affect their health. We teach them continuously on health-related issues to prevent the occurrence of accidents and diseases.*

Participant Safety 15: safety officer ***"****My role is to enforce compliance. Secondly, the employer gives us all the procedures we need to go through the procedures and know what they're expecting from us and also the miners. So my goal is to make sure that people the safe must enforce compliance. So I'm like the police who check around if people are complying".*

The aspect that stands out from the extracts above is that the OHNP and safety officers have important roles to play in ensuring safety compliance. On the same issue, Hatting and Acutt (2016) highlighted that the occupational health professionals have major responsibility concerning medical problems, and especially on their relationship to working capacity, wellbeing, and safety at work or where alterations to the work or workspace can be made to assess the changing wellbeing status of representatives. The sub-theme that follows describes the role of OHP in health promotion and safety compliance.

Sub-theme 3.2: Health promotion and safety compliance

One of the major roles of the occupational health clinic and the safety department is to prevent, promote and ensure the health of both the miners and the employer and also to ensure that the environment is safe.

Participant Safety 20 safety representative "*My role is to assist in terms of all technical things when it comes to safety in the workforce, especially for my specific department. So my role is to handle all safety-related issues that have to do with my department and not necessarily close myself in for my department. But obviously, even if there are any other safety issues that I also assist in other departments".*

Participant 5: OHNP: *"My role is to ensure that employees are fit to work, this is ensured examination which is done when the miner is employed for the initial first time, or pre-employment, annual and exit medical examination. I do the physical assessment. And then they do check the audio drives the vision. And then for me, I'm going to assess that employee, is fit and go and work. If he or she is not fit we refer*

him for medical treatment from the specialist. And the mine hs a system where they block the employees who are not fit to enter the gates".

Participant 6 OHNP: *"To ensure health and safety we do initial, periodic, and exit medical examinations in this clinic. By assessing the miners following the standards from the mine and the MHSA act. But when we discover abnormalities we do refer them for further management and we also communicate with their supervisors to ensure that they don't go to work until they are fit".*

Participant 1: OHNP: "*I do safety walk-through every week in all the departments checking if they are complying, I also do medical examinations to ensure that the employees are fit to work. In this clinic, we also do health awareness at least twice a year usually in June and September where we address health-related problems such as HIV, cancers, and chronic conditions."*

Participant 18 safety officer: *My role is to ensure compliance. In terms of all the safety standards and ensuring that the DMR regulations are effectively implemented, my role is to monitor compliance, my role is to enforce compliance. My role is to assist in terms of all technical things when it comes to security in the workforce, especially for my specific department. So my role is overall to handle all safety-related issues that have to do with my department, and not necessarily close myself in for my department. But obviously, even if there are any other safety issues that I cannot close, outside of my department*.

Participants describe activities (Medical examination awareness and safety walk) that they do to promote ad ensure the safety of the miners. According to Smith (2015), health promotion activities have the potential to change the miner's health practices such as choice of a healthy diet, exercising more frequently to prevent occurrences of chronic diseases. Additionally, these activities have the potential to reduce the incidence of injuries and accidents because miners will be having more knowledge on health-related risks that might endanger their lives.

Implementing an educational and training programme in the mine with a specific focus on creating a culture of safety among miners and more focus on safe working

conditions can help overcome the challenges of non-compliance (Smith, 2015) The sub-theme that follows looks at the resistance of poo feedback from the managers.

Sub-theme 3.3: Poor feedback and communication from the manager

This is supported by the following quotes:

Participant 15 Safety officer: ***"****So the biggest thing that we have to say is, we don't tell, we don't have anything to say we don't engage with other companies because we have this thing called tripartite whereby every quarter, three months, different representatives from the mines meet to discuss safety issues and they also discuss the challenges concerning health and safety. So, in our case, only our manager attends and he does not give us feedback so we can improve our practices*

Participant 20 Safety representative: *"Communication is a problem, people don't communicate well especially with us. Sometimes they only tell us proper reports if they know that audit is coming and we must prepare which is not right. But you will find that they attend meetings with other stakeholders without even giving us feedback o that we can improve on how we do things".*

Participants raised a challenge of poor communication and networking in health and safety issues. The study was done by Mabika (2018), the participants emphasized the importance of communication at different levels, more importantly, they also indicate that it promotes adherence, confidence, and trust. The sub-theme that follows presents the challenges of poor adherence due to peer pressure.

Sub-theme 3.4. Peer pressure leads to poor adherence to health instructions

The participant's perceived peer pressure as one of the contributing factors in contributing to non-adherence with health and safety instructions. The following quotes indicate the influence:

Participant 7 OHNP: *" We do experience challenges with adherence to chronic medications from the miners. You find out that they discuss among each other and convince each other that treatment will affect their manhood and they end up defaulting".*

Participant 5 OHNP: "*We usually experience non-compliance with chronic treatment, especially among the males, as compared to women. But with the males is a major problem especially the older ones they talk among each other and they decide to use other alternatives to manage their conditions such as church tea".*

Participant 16 Safety officer: "*Some is peer pressure and some is because of ignorance. Like you will find that they influence each other not to wear earplugs and convince each other that they will hurt their ears. Those are the challenges we are experiencing daily, but we keep on enforcing."*

The aspect that stands out from the extracts above is that peer pressure leads to non-adherence to health and safety instructions. The major theme that follows presents the perceived measures that can be adopted to improve compliance with the health and safety standards.

THEME 4: PERCEIVED HEALTH AND SAFETY MEASURES TO IMPROVE COMPLIANCE.

Based on their experiences, the following strategies were suggested by the participants to improve health and safety compliance. Table 5.7. Presents the sub-themes.

Table 5.7: Theme 4 and its Sub-themes

THEME	SUB-THEME
4.Perceived health and safety measures that can be adopted.	4.1. Health and safety compliance support measures 4.5. Token of appreciation to boost the morale of the miners 4.6. Supervisors/ Leadership must lead by example

	4.7. Suggestion on the role of unions in ensuring health and safety

Sub-theme 4.1: Health and Safety compliance support measures

T7e participants were concerned that their departments don't get enough support from the management and the supervisors, which become a barrier in the complete implantation of health and safety duties. The following quotes indicate the suggestions:

Participant 18 Safety officer: " *We don't know from our side from an administrative department, we don't get support. There's no support from the people that are supposed to support from the true department more especially senior managers. So it's very difficult to enforce compliance. Because you go there and make recommendations and report to the supervisor of that section. When you go back the following day you find the same thing when that you have reported not corrected. And when you ask the shift supervisor will tell you that my manager spoke to your safety manager which means you are nothing. This is something that discourages us it cant kill you inside."*

Participant 9 Safety Officer: "*Okay, so it's the challenge that we are experiencing. for us to enforce compliance we must get support from the management. It's like when I go to the plant and do an inspection you find that there is no one fixing the deviation even though the report was given to the manager, he will just sign and file it. They will only act when the accident occurs.*

Participant 9 Safety officer: "*They have to teach management not to take shortcuts because they are role models and miners follow what they do. More especially engineering sites, where you're supposed to buy a certain machine, they will go for a second-hand machine and at the end of the resulting incident, fire incident should have been avoided. For example, last week, we had the very same findings from the audits that we have been saying that we need to have an automatic communication system. There is no means of communication. So they know it very well because there's a*

procedure in place and risk assessment in place. To say in this area, we need to put one to two"

The aspect that stands out from the extracts above is that the leadership has the power to enforce health and safety in the mine by leading by example. Once the individuals which lead the company have a clear understanding of and commitment to the role and importance of safety compliance management, it is far easier for it to filter down as a key driver of successful working (Pro-resources, 2019). Managers and supervisors must serve as role models for the safety programs. The sub-theme that follows presents the suggestion by the participants for the mine management to introduce a token of appreciation.

Sub-theme 4.2: Tokens of appreciation to boost the morale of miners and to enhance zero harm

Participants believe that safety compliance can be improved through the initiation of safety activities that can boost the morale of the miners. Such activities are described in the quotes below:

Participant 11Safety officer: *"We used to have first aid competition. We used to have tokens of appreciation in cases where we had zero incidences. There were also safety competitions and they will be asked to do safety-related activities and will get tokes of appreciation such as pens and other small things that motivate them. We don't have any tokens of appreciation anymore to boost their morale."*

Participant 13 Safety officer: *When employees are not recognized for achievements such as zero accidents or adherence to safety, they become demoralized. Like when they achieve certain things like zero harm safety they are not recognized? They only blame them when the accident occurs. I have been working in this mine past 18 years we used to have top-notch safety culture whereby we wi have annual safety competitions to motivate the miners. It was done once a year, just appreciate and motivates them and to show that we as a company recognize them."*

Participants reflected on their previous experience where there was a token of appreciation that was offered to appreciate and boost the morale of miners on safety compliance. These were viewed as some of the strategies that could bring change in the current situation of compliance in this mine. According to Zungu (2016) rewarding good safety, performance must be used as a motivation to the miners to adopt a positive health and safety culture which is crucial for risk control at the workplace. More importantly, miners are the key to the success of the organization therefore, inspiring and engaging with the miners should be considered as the top priority. The sub-theme that follows present the proposal on the leadership role to lead by example.

4.3. Supervisors/ Leadership to lead by example

The participants view the leaders as role models who should always and constantly maintain the role of safety compliance in different departments. The following quotes indicate the need to improve the behaviour of the leaders:

Participant 17 Safety representative "*Leadership is a problem. I was doing an inspection yesterday and I found the supervisor operating the machine without the standard license according to the system or COP. No one is allowed to operate that machine without a license, so the miners adapt to that wrong behavior if the leader is doing that the rest will follow that. As a result, those employees adopt behaviors which compromises health and safety".*

Participant 5 OHNP *"Again, it must start from their management, we must learn from them because they are the custodians of the procedures. So they must comply and enforce compliance. Note that compliance to starts from that lower level but the leaders downward. So they need to commit themselves to what is in the paper is what they are supposed to be practical. So for now, there's nothing in support".*

Participants suggested that health and safety compliance can be improved by improving the behaviour's and the leading role of the managers and supervisors. Okorie, Okoro, and Musonda (2016) argued that a positive change at the upstream usually manifests the downstream (safe behavior of workers), therefore, optimal health and safety compliance of the miners can be achieved through the right attitude and

behavior of the shift leaders and supervisors Along these lines, the South African mining industry ought to take on moral authority methodology, and the explanation or advantage for the moral culture is that the managers are needed to guarantee that the area is run morally as this will help the area to accomplish safety compliance aiming to prevent injuries and accidents (Shivambu, 2017). The sub-theme that follows presents the suggestions on the role of unions in ensuring safety in the mines.

Sub-theme 4.4: Resolution of conflict between the powers of union representatives and health and safety procedures

The participants raised a concern that unions mostly interfere with their role in ensuring the health and safety of the miners. The following quotes indicate the experiences:

Participant 1 OHNP: "*The major challenge that we have is the unions they interfere with the health and safety issues. Like you find that the miner is not fit due to a certain medical condition but you will find that they influence the miners and start to interfere with the occupational health clinic procedures"*

Participant 6 OHNP: *"The problem is that the unions want to be seen doing the job by representing the miners and in other instances, they want to deviate from the regulations especially when it comes to fitness we are always having problems because of their interference."*

When the participant was asked to further explain this challenge, this is how he responded:

"*The unions always come to the clinic with the miners to question why miners are not fit to work and they provide support to the miners without even understanding their medical condition and how it will affect the overall safety of the other miners. What I do I always refer them to the guidelines and procedures".*

The OHNP are the main coordinators of the health activities in the mine and also in ensuring that all the miners are fit to work. They were able to describe challenges related to the union's representatives whom they perceive are overusing their powers by disturbing their role in ensuring compliance with the policies and the procedures. They further suggested that the union must stop interfering with the health and safety

procedures and support the miners with compliance with the health and safety standards. On the contrary Walters et al. (2017) argued that sometimes union representatives differ with the supervisors on the appropriate actions based on their regulatory framework to which aims to protect the miners.

5.1.2 Summary of the qualitative strand results

The qualitative strand took place from October 2019 to March 2020. Semi-structured one-on-one interviews were conducted among the ONNP and the health and safety teams in different departments. The OHNP and the safety team described their lived experiences and challenges related to safety compliance. The following were the main findings of qualitative strand: experiences related to health and safety standards compliance among the mineworkers; the significant role of communication channels regarding safety; significant role and challenges experienced played by safety officers and occupational health nurse practitioners in promoting compliance and perceived health and safety measures that can be adopted. To further explore and describe the experiences and challenges, the results from the interviews were used to develop a data collection instrument in the quantitative phase, which is presented below.

5.2. PRESENTATION OF QUANTITATIVE STRAND

The study adopted a mixed-method approach. The study commenced with the qualitative strand, and thereafter the results from the themes and sub-themes which emerged during thematic analysis were used to develop data collection tools for the quantitative phase. According to Creswell (2015), one of the limitations of a qualitative research approach is a bias where the researcher might influence the results, and more importantly, qualitative results can not be generalized because of the sample size. In this study, the use of a quantitative approach enabled the researcher to generalize the qualitative results to a larger population of miners in different departments.

5.2.1. Response rate

To ensure that the findings of the study are representative of the whole population, a total of 370 questionnaires were distributed, and 300 were returned. However, only 277 questionnaires were considered for data analysis as they were fully completed.

5.2.2. Presentation of the results

Data were analysed using SPSS version 26.0 with the assistance of the University statisticians. Tables, graphs are used to present data which is divided into two parts: demographic data and the main results.

5.2.3. Demographic data

A detailed description of respondents' demographic information permits the readers and scholars to establish to whom the study results generalize (Hammer, 2011). The description also allows the study to be transferred to a different setting or to be compared in case of replication. The respondent's gender, age, years of working experience, employment status, level of education, and religion are described below.

5.2.3.1. Gender Distribution

The respondents were made up of fewer females (11%), and the majority were males (89%), as indicated in figure 5.6. The issue of gender inequality has been under discussion in the SA mining industry, with the provisions for the inclusion of women in core mining activities and requiring 10% of core positions to be filled by women. The age distribution of the miners was grouped into 5 categories. There were few respondents (5%) above the age of 59 years. Those aged between 49-58 were (14%), followed by 39-48 category (39%). Between the 29-38 were (28%) and the miners below 28 years were (23%). Figure 5.7 Shows the age range percentages.

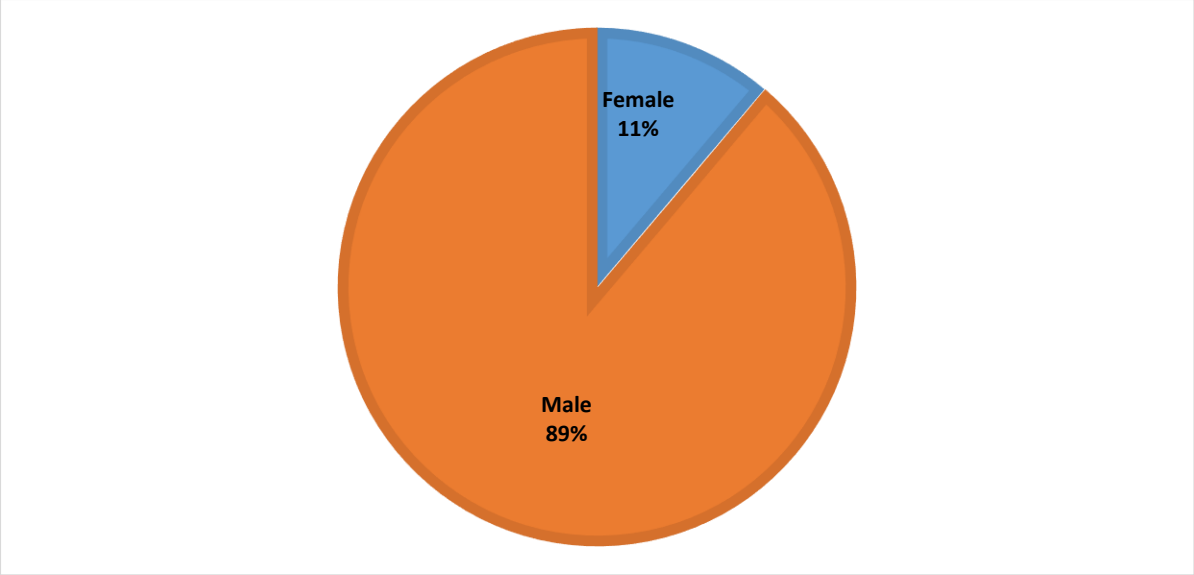

Figure 5.6: Demographic characteristics reflecting gender distribution

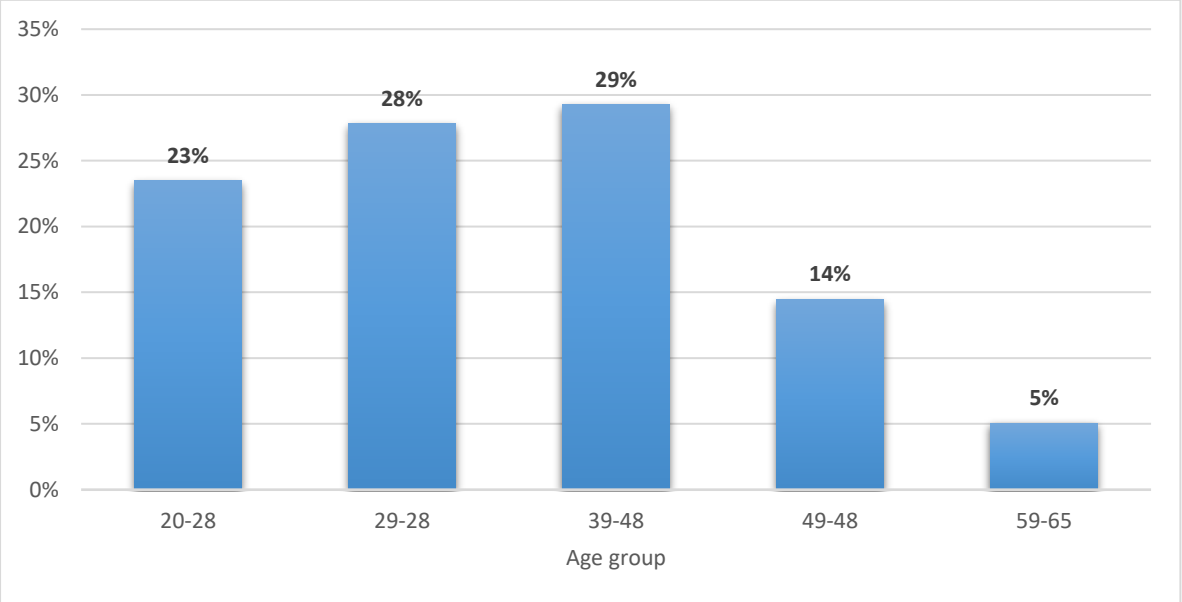

Figure 5.7. Demographic characteristics reflecting age distribution

5.2.3.2. Years of Experience and Employment Status

The miners who were more experienced had 10 or more than 10 years of working experience with only 61% and those with 5 years and less (39%). The majority of the

respondents were employed on a full-time basis (84%), and 16% of miners were either employed on a part-time or temporary basis.

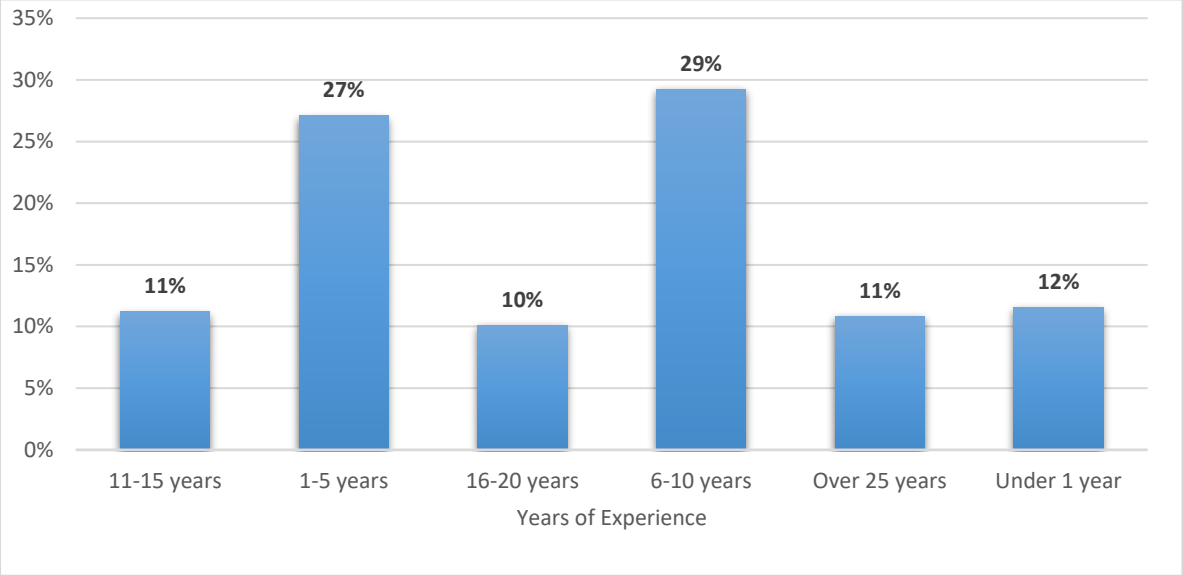

Figure 5.8: Demographic characteristics reflecting years of experience

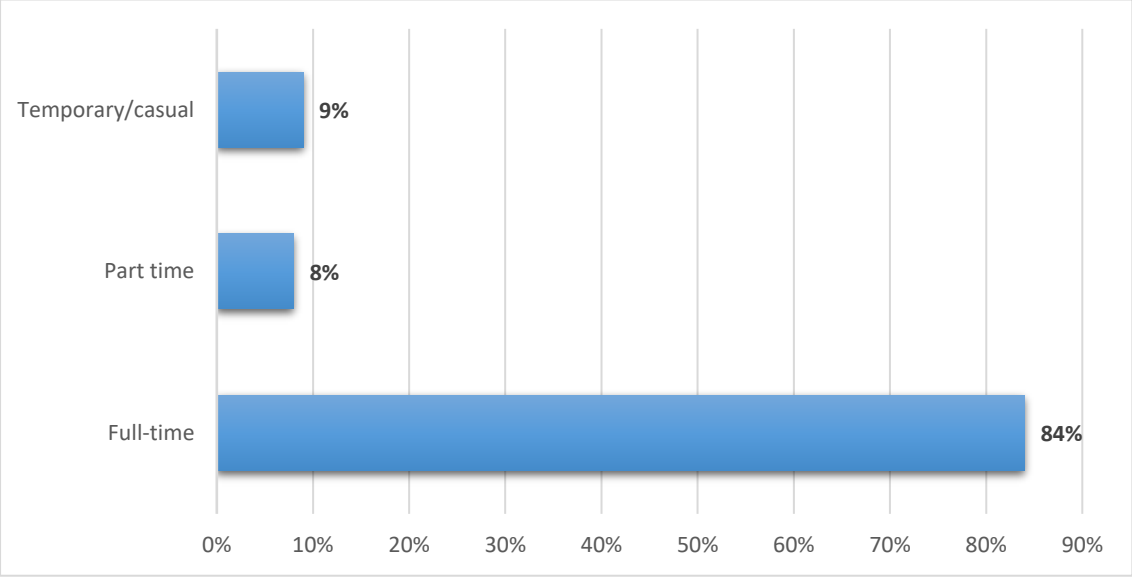

Figure 5.9: Demographic characteristics reflecting employment status

5.2.3.2. Level of Education

In terms of educational qualification, only 51% of the miners had a tertiary qualification, either college certificate or university degree, 42% had high school education, and 7% had primary school education. A study done by Shibambu (2017) outlined that

because historically South Africa is an underprivileged country, most of the people are not educated, especially the old generation, and therefore they lack skills and qualifications. However, the current study results show that there is progress in eliminating the gap of lack of qualification and skills.

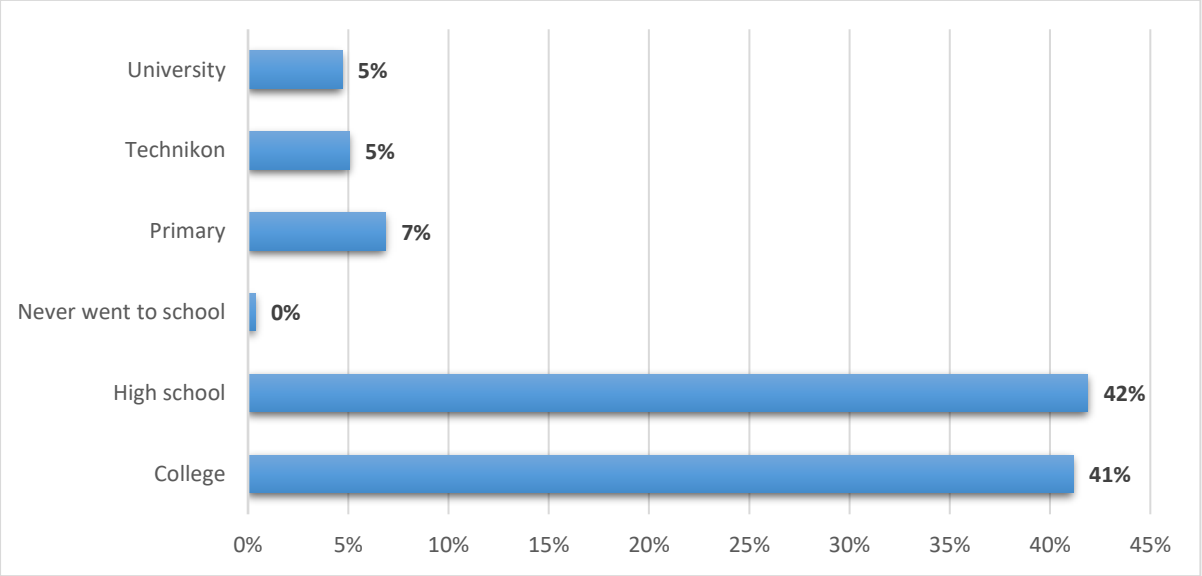

Figure 5.10: Demographic characteristics reflecting the educational level

5.2.3.3. Religion

The findings of the study revealed that the majority of participants (92%) believe in Christianity, while 6% believe in traditional healers. This means that there is common practice and belief system in this mine.

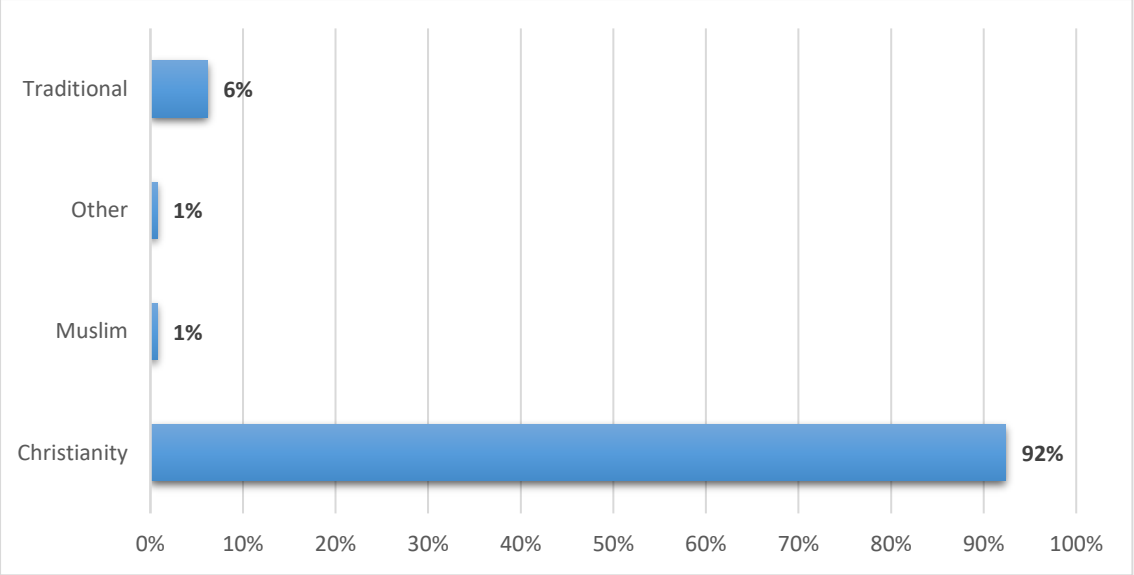

Figure 5.11: Demographic characteristics reflecting the religion

5.2.4. Presentation of the main results

The study findings are presented according to different sections in the questionnaire reflecting the responses of the question items. A descriptive statistical test was used in the analysis of data, including frequencies, means, and standard deviation. Pearson correlation tests were also used to test the relationship between variables. Cronbach's alpha test was used to measure internal consistency.

5.2.4.1. Section A: Health and safety policies standards and regulations

Section A of the questionnaire required the respondents to indicate their level of agreement or disagreement on the availability and implementation of health and safety regulations to enhance compliance. The results are presented in Table 5.8.

Table 5.8: Frequencies and the percentages: Health and Safety regulation standards and regulations.

Scale: 1= strongly disagree, 2= Disagree, 3= Agree, 4= strongly agree, 5 = Uncertain

Health and Safety policies, standards, and regulations	1	2	3	4	5
➢ Safety regulations and standards play an important role in avoiding accidents the mines	127 (41.5%)	4 (1.3%)	133 (42.1%)	5 (1.6%)	7 (2.2%)
➢ Violation/Non-compliance of health and safety regulation causes accidents	40 (12.7%)	11 (3.5%)	149 (47.2%)	65 (20.6%)	12 (3.8%)
➢ I know the regulations designed to protect the health and safety of employees in this mine	109 (34.5%)	4 (1.3%)	152 (48.1%)	11 (3.5%)	0 (0%)
➢ I receive full training on health and safety regularly in this mine, which fully prepared me to identify risks and comply with the regulations	95 (30.1%)	3 (0.9%)	156 (49.4%)	4 (1.3%)	14 (4.4%)
➢ Policies for improving health and safety are published at the mine administration.	81 (25.6)	5 (1.6)	166 (52.2%)	-	24 (7.6)
➢ I understand the language used to publish policies, standards, and instructions at my workstation.	97 (30.7%)	3 (0.9%	154 (48.7%)	2 (0.6%	19 (6.0%)
➢ My employer has developed specific health and safety standards that relate to the work that I do on a daily basis.	75 (23.7%)	4 (1.3%)	172 (54.4%)	-	24 (7.6%
➢ The health and safety is taken seriously and respected in this mine	73 (23.1%)	7 (2.2%)	158 (50.0%)	1 (0.3%)	30 (9.5%)
➢ The existing health and safety standards cover all the risks in this mine	81 (25.6%)	9 (2.8%)	162 (51.3%	-	21 (6.6%)
➢ There are adequate policies for investigating and preventing further accidents	67 (21.2%)	16 (5.1%)	155 (49.1%)	-	38 (12.0%)
➢ There is a need for the mine to develop the measures to create a high standard of safety culture.	27 (8.5%)	7 (2.2%)	226 (71.5%) -	-	16 (15.1%)
Cronbach's Alpha	**0.893**				

The results indicate that (42.1%) agreed and strongly agreed that safety regulations and standards play an important role in avoiding accidents in the mines, followed by 40.2% who strongly disagreed and disagreed.

According to Haradhan (2017), Cronbach's alpha values above 0.8 are usually considered quite well. The current study Cronbach's alpha is 0.893 for the health and safety regulation standards and regulations dimension, which indicates a high level of internal consistency for our scale with this specific sample.

5.2.4.2. Section B: leadership influences on health and safety compliance

Section B of the questionnaire presents the frequencies and percentages on how leadership influences compliance with health and safety standards. The measurement results are presented in Table 5.9.

Table 5.9: Frequencies and percentages: leadership influence

Scale: 1= strongly disagree, 2= Disagree, 3= Agree, 4= strongly agree, 5 = Uncertain

Leadership influences	1	2	3	4	5
➢ The mine management makes honest and reasonable efforts to promote a healthy working environment	59 (18.7%)	7 (2.2%)	206 (65.2%)	-	4 (1.3%
➢ My immediate supervisor consistently model respectful safety culture in my duty station	48 (15.2%)	5 (1.6%)	203 (64.2%)	1 (0.3%)	20 (6.3%)
14 The mine takes miners' actual rights and interests into consideration	54 (17.1%)	24 (7.6%)	184 (58.2%)	-	15 (4.7%)
➢ People oriented safety culture is practised and considered	66 (20.9%)	16 (5.1%)	175 (55.4%)	5 (1.6%)	277 (87.7%)
➢ The culture created in this mine is to value the profit of the company ahead of the safety of the miners	67 (21.2%)	36 (11.4%)	162 (51.3%)	-	12 (3.8%)

➢ Health and satey team play an important role in ensuring safety in the mine accidents the mines	51 (16.2%)	2 (0.6%)	210 (66.5%)	5 (1.6%)	2 (0.6%)
Cronbach's Alpha	**0.838**				

The majority of the respondents (65.2%) agreed that the mine management makes honest and reasonable efforts to promote a healthy working environment, followed by (16.8%) who disagreed. 58.2 % agreed that the mine take miners' actual rights and interests into consideration, followed by 17.1% who disagreed. The majority of the miners were uncertain whether people-oriented safety culture was practised and considered. 51.3% of the respondents agreed that the culture created in this mine is to value the profit of the company ahead of the safety of the miners, whereas 32.6% disagreed. Health and safety teams play an important role in ensuring safety in mine accidents the mines. The majority of the participants (66.5%) agreed that the health and safety team plays an important role in ensuring safety in the mine accidents in the mines, and 16.6% of the respondents disagreed.

Leadership influence on health and safety compliance was grouped with seven items. Cronbach alpha for these variables is 0.838, which is an indication of the consistency and reliability of data.

5.2.4.3. Section C: Political and economic influence on health and safety compliance

Section C of the questionnaire presents the frequencies and percentages of the level of agreement on the political and economic influence on health and safety compliance. The measurement results are presented in Table 5.10.

Table 5.10. Frequencies and percentages: political and economic influence

Scale: 1= strongly disagree, 2= Disagree, 3= Agree, 4= strongly agree, 5 = Uncertain

Political influences					
➢ The unions and different organizations in the mine influence the behaviour of employees towards compliance with the standards.	68 (21.5%)	28 (8.9%)	169 (53.5%)	-	12 (3.8%)
Economic influences					
➢ Lack of resources and proper equipment's causes non-compliance in this mine	62 (19.6%)	26 (8.2%)	177 (56.6%)	-	12 (3.8%)
➢ The production pressure contribute to the non-compliance with the health and safety standards	51 (16.1%)	40 (12.7%)	170 (53.8%)	-	277 (17.7%)

Table 5.4 above shows that 53.5% of respondents agreed that the unions and different organizations in the mine influence the behaviour of employees towards compliance with the standards. Whereas 56.6% agreed that there was a lack of resources and proper equipment's causes non-compliance in the mine, followed by (27.2%) who disagreed. 58.8% agreed that the production pressure contributes to non-compliance with the health and safety standards, and 28% disagreed.

5.2.4.5. Section D: Environmental influence on health and safety compliance

Section D of the questionnaire presents the frequencies and percentages on how the mining environment influences compliance with health and safety standards. The measurement results are presented in Table 5.11.

Table 5.11: Frequencies and percentages: Environmental influence

Environmental influences					
➢ The physical environment is poorly designed	52 (16.5%)	42 (13.3%)	172 (54.4%)	-	10 (3.2%)

➢ The environment is safe and free from risks such as heat, noise, slippery floors, and poor ventilation	50 (15.8%)	32 (10.1%)	276 (87.3%)	-	40 (12.7%)
➢ Accidents are caused by the temporary unsafe environment created as a result of the work process	61 (19.3%)	21 (6.6%)	173 (54.7%)	-	22 (7.0%)
Cronbach's Alpha	**0.802**				

Table 5.5. above indicate that 54.4% agreed that the physical environment is poorly designed, followed by 29.8% who disagreed. At the same time, the majority (87.3%) agreed that the environment was safe and free from risks such as heat, noise, slippery floors, and poor ventilation. Whereas (54,7%) agreed that the accidents are caused by the temporary unsafe environment created as a result of the work process. The overall Cronbach's alpha on the environmental influence health and safety compliance was 0.802, suggesting that all constructs were reliable (see Table 5.12)

Table 5.12 Frequencies and percentages: Technological influences

Technological influences					
➢ The equipment provided are of good quality	55 (17.4%)	25 (7.9%)	178 (56.3%)	-	19 (6.0%
➢ There are procedures available on regular inspection of the equipment's.	17 (5.4%	28 (8.9%)	176 (55.7%)	49 (15.5%)	7 (2.2%)

The results indicated that 56.3% of the respondents agreed that the equipment provided to them was of good quality, whereas 25.8% disagree. The majority of the participants, 55.7%, agreed, and 15,5% strongly agreed that there are procedures available on regular inspection of the equipment.

5.2.4.6. Section E: Effect of cultural beliefs and behaviour on safety compliance

Section E of the questionnaire presents the frequencies and percentages on how the cultural beliefs and the behaviour of miners influence compliance with health and safety standards. The measurement results are presented in Table 5.13

Table 5.13: Frequencies and percentages: Cultural beliefs

Employees cultural beliefs					
➢ There is an association between employees cultural beliefs or religious background with compliance to the health and safety standards	49 (15.5%)	46 (14.6%)	170 (53.8%)	-	11 (3.5%)
➢ The attitude and behaviour associated with unsafe acts or non-compliance is related to the employees level of education	53 (16.8%)	48 (15.2%)	168 (53.2%)	-	7 (2.2%)
➢ The young employees are more likely to engage in sub-standard practices than the older ones	58 (18.4%)	64 (20.3%)	143 (45.3%)	-	11 (3.5%)
Cronbach's Alpha	0.790				

The majority of the respondents agree that there is an association between employees' cultural beliefs or religious background with compliance to the health and safety standards (53.8%). 53.2 % of the respondents agree that the attitude and behaviour associated with unsafe acts or non-compliance is related to the employee's level of education, whereas 32% of the participants disagree. 45.3% agree that the young employees are more likely to engage in sub-standard practices than the older ones, followed by 38.7% who disagree.

In terms of the employee's cultural beliefs, The composite measure of internal consistency was above 0.70 for all factors, suggesting that all constructs were reliable

5.2.5.1. Summary of the quantitative strand results

Section A had 11 describing the health and safety policies, standards and regulations. All questions created gave more agreeable rather than disagreeable outcomes. When investigating all questions and by checking out the engaging measurements (see table 5.2), it was apparent that the most elevated positioned question was the one expressing the need for the mine to develop the measures to create a high standard of safety culture (71.5%). The second question, which was ranked high, was expressing that violation/Non-compliance of health and safety regulation causes accidents (47.2 % and 26.2%) agree and strongly agree. The third question, which was ranked high, was on the employer developed specific health and safety standards that relate to the work that I do on a daily basis (54.4%). Cronbach's reliability test in this section indicated that there was high reliability for all the questions

The significance of the leadership influences on health and safety compliance is reflected in the three high-ranked questions in section B. The respondents indicated that the health and safety team plays an important role in ensuring safety in the mine accidents the mines (66.5%). It was indicated that the mine management makes honest and reasonable efforts to promote a healthy working environment ((65.2%). This was trailed by the rating that mine takes miners' actual rights and interests into consideration (58.2%). Cronbach's reliability test also showed that there was high reliability for all the questions.

Section C reflected the responses on the political and economic influence on health and safety compliance. The highest-ranked question indicated that production pressure contributes to non-compliance with the health and safety standards (58.8%). Followed by a lack of resources and proper equipment causes non-compliance in the mine (56.6%), and lastly, the unions and different organizations in the mine influence the behaviour of employees towards compliance (53.5%).

In section D, respondents indicated that the environment is safe and free from risks such as heat, noise, slippery floors, and poor ventilation (87.3%). 54.7 % agreed that accidents are caused by the temporary unsafe environment created as a result of the

work process, and lastly, 54.4% indicated that the physical environment is poorly designed.

Section E reflects that the majority of the respondents agree that there is an association between employees' cultural beliefs or religious background with compliance to the health and safety standards (53.8%). 53.2 % of the respondents agree that the attitude and behaviour associated with unsafe acts or non-compliance is related to the employee's level of education. Cronbach's reliability test also showed that there was high reliability for all the questions

5.3. INTERPRETATION AND INTEGRATION OF THE QUALITATIVE AND QUANTITATIVE RESULTS

The previous section discussed the results from phase 1 and phase 2 of the study. The study applied the mixed-method sequential exploratory design, which involved a two-phases project. The researcher started by collecting qualitative data and the results were used to develop the questionnaire for the quantitative phase. This section will focus on interpretation and integrating the qualitative and quantitative results.

The integration of the qualitative and quantitative data was done to fully address the objectives of the study. The qualitative data was connected with the quantitative data to draw insights into information gained from the quantitative and qualitative results (Fetters, Curry & Creswell, 2013; Berman, 2014).

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5.3.1. Procedures/steps followed to integrate the findings

The study adopted a mixed-method approach. Fetters, Curry, and Creswell (2013); McCrudden & McTigue (2019) outlined that integration in mixed-method research occurs in 3 levels, namely: study design, method, reporting, and interpreting. They further outlined that the researchers need to integrate the results as it enhances the value of adopting mixed-method research in a study.

The integration at the design level was done through adopting the sequential exploratory, which was best suited for this study to achieve the aim of this study which was to develop and validate the strategies to enhance compliance with the health and safety standards. The methodological integration occurred through building the results that emerged from qualitative data collected from the OHNP and the H & S team. Four themes and nineteen sub-themes that emerged from the semi-structured interviews, which were conducted among OHNP and H & S team, informed the development of the quantitative data collection instrument. In the qiuantitatie strand, the questionnaires were distributed amngost the miners to explore and describe the compliance with the health and safety standards. Whereas the reporting and the interpreting level was done through narrative interfered from qualitative and quantitative data were contiguously described (Fetters, Curry, and Creswell (2013). Additionally, through a narrative approach, the researcher was able to connect the qualitative and quantitative data, and thereafter meta-inferences (narratives and theoretical statements) were developed to provide the connection between the qualitative and quantitative phases of the study (Creamer, 2018; McCrudden & McTigue, 2019). Figure 5.12 presents different levels and approaches adopted during the integration.

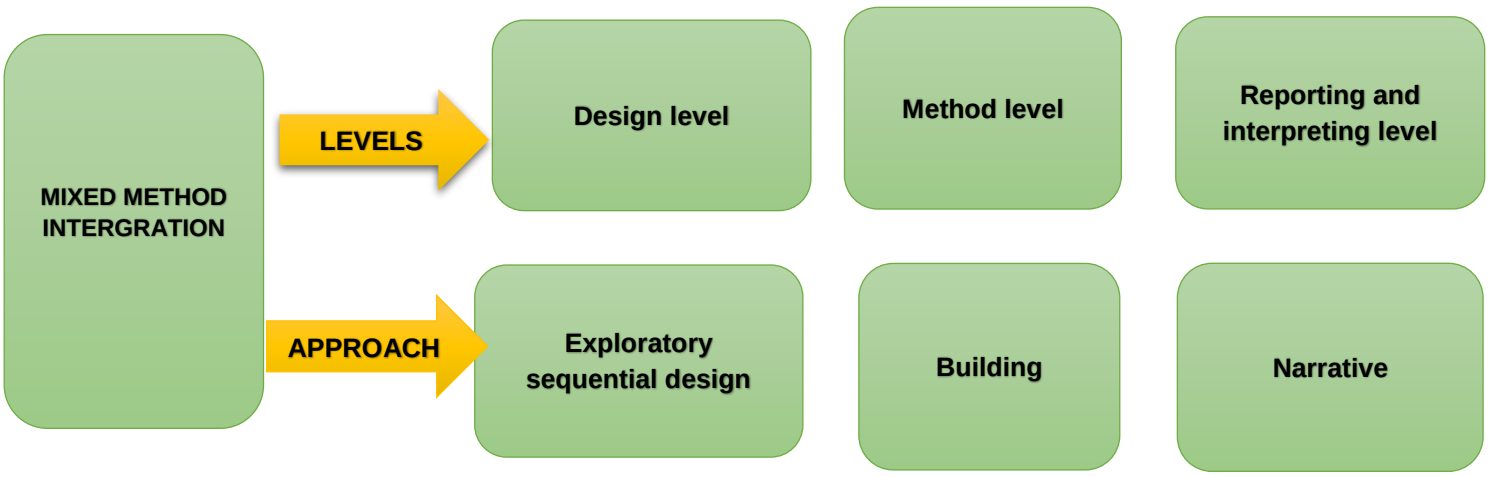

Figure 5.12: Levels and approaches adopted for integration of mixed-method

5.3.2. Integration, interpreting and discussion of both qualitative and quantitative results

The demographic characteristics and the main findings were integrated, reported, and interpreted.

5.3.2.1. Demographic characteristics

Most of the participants were males in both phases. This finding indicates that the mines are still dominated by males. Descriptive statistics describing these samples can be found in Table 3. The study results are supported by Botha and Cronje (2015), who concluded that though there is the progress made in employing more women with the provision of 10% positions to be occupied by women, mining has always been considered a very masculine industry due to its heavily male-dominated workforce as well as the physicality of mining work.

The majority of the participants in both phases had more than 10 years of working experience (61%). A study conducted by Haas, Eiter, Hoebbel, and Ryan (2019) concluded that miners who are more experienced have a higher level of knowledge on their job and also that the level of compliance with health and safety is high. Klein and Duplessis (2016) also supported that miners with less experience are likely to participate in sub-standard practices because they did not previously experience dangerous situations or loss of life as a result of non-compliance. In a study done by Nordlof et al. (2015), the participants indicated that less experienced employees who are new at the workplace are more likely to take risks. Most of the participants in both strands were below the age of 50. Only 19 % were above the age of 50. The varying ideas, values, and experiences of a different generation can affect health and safety compliance in the workplace (Amezcua, 2014).

In a qualitative phase, most of the participants had tertiary qualifications, either college certificate or university degree, with 51% in the quantitative phase, 42% had high school education, and 7% had primary school education. A study done by Shibambu (2017) outlined that because historically South Africa is an underprivileged country,

most of the people are not educated, especially the old generation, and therefore they lack skills and qualifications. In a study done by Wamuzuri (2011) in the United Kingdom (UK) investigating factors that contribute to positive and Negative Health and Safety Cultures in Construction, Educational level was identified as one of the elements which influence safety compliance. Additionally, poorly educated employees experienced learning difficulties in terms of health and safety training. According to Andel et al. (2015), employees with literary and creative interests are significantly more prone to preventable accidents than those who are were low in creative and literary interests; however, the current study results show that there is progress in eliminating the gap of lack of qualification and skills. The majority of the respondents were employed on a full-time basis (84%), and 16% of miners were either employed on a part-time or temporary basis.

5.3.2.2. Integration and interpretation of major findings

Narrative Integration of major findings from quantitative phase (1) and quantitative phase (2) assisted the researcher in understanding the bigger picture on the compliance with health and safety and also to develop compliance strategies.

5.3.2.3. Narrative of experiences related to health and safety standards compliance

To achieve objective 2, which was to explore and describe miners and organizational practices related to compliance with health and safety standards in the mining industry. In the qualitative phase, the participants were asked to describe their experiences related to health and safety standards within the organization. One theme and seven subthemes emerged. The following sub-themes outline the experiences of the health and safety officers and the occupational health nurse practitioners related to health and safety standards compliance among the mineworkers and the mining organization; Compliance versus non-compliance by the miners: Challenges related to leadership compliance, Challenges related to cost of safety compliance, Diverse barriers influencing compliance, Description of the impact of noN-compliance on the safety of and existence of conflict between production and safety. The theme and sub-

themes involved the development of the questionnaire in the quantitative phase, which included sections B and C of the questionnaire.

5.3.2.4. Health and Safety compliance is an ongoing process that needs continuous improvement.

The qualitative findings suggest that the participants have diverse experiences related to compliance with the health and safety standards in their workplace. The participants in this study indicated that the rate of compliance is average. They further outline that the health and safety in the mine are governed by the department of minerals and energy in which they regularly inspect if they are found not complying is a serious offense with harsh consequences. On the other hand, compliance is viewed by participants as a process that needs continuous improvement because of different human behaviours. In a quantitative phase, 50% of the respondents were satisfied with the health and safety compliance rate in this mine. The results are in line with the Society for Mining, Metallurgy and Exploration (SME) Mining Engineering Handbook (2011) states that all mining operations are required to adhere to local, provincial, and governmental regulations that, among other things, specify mine safety regulations and standards, environmental protection, and labour relations.

When integrating both the qualitative and quantitative results, it can be concluded that compliance with health and safety in this mine is average; therefore, there is a need for the health and safety team to develop measures to create high standards of compliance and to improve occupational health in this mine. Compliance with health and safety law involves the development and implementation of an effective health and safety management system and building a positive health and safety culture at work (Maseko, 2016). The question is from this cultural transformation framework. How do we then ensure that the health and safety in SA mining continuously improve to be of the best class? According to the cultural transformation framework, It is also worth noting that the study also identified that compliance could not only be achieved by the availability of safety standards only there is a relationship between compliance and the organizational safety culture (Changing minds, Changing mines final report, 2010).

5.3.2.5. Challenges related to cost of safety compliance

The qualitative results revealed that maintaining a high standard of safety is costly, and in this mine, this is viewed as a serious challenge in terms of resources and equipment. In the quantitative survey, lack of resources and proper equipment's which is viewed as the cause of noncompliance scored 64.8%. It can therefore be concluded the resources and quality of equipment provided is a factor that affects how employees perceive health and safety standards. In China, a study was done on the Impact of Safety Attitude on the Safety behaviour of Coal Miners. The results have shown that inadequate provision of safety equipment harms the attitude and behaviour of miners towards safety compliance (Li et al., 2019). Shaw, Verna Blewett, and Schu Schutte (2011) outlined that failure to invest in technology reduces the practicability of risk controls; and much lower social expectations of working conditions of the mining labour market.

5.3.2.6. Challenges related to leadership compliance

In the qualitative phase, lack of support from the management and supervisors was described as a challenge in maintaining health and safety. Participants described that though there are procedures and policies, there is poor implementation from the leadership side. In contrast with the qualitative results, the quantitative strand revealed that the majority of the respondents (65.5 %) agreed that their immediate supervisors model respectful culture in their workplace, with 65.2% displaying satisfaction that the mine management makes honest and reasonable efforts to promote a healthy working environment. The qualitative findings correlate with the studies from different authors who established that the miners experience the uncaring attitude from the managers has the potential to draw the miners attention from health and safety activities and adherence compliance, which put them at risk of occupational diseases, injuries, and accidents (Masia & Pienaar, 2011). On the other hand, employers and supervisors are interesting organizational actors because they exert production pressure on workers while simultaneously experiencing production pressure themselves from higher-level management. In other words, like workers, supervisors are also employees who face production pressure from employers.

5.3.2.7. Challenges related to the balance between safety and production

In a qualitative strand, the participants were asked to describe their experiences and their role in ensuring the health and safety of the miners during production. They described their experiences that mostly there is a conflict between safety and production which compromises compliance with the standards. They further elaborate the issue of imbalance between production and safety create conflict between safety and production. In the quantitative strand, the majority of the respondents (53,8%) agreed that production pressure contributes to non-compliance with the health and safety standards. The integrated results suggest that there is a need for the mine to prioritise safety first and overproduction.

Lim, Murray, Dowdeswell, Glynn and Sonnenberg (2011) argued that the production targets of most mining companies, both locally and abroad, are often the underlying cause of poor compliance to safety systems by employees. They were also concerned about the increased hours of operation, and pressure to meet higher targets results in employees “doing things faster”, often at the expense of safety compliance.

5.3.2.8. Description of the impact of non-compliance on the overall health and safety of the miners.

The qualitative results insinuated that poor compliance with the health and safety standards exposes the employees to occupational diseases such as noise-induced hearing loss and injuries. And more importantly, the occupational health practitioners were concerned that it also affects the overall health of the miners. Whereas the quantitative data displayed that there is a relationship between the occurrence of accidents, occupational diseases, and the non-compliance. In the quantitative strand, 54,7% of respondents agreed that the poor environment and non-compliance are the root causes of accidents. In agreement with the study findings, the existing literature reveals that most of the accidents and injuries are caused by non-compliance with the available regulations and standards and the established health and safety management system in the organization, which supports and enhances culture compliance (Beech, 2019). In addition, improving safety in the mines remains a priority

in every country around the world because it is one of the main contributors, which ranks high in the rates of severe and fatal occupational injuries as compared to other industries (Bhattacharjee & Gosh, 2011). Hermanus, Phakathi, Coulson, and Stewart (2019) also raised a concern that in SA, there is still a major challenge in improving occupational health in the mining industry with a high rate of occupational diseases such as noise-induced hearing loss.

5.2.3.9. Barriers influencing non-compliance

Qualitative findings suggest that factors such as human behavior and experience as some of the existing barriers in achieving health and safety compliance. The described behavioural issues such as taking shortcuts instead of following procedures and working under the influence of alcohol were described. In the quantitative strand, the barriers influencing non-compliance were measured in terms of the association between the attitude and behaviour with unsafe acts and non-compliance, (53,8%) agreed that attitude and behaviour are associated with unsafe acts and non-compliance. Different authors have outlined that the views and behaviour of mineworkers have a severe influence on the level of adherence to safety standards and the safe functioning of mining organisations (Masia & Pienaar, 2011; Öz, Özkan & Lajunen, 2013; Mustapha, Aigbavboa & Thwala, 2015). This suggests that addressing the relationship between the barriers may increase safety compliance.

Table 5.14. Display of how phase 1 data informed the development of quantitative data collection instrument to describe the diverse experiences related to compliance

Objective	Sub-themes and quotations from qualitative data	Corresponding questionnaire from the quantitative phase	Methodological integrated Results
Objective 1: to explore and describe miners and organizational practices related to compliance with health and safety standards in the mining industry. **Objective 2:** To explore the OHNP and H & S team perspective regarding compliance with health and safety standards	**Sub-theme:** Compliance versus non-compliance within the mine **Quote:** *"I will say if I had to rate the state of compliance in this mine out of 10 I will give you 7. The reason I'm saying this is that currently where I'm working, you will find that the employees are working in a noisy area and they not wearing the earplugs. They are expected to do hazard identification risk assessment, we'll find that that is*	Health and safety compliance is taken seriously and respected in this mine (50.0%). People-oriented safety culture is practised and considered (51.4% agree and 1.6 % strongly agree)	Compliance with health and safety in this mine is average. Therefore, there is a need for the health and safety team to develop measures to create high standards of compliance and to improve occupational health.

	working and they didn't do their hazard identification".		
	Sub-theme: Existence of conflict between safety and production. **Quote:** ***"****When I look at safety, like here, we are seeing six different production lines. But it's quite surprising to find out that most of the time they strive to push production while compromising safety. For example, you will find that people are using the machine and the emergency stop is not working but they just tick so that they can work and reach the targets".*	The production pressure contribute to the non-compliance with the health and safety standards (53.8%)	The integrated results suggest that there is a need for the mine to prioritise safety first and overproduction.
	Sub-theme: Challenges related to cost of safety compliance.	Lack of resources and proper equipment's causes non-	The resources and quality of equipment provided is a factor that affects how

	Quote: "*The challenges that are there is about the cost of maintaining safety. the company is not doing well and they are expected to meet certain standards e.g they are expected to buy quitter machines for noise control, and they have very old machines, and they are very expensive*	compliance with the health and safety standards (56.6%)	employees perceive health and safety standards.
	Sub-theme: Diverse barriers influencing compliance **Quote:** *"So now I've seen as behaviour like in terms of incidents in their life, most of the incidents when we do the root cause analysis will find that was a behaviour issue. For example, when a person is expected to follow the procedure you will find the person doing short*	The attitude and behaviour I associated with unsafe acts or non-compliance related to the educational level (53.2%)	There is an association between the attitude and behaviour with unsafe acts and non-compliance

	cut, like using one hand instead of using both hands when operating the machine which can result in a serious injury".		
	Sub-theme: Description of the impact of non-compliance on the safety of mine. **Quote:** *"Yes, there is the relationship between non-compliance and the occurrence of diseases because recently we submitted section 1.5 investigation which was the noise-induced hearing loss of which when employees are on site remove the earplugs. After all, they can't hear each other well which affects the hearing. This is happening in a*	Violation/Non- compliance with health and safety regulations causes accidents (47,2 % agreed and 26.2% disagreed).	There is a relationship between the occurrence of accidents, occupational diseases, and non-compliance.

	certain department I can say is human behaviour"		
	Sub-theme: Challenges related to leadership compliance **Quote:** *"We do not get support from managers and supervisors. It's very difficult to enforce compliance because even the supervisors themselves are not complying. We usually give them reports after inspection but you will find that nothing is done with those reports instead they wait for an accident to happen so that they can act, which is very discouraging."*	My immediate supervisor consistently model respectful safety culture in my duty station (64.4%)	The findings from the qualitative strand revealed that participants were not satisfied with the support they got from the management. At the same time, quantitive results show that 64.4% of respondents are satisfied with the commitment of the management in ensuring health and safety.

5.3.3. The significant role of policies/ standards and communication channels regarding safety compliance

Phase 2 objective was to develop and describe strategies to enhance compliance with health and safety standards in the mining industry. To develop the strategies, the participants were asked to describe their views on the role of the existing policies concerning safety compliance. The outcomes of the quantitative phase were based on 1 theme and 5 sub-themes which emerged during the qualitative data analysis: Diverse description of the existing policies and procedures; The gap between the existence of policies and practice; Existence of different communication Platforms about practices and standards; Training and induction programme remains a priority and safety report used for filling purpose.

5.3.4.1. Description of existing policies, standards, and procedures

The results from the qualitative strand give a clear indication of the availability of health and safety standards and policies which are governed by the department of minerals and energy are viewed by the participants as important. They further describe that though there are standards and policies available, they still experience challenges with compliance. Cronbach's alpha is 0.893 for the health and safety regulation standards and regulations dimension, which indicates a high level of internal consistency for our scale with this specific sample. The majority of participants strongly agreed that they know the regulations designed to protect the health and safety of employees in this mine (48.1%) and (3.5%) also agreed. In terms of the role of safety regulations and standards in the prevention of accidents in the mines (42.1%) agreed, followed by 40.2% strongly disagreed. Similarly, a study conducted in SA by Mogale et al. (2018) on employees' knowledge of occupational legislation and related health and safety benefits revealed that knowledge and the accessibility of the occupational health and safety legislation has an impact on the implementation and compliance among miners. Dragan, Georges and Mustafa (2017) concluded that adherence to the health and safety standards/ policies is influenced by the practice of knowledge exchange systems and the degree of knowledge exchange in the organizational system, both within and between units. The integrated findings of this study suggest that the knowledge and the availability of policies/standards and procedures to has a greater

impact on how the miners perceive compliance with the health and safety standards. Hence it is expected that miners who have insight on health and safety procedures and policies are more likely to comply with those procedures and change their behavior to promote safety. Safety regulations and standards play an important role in avoiding accidents. The mines item recorded the highest loading under this dimension, suggesting that this item contributes the most to knowledge and the availability of health and safety standards, procedures, and policies.

5.3.4.2. Communication Platforms about practices and standards

Participants described clear views about different levels of communication in different platforms such as notice boards, safety tips before the beginning of each shift, and meeting with the union representatives. In the quantitative strand, 52,2% agreed that policies for improving health and safety are published at the mine administration. Whereas 47.8% acknowledged that they understand the language used to publish policies, standards, and instructions at my workstation. The integrated findings conclude that communication of safety procedures and policies in different platforms and languages understood by employees influence compliance with health and safety standards. The study was done by Mabika (2018), aiming to improve the health and safety of workers in the mining industry concur with the study findings the participants emphasized the importance of communication at different levels, more importantly, they also indicate that it promotes adherence, confidence, and trust.

5.3.4.3. Training and induction programme remains a priority

The present study revealed that training on occupational health and safety, first aid and hazard identification, and risk assessment is prioritized in this mine. More importantly, participants also describe that re-training is also done after the occurrence of the incidence. Miners also receive training and education on the health-related issue in the clinic, such as the management of chronic diseases. 50.7% of respondents acknowledged that they receive full training on health and safety regularly in this mine, which fully prepared me to identify risks and comply with the regulations. The findings of both phases indicate that training and induction have a positive influence on compliance with the health and safety standards. The results concur with Palka's (2017) study, which specifies an increase in awareness among miners on the role of

training in health and safety. Similar results were found in Widajati et al. (2017), who revealed that though the safety briefings were carried out by the safety officers, poor adherence to health and safety regulations was observed among the majority of workers). On the other hand, Tibane and Niemand's (2017) study argued that once-off safety training might not have a significant impact on compliance.

5.3.4.4. Health and Safety compliance is recognised in filling and documentation

The study results revealed that in this mine, there is a culture of filling safety reports on the inspections without implementation or mitigating the identified risks. How well safety procedures and regulations are followed within an organization is considered to be influenced by the reigning safety culture of the organization. According to Masia and Pienaar (2011), there are substantial organizational factors that contribute to unsafe acts leading to workplace accidents, such as the harsh conditions of the mining industry. Different authors have outlined that organizational culture is based on the values, practices, and norms which are being applied in the work setting (Masia & Pienaar, 2017; Saad, 2016; Mustapha et al., 2015). To improve compliance with health and safety, the mining organizations must develop and implement an effective health and safety management system and build a positive health and safety culture at work (Masia & Pienaar, 2011; Maseko, 2016).

Table 5.15. Display of how phase 1 data informed the development of quantitative data collection instrument to describe the significant role of policies/ standards and communication channels regarding safety compliance

Objective	Sub-themes and quotations from qualitative data	Corresponding questionnaire from the quantitative phase	Methodological integration
Phase 2 objective: to develop and describe strategies to enhance compliance with health and safety standards in the mining industry. To develop the strategies, the participants were asked to describe their views on the role of the existing policies concerning safety compliance.	**Sub-theme:** Diverse description of the existing policies and procedures **Quote:** **"***The challenges are the Safety Department that we face as well. But it goes back to people not responding appropriately to safety standards that are in place, people neglecting procedures that we put in place*	I know the regulations designed to protect the health and safety of employees in this mine (48.1 agreed and 3.1.% strongly agreed).	Knowledge and the availability of policies/standards and procedures to has a greater impact on how the miners perceive compliance with the health and safety standards.
	Sub-theme: Communication Platforms about practices and standards	Policies for improving health and safety are published at the mine administration (52.2% agreed).	Communication of safety procedures and policies in different platforms and a language understood by employees

	Quote: *"There are different types of levels of communicating line, we've got three areas we looked at before starting with the way the supervisors will prepare information that has been distributed by the communication board. So this can be the internet way or communications department, the state, each department will have an opportunity to print out the communication, and then take it down to the employees so that in their green areas, they're able to communicate with their subordinates".*		influence compliance with the health and safety standards.
	Sub-theme: Perception that compliance is recognized in the filing and documentation.	People oriented safety culture is practised and considered (55.5%)	How well safety procedures and regulations are followed within an organization is considered to be

	Quote: *I will say it is 50/50 we have those who are educated and have experience but they still do not comply. Since and of course, we'll find a person who was well educated, like an artisan who is working is expected to know. When you operate the machine you must first complete the checklist, but you will find that the same person who is educated when you do the inspection that he just ticked without checking the machine.*		influenced by the reigning safety culture of the organization

5.3.5. Role of safety officers and occupational health practitioners in promoting compliance

Objective 2 in phase 1 was to explore the occupational health nurse's perspective regarding compliance with health and safety standards of employees and organization. In a qualitative strand, one theme and the following four sub-themes emerged from this objective: Viewed by miners as police who must guard against their behaviour, Promoting the culture of safety compliance within the organization, ensuring the safety of both employer and the employees, and ensuring the DMR standards are met and implemented. The theme and sub-themes involved the development of the questionnaire in the quantitative phase, which included sections B and C of the questionnaire.

5.3.5.1. Promoting the culture of safety compliance within the organization

In phase 1 of the study, findings outlined the role played by the occupational health team to promote the culture of safety compliance. Such role included prevention of occurrence of diseases through conducting medical examinations, safety talk, and audits, training, investigation of diseases and accidents. More importantly, health promotion was emphasized through educating employees on the management of chronic diseases. In the quantitative phase, the majority of respondents (66.5%) of the respondents acknowledged that the health and safety team plays an important role in ensuring safety in the mine accidents mines. From the results of both phases, it is worth mentioning that the duty of occupational health and safety professionals is to enforce the culture of safety in the workplace.

The results concur with WHO (2001), outlining that occupational health nurse practitioners are the frontlines who are responsible for the prevention of industrial injuries and diseases, as well as providing advice in matters concerning the protection of the environment. According to Widajati, Ernawati & Martiana (2017), the safety team has an influential role in the accomplishment of a work environment that is free from accidents and injuries. Moreover, the development of safety programs such as safety talks and safety walkthroughs can improve the aspect of OSH.

5.3.5.2. The perceived role of the safety team on health promotion and compliance

In the qualitative strand, the participants describe health promotion and safety activities that they do to ensure compliance, such as (Medical examination awareness and safety walk). However, they raised concerns that even though there are different activities done to promote the safety culture, safety compliance is still a major challenge that needs continuous improvement. In the quantitative phase (49, 4%) and 1.3% agreed that they receive full training on health and safety regularly in this mine, which fully prepared me to identify risks and comply with the regulations. The integrated result suggests that there should be a significant relationship between labour compliance and the knowledge acquired during those safety talks and health promotion.

Similar results were found in Widajati et al. (2017), who revealed that though the safety briefings were carried out by the safety officers, poor adherence to health and safety regulations was observed among the majority of workers). On the other hand, Tibane and Niemand's (2017) study argued that once-off safety training might not have a significant impact on compliance. The cultural transformation framework places responsibility occupational safety team and practitioners together with the organization and the involvement of the miners to continuously develop interferences to improve the health and safety of the miners (Changing minds, Changing mines final report 2010). For this study, the improvement strategies were developed and will be discussed in detail in chapter 7 of this study.

5.3.5.3. Poor adherence to health instructions due to peer pressure

In the qualitative strand, the participants perceived peer pressure as one of the contributing factors in contributing to non-adherence with health and safety instructions. The Pearson correlation test in the quantitative strand suggests that there is a positive relationship between the peer age group and how they are likely to engage in unsafe behaviour. This suggests that creating support groups among the miners with common health problems may increase adherence to health instructions. According to the WHO Healthy Framework, each mining organization must strive to

achieve adherence and create a healthy work environment. This could be achieved by involving the miners in focus groups so that they can identify and implement the solutions in unity.

Table 5.16. Display of how phase 1 data informed the development of quantitative data collection instrument to describe how safety culture is promoted.

Objective	Sub-themes and quotations from qualitative data	Corresponding questionnaire from the quantitative phase	Methodological integration
To explore the OHNP perspective regarding compliance with health and safety standards	**Sub-theme:** Promoting the culture of safety compliance within the organization	Health and safety teams play an important role in ensuring safety in mine accidents the mines 66.6% agreed, and 1.6 % strongly agreed.	There should be a significant relationship between labour compliance and the knowledge acquired during those safety talks and health promotion.

	Quote *"You do find situations where people neglect standards, people neglect rules that have been put in place. It is a continuous ongoing thing where we try to improve that people want to just try to comply and to adhere to all safety standards that are put in place. So it's also an ongoing improvement process in terms of that training is also improved among the employees to continuously*		
	Sub-theme: Health and safety compliance role. **Quote** *"*My role is to ensure that employees are fit to work, this is ensured examination which is done when the miner is employed	I receive full training on health and safety regularly in this mine which fully prepared me to identify risks and comply with the regulations (49, 4%), and 1.3% agreed	There should be a significant relationship between labour compliance and the knowledge acquired during those safety talks and health promotion.

	for the initial first time*, or pre-employment, annual and exit medical examination. I do the physical assessment. And then they do check the audio drives the vision. And then for me, I'm going to assess that employee, is fit and go and work. If he or she is not fit we refer him for medical treatment from the specialist. And the mine hs a system where they block the employees who are not fit to enter the gates".*		
	Sub-theme: Peer pressure leading to poor adherence with health instructions **Quote:** *We usually experience non-compliance with chronic*	The young employees are more likely to engage in sub-standard practices than the older ones (43, 5%)	There is a positive relationship amongst the peer age group and how they are likely to engage in unsafe behaviour

	treatment especially amongst the males, as compared to women. But with the males is a major problem especially the older ones they talk amongst each other and they decide to use other alternatives to manage their conditions such as church tea".		

5.3.6. Perceived health and safety measures to improve compliance.

Phase 2 objective was to develop and describe strategies to enhance compliance with health and safety standards in the mining industry. When the participants were asked what could be done to improve the current state of compliance to improve the current state of health and safety in their workplace. In this theme, the following 4 sub-themes emerged: Health and Safety compliance support strategy, Tokens of appreciation to boost the morale of miners and to enhance zero harm, and supervisors/ Leadership to lead by example. In the qualitative strand, the results suggest that there is a need for the mine to develop the measures to create a high standard of safety culture (71.5%).

5.3.6.1. Health and safety support measures

In the qualitative phase, the participants raised a concern that there is a need for the mine to improve the support to health and safety compliance. They further described that they find it difficult to enforce and implement safety standards because of a lack of support from the management and the leadership structures. The quantitative findings differ from the qualitative strand. The results (62,5 %) suggest that that mine management makes honest and reasonable efforts to promote a healthy working environment. Furthermore, quantitative results also suggest that immediate supervisors consistently model respectful safety culture (64.2%).

According to safety pro-resources (2019), the recognition of senior management on the importance of safety is one of the most effective ways to ensure health and safety compliance. They further raised a concern that it is unfortunate because most of the managers concentrate on achieving the organizational objectives, which are centered around production while neglecting the safety of the employees. When the people which lead the organization have an unmistakable comprehension of and obligation to the job and significance of wellbeing consistence the executives, it is far more straightforward for it to channel down as a critical driver of effective working (Pro-assets, 2019).

5.3.6.*2* Token of appreciation to boost the morale of the miners and to enhance zero harm

In the qualitative strand, participants suggested that the culture of health and safety compliance can be improved by motivating the employees through competitions, giving tokens of appreciation to employees who achieve zero-based harm. The quantitative strand results suggested that the mine should develop the measures to create a high standard of safety culture (71.5%). The integrated results suggest that there is a need for the mine to. There is a need for the mine health and safety performance with the performance reviews and financial incentives with safety goals and objectives. Similarly, Kayatsha (2018) study showed that sports vouchers, work environment, and safety days were part of the activities that motivated the employees. Furthermore, this also made them be committed, thereby increasing adherence to safety rules. The WHO healthy framework emphasized the importance of the mining organizations to implement prizes and motivations such as reducing the time of work, acknowledgement of commitment in the health and safety programme. However, the right devices to evaluate and award the incentives must be used (Burton, 2010). In support of the WHO framework, the Cultural transformation framework emphasized that the mining organizations should strive to implement ZERO HARM Bonuses and performance operations bonus systems. Additionally, the health and safety indicators should be available to determine the ZERO HARM. Regular evaluation should be done to determine the bonus and incentive system and to ensure that the miners understand how the system is applied and the fairness (Changing minds, Changing mines final report, 2010).

5.3.6.3. Resolution of conflict between the powers of union representatives and health and safety procedures

In the qualitative strand, the participants raised a concern that unions mostly interfere with their role in ensuring the health and safety of the miners. They further suggested that the union must stop using their power and interfering with the health and safety procedures but support the miners with compliance with the health and safety standards. The quantitative results suggest that the unions and different organizations

in the mine influence the behaviour of employees towards compliance with the standards (53.5%).

On the contrary, in a global study conducted among the union representatives by Walters, Wadsworth, Johnstone et al. (2017), in five countries, there was no evidence to confirm that the union representatives over-utilized their privileges or powers to intercede in circumstances they respected as requiring medical intervention to protect the miner's health and safety. The authors further described that their findings affirm those of past investigations that show that union representatives act mindfully, fundamentally address possibly genuine OSH issues, and are intentionally mindful to remain inside the limitations to their activities that are outlined by guidelines, principally inspired by a paranoid fear of presenting themselves to retaliations that may compromise pay, advancement and professional stability assuming they don't. While in SA, In February 2021, the National Union of Miners (NUM) in South Africa raised a concern that mining companies must prioritise the health and safety of mineworkers and not the profit margins (NUM, 2021).

Table 5.17: Outline of the integration of qualitative and quantitative strands on the suggestions to improve compliance with the health

Objective	Sub-themes and quotations from qualitative data	Corresponding questionnaire from the quantitative phase	Methodological integration
Objective: To develop and describe strategies to enhance compliance with health and safety standards in the mining industry.	**Sub-theme:** Health and safety support measures "*We don't know from our side from an administrative department, we don't get support. There's no support from the people that wanted to know support from the department that is true. So it's verydifficult to enforce compliance. Because you go there and say, Well, I'm expecting like this. When you go back the following day, you find that medicine. the same thing when you ask them to say my manager*	The mine management makes honest and reasonable efforts to promote a healthy working environment (62.5%). My immediate supervisor constantly models respectful safety culture in my duty station (64,2%).	The integrated results revealed that there is a need t develop leadership support strategies to improve compliance

	spoke to the manager. Something he said it's fine, it can kill you		
	Sub-theme: Token of appreciation to boost the morale of the miners and to enhance zero harm **Quotes** "*We used to have first aid competition. We used to have tokens of appreciation in cases where we had zero incidences. There were also safety competitions and they will be asked to do safety-related activities and will get tokens of appreciation such as pens and other small things that motivate them. We don't have any tokens of appreciation anymore to boost their morale."*	The quantitative strand results suggested that the mine should develop the measures to create a high standard of safety culture (71.5%).	There is a need for the mine health and safety performance with the performance reviews and financial incentives with safety goals and objectives.

	Sub-theme: Suggestion on the role of the union in ensuring health and safety. **Quote:** **"***The major challenge that we have is the unions they interfere with the health and safety issues. Like you find that the miner is not fit due to a certain medical condition but you will find that they influence the miners and start to interfere with the occupational health clinic procedures"*	The quantitative results suggest that the unions and different organizations in the mine influence the behaviour of employees towards compliance with the standards (53,5%).	Unions have an influential role in ensuring the health and safety compliance of the miners

CHAPTER 6

DEVELOPMENT AND VALIDATION OF THE PROPOSED STRATEGIES TO ENHANCE HEALTH AND SAFETY COMPLIANCE

6.1. INTRODUCTION

The previous chapter covered the integration of the qualitative and quantitative results. This chapter outlines how the strategies to enhance compliance with the health and safety standards in the mining industry were developed and validated. The development and validation of the developed strategies were guided by the Delphi technique, and the proposed strategies covered recommendations from experts during Delphi rounds to ensure reliable strategies.

6.2. DEVELOPMENT OF THE PROPOSED STRATEGIES

Strategies are plans of action designed to achieve a long-term or overall aim (Blair, 2017). Moreover, the development of the strategies that is contextualized assists the organization in prioritizing and focusing on problematic areas before major or full-blown problems that might compromise the safety of the miners (Blair, 2017). In this study, strategies are regarded as a plan of intervention, recommendations to enhance compliance with the health and safety standards in the mining industry based on the identified challenges. The cultural transformation framework which guided this study stresses the importance of the academics/ researchers to assist the mining organizations in creating strategies that integrate miners and the mining organization itself to successfully practice and be mindful of their safety and well-being at all times. The developed strategies are aimed to improve the current practices of both the miners and the organization, aiming to enhance compliance with the safety standards.

The development of the strategies was guided by the findings of both quantitative and qualitative phases, the World Health Organization Healthy Workplace Framework, and the cultural transformation model which guided this study. Additionally, the strategies

were also identified during the qualitative phase, which involved engagement with the occupational health practitioners and the safety experts who are facilitating occupational health activities in the selected mine. Their lived experiences assisted in the identification of the current practices and strategies that can be adopted to ensure compliance. The researcher also referred to the current legislation (MHSA, OSHA, and guidelines to develop current strategies, Going back to the literature, different scholars have acknowledged that there is a gap in the literature on the management of compliance with health and safety strategies. Moreover the sholars have also raised a concern that the impact of legal non-compliance is even more scarce in the literature (Jacinto, Guedes Soares, Fialho, Antão, & Silva, 2011; Salguero-Caparrós, Pardo-Ferreira, Martínez-Rojas, Rubio-Romero, 2020). Previous research done by Tibane and Niemand (2017) on challenges experienced by employees relating to safety compliance emphasized the importance of the development of strategies to reduce safety threats caused by poor compliance as a result of unsafe acts**.** Tibane and Niemand (2017) further raised a concern that if they are safety regulations available and miners are aware of the dangers, what is the rationale behind poor compliance with the health and safety standards. Jacanito et al. 2020 argued that though there are several studies done to determine different methods on health and safety management, the methods on the management of compliance with legislation and the impact of non-compliance are rarely discussed.

The current study results revealed that health and safety compliance is a process that warrants continuous improvement. Based on the identified research gap, the current state of occurrence of occupational diseases, and safety concerns in the SA mining industry, the current study resolved in developing the health and safety strategies to enhance consistency in health and safety compliance.

6.3 DRAWING BACK ON THE OBJECTIVES WHICH GUIDED THE DEVELOPMENT OF THE STRATEGIES

The following objectives guided the study concerning the literature review, theoretical framework, selection of the mixed-method approach, and also during both qualitative and quantitative phases. Moreover, the outcomes of these engagements will be used to develop the proposed strategies to enhance compliance with health and safety.

Phase 1 Objectives: The first objective was to explore and describe miners and organizational practices related to compliance with health and safety standards in the mining industry. The second objective was to explore the OHNP and the H & S team perspectives on health and safety compliance. This objectives were achieved through conducting one-on-one interviews in the qualitative phase and survey questionnaires in the quantitative phase.

Phase 2 Objective: Develop and describe strategies to enhance organizational and employees' practices towards compliance with health and safety standards in the mining industry. The strategies were developed based on the results, reviewed literature, and the healthy framework model which guided the study.

Phase 3 Objective: Validate strategies to enhance organizational and employees' cultural practices towards compliance with health and safety standards in the mining industry.
Delphi technique was used to develop and validate the strategies.

6.4. PURPOSE OF THE STRATEGIES

The purpose of developing the proposed strategies is to improve the current state of compliance with the health and safety standards in the mining industry. Aiming to reduce the health and safety risks and the associated factors underlying the occurrence of accidents at work, occupational diseases, and other occupational health hazards among miners in the selected mines, Limpopo Province. Additionally, the strategies will guide occupational health care facilities/clinics in the mines in ensuring compliance with the health and safety preventative strategies. The strategies will also assist the occupational health practitioners, health, and safety team in increasing awareness of health risks that impact the well-being and safety of employees. Moreover, the proposed strategies might also assist the mining council policymakers in developing appropriate strategies and or allocate resources to implement the strategies that will be developed in this study. Therefore the implementation of the proposed strategies might have the potential to reduce the strain in the families caused by accidents and occupational diseases.

6.4.1. Summary of health and safety legislation, regulations, and standards in support of health and safety compliance

Health and safety compliance includes abiding by health and safety measures and completing duties in a safe way (Masia & Pienaar, 2011). Additionally, it involves a lack of accidents and fatalities in the workplace (Masia & Pienaar, 2011). Compliance with health and safety law involves the development and implementation of an effective health and safety management system and building a positive health and safety culture at work (Maseko, 2016). To ensure compliance with regulations, the mine health and safety council has introduced guidelines for compliance with the Mine Health and Safety Act (29 of 1996). However, the high rate of sub-standard performance has shown that the available regulations and policies have not led to the anticipated result (Kleyn & du Plessis, 2016).

6.4.2. Mine Health and Safety Act (MHSA, Act no 29 of 19

The act provides for the safety of the employees and other persons at mines to:

- Encourage principles of health and safety; cater for the implementation of health and safety measures;
- Provide for appropriate systems of the employee, employer, and State participation in health and safety matters;
- Establish representative tripartite institutions to review legislation, promote health and enhance properly targeted research; provide for effective monitoring systems and inspections, investigations, and inquiries to improve health and safety;
- Promote training and human resources development; regulate employers' and employees' duties to identify hazards and eliminate, control, and minimize the risk to health and safety;
- Entrench the right to refuse to work in dangerous conditions; and to give effect to the public international law obligations of the Republic relating to mining health and safety (South Africa, 1996).

Section 2 of this act emphasized that health and safety in the mines should be ensured. More importantly, this act also outlines the importance of the provision of

occupational health services such as medical surveillance. In the context of this study, occupational health practitioners and health and safety officers have a major role in ensuring health and safety compliance. Their views will be discussed in the results section.

6.4.3. Guidelines for the South African Small-Scale Mining to Comply with the Mine Health and Safety Act

Though the guidelines were designed for small scale mining, it is important to understand that the main aim is to prevent or reduce the occurrence of workplace injuries and diseases, enhance production and facilitate the achievement of zero harm tolerance in line with the industry's vision of ensuring that every mineworker returns home unharmed every day. This can be improved through compliance with the available health and safety.

6.5. IDENTIFICATION OF THE GAP IN COMPLIANCE STRATEGIES: RESULTS AND THEORETICAL FRAMEWORK PERSPECTIVE.

Proposed strategies to enhance health and safety compliance were identified and guided by the World Health Organization (WHO) Healthy Workplace Framework model, the cultural transformation framework model, and the study findings. The healthy framework model stresses the importance of the mining organizations to use continual improvement processes to protect and promote the health, safety, and wellbeing of all employees (WHO, 2010). At the same time, the cultural transformation framework model emphasizes the importance of the mining organizations to develop and implement the multi-faced strategies that address the workplace cultural change as well as specific initiatives that are incorporated into their operational change priories. Morever Bliar (2017) emphasized that the development of strategic measures enables the mining organization to focus and prioritize on the problematic areas, which can cause long-term consequences if not addressed early. For example, in the context of this study, the OHNP raised the concern about the occurrence of occupational diseases such as noised induced hearing loss which develops over some time due to exposure to severe noise. Therefore by incorporating the results which identified that health and safety compliance is a process that warrants continuous improvement, the following strategies were developed.

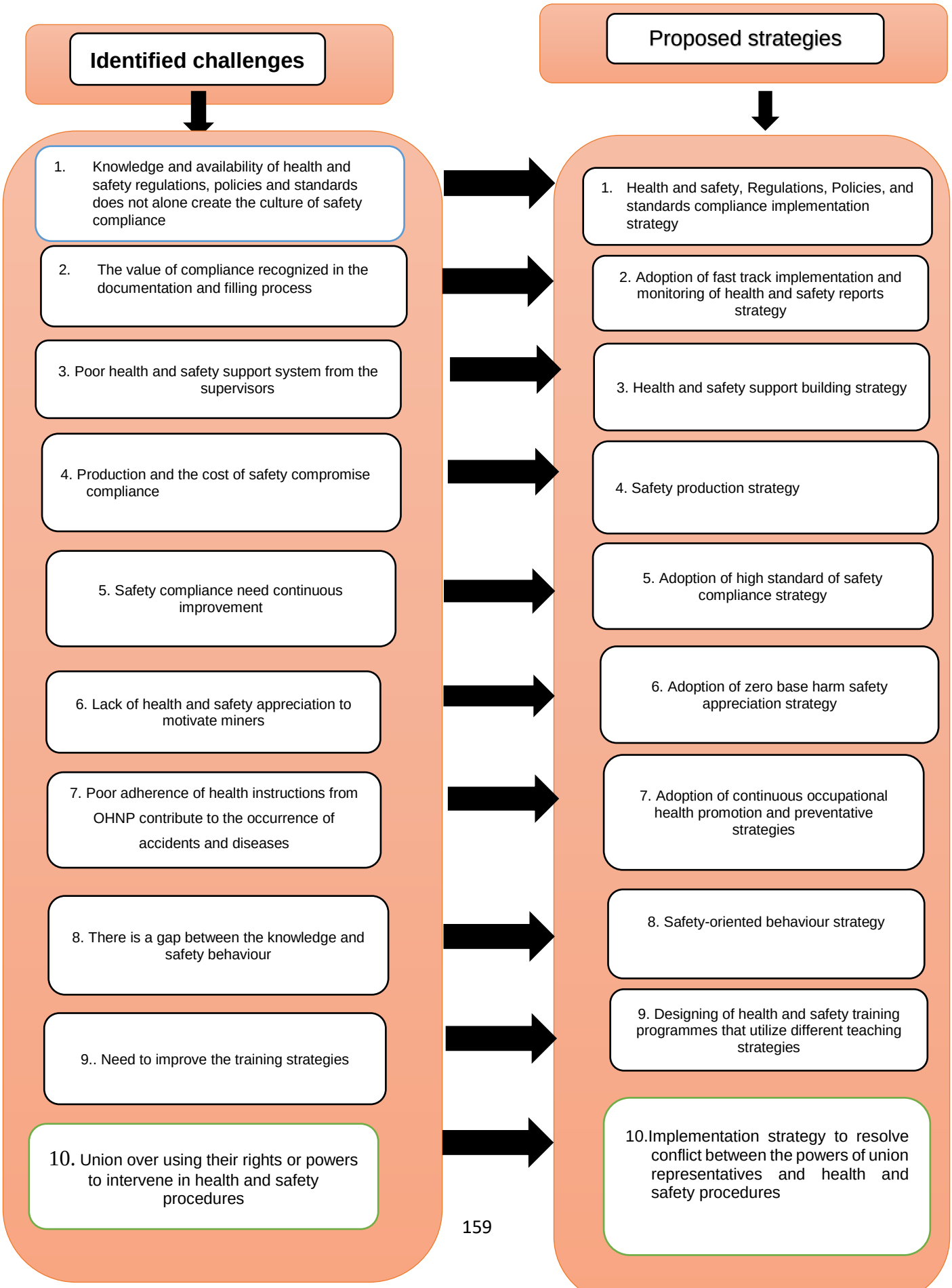
Identified challenges
Proposed strategies
1. Knowledge and availability of health and safety regulations, policies and standards does not alone create the culture of safety compliance
2. The value of compliance recognized in the documentation and filling process
3. Poor health and safety support system from the supervisors
4. Production and the cost of safety compromise compliance
5. Safety compliance need continuous improvement
6. Lack of health and safety appreciation to motivate miners
7. Poor adherence of health instructions from OHNP contribute to the occurrence of accidents and diseases
8. There is a gap between the knowledge and safety behaviour
9.. Need to improve the training strategies
10. Union over using their rights or powers to intervene in health and safety procedures
1. Health and safety, Regulations, Policies, and standards compliance implementation strategy
2. Adoption of fast track implementation and monitoring of health and safety reports strategy
3. Health and safety support building strategy
4. Safety production strategy
5. Adoption of high standard of safety compliance strategy
6. Adoption of zero base harm safety appreciation strategy
7. Adoption of continuous occupational health promotion and preventative strategies
8. Safety-oriented behaviour strategy
9. Designing of health and safety training programmes that utilize different teaching strategies
10.Implementation strategy to resolve conflict between the powers of union representatives and health and safety procedures

Figure 6.1: Graphical presentation outlining the identified gaps and the developed strategies

Strategy 1: Health and safety, regulations, policies, and standards compliance implementation strategy.

- **Goal**

To create the culture of compliance and close the gap between availability and implementation of safety regulations, policies, and standards.

- **Justification**

This strategy was developed based on this challenge which emerged from the integrated results: Knowledge and availability of health and safety regulations, policies, and standards do not alone create the culture of safety compliance.

According to the WHO healthy framework model, the availability of health and safety standards and regulations can not alone achieve compliance. Moreover, Miner's participation is a precondition of successful health and safety management and a major contributing factor in the reduction of occupational diseases and injuries (Burton, 2010). On the contrary, the study revealed that The administration should not continue creating more and more rules and regulations that aim to cover all aspects of mining. Such wide-ranging and detailed regulating standards and health and safety management plans do not "connect" with the miners. Effective rules and regulations are not the only way to make a workplace safer. A related literature review study by Salguero-Caparros, Pardo-Ferreira, Martinez-Rojas, Rubio-Romero (2020) argued that health and safety management must not exclusively be grounded on prescriptive standards and recognition of compliance. However, it should also be based on proactive standards, including an assessment of how legal compliance affects means for day to day performance.

- **Responsibility**

Training and induction department and Shift supervisors

- **Performance drivers**

- Design and review the regulations, standards, policies that are meaningful to the context their specific to the experiences in their settings/environment
- The miner's involvement through the activities, expertise, and other resources the mining organization engages in which affects the physical and mental health, safety, and well-being of miners and their families.
- Giving each miner hands-on and appropriate instruction, taking account of his or her skills and professional experience
- Defining the objective to be achieved in terms of ability to perform a specific function
- Providing training involving the acquisition of knowledge and know-how to be applied in a specific job and corresponding to the qualifications required.

The Cultural Transformation Framework indicates that mining organizations should design and review the regulations, standards, policies that are meaningful to the context their specific to the experiences in their settings/environment (Changing minds, Changing mines final report, 2010).

Strategy 2: Adoption of fast track implementation and monitoring of health and safety reports strategy

- **Goal**

To adopt and monitor the implementation of the outcomes of health and safety reports within 30 days.

- **Justification**

The strategy was developed based on this challenge: The value of compliance is recognized in the documentation and filling process.

The health and safety team are the main drivers behind occupational health and safety in the mining industry. However, they were concerned that, though they are committed to their work which includes conducting safety inspections and audits, there is the culture of filling safety reports on the inspections without implementation or mitigating the identified risks. The Guidelines for the South African Small-Scale Mining to Comply with the Mine Health and Safety Act (2016), mitigation of the identified risks should be implemented as part of the occupational health and safety management system that enables the mining health and safety team to detect and control the health and safety risks aiming to reduce the potential of accidents and injuries. More importantly, the health and safety management system assists in achieving compliance with health and safety legislation and standards and regulations and constantly improves performance (Zungu, 2016). According to the occupational health and safety act, no 85 of 1993, the hazards in the workplace must be recognized, assessed, and controlled through a hierarchy of controls that includes elimination or substitution, engineering controls, administrative controls, and personal protective equipment.

- **Responsibility**

Health and Safety and the department Supervisors

- **Performance drivers**

- Follow-up on corrective action of the identified hazards
- Track the percentage of corrective actions within 30 days
- Each department to have a visible system to indicate the number of submitted reports and hazards calculated against the number of implantation on the identified hazards, e.g. •> 80% = green light
  •> 60% completed = yellow light

•< 60% completed = red light

Strategy 3: Health and safety support building strategy

- **Goal**

To continuously strengthen the health and safety support system from the supervisors.

- **Justification**

This strategy was developed based on this challenge: Poor health and safety support system from the supervisors.

The health and safety team described that they find it difficult to enforce and implement safety standards because of a lack of support from the management and the leadership structures. Good leadership and a healthy work environment are important aspects for miners' well-being and safety (Kayastha, 2018). Tibane and Niemand (2017) stated that management commitment to safety is important because the attitudes and actions of management can significantly influence the culture of safety in an organization, and it is therefore critical that leaders commit to the success of the implementation and continuous monitoring of the safety system. It is crucial to address safety issues at an early stage because failure to do so may result in long-term consequences that will likely be more severe (Bliar, 2017).

The World Health Organization (WHO) Healthy Workplace Framework model outlines that how the leaders/supervisors describe and behave concerning safety affects how it is applied by the miners in its application in the workplace. Furthermore, leadership behaviour also provides the opportunity to influence positive outcomes for workers, managers, and the organization (Balderson, 2016). The cultural transformation

framework informs that the leadership practices in the workplace can improve or worsen the culture of health and safety across the mining sector. Therefore, this strategy suggests that the optimal health and safety compliance of the miners can be achieved through the right attitude and behaviour of the shift leaders and supervisors (Okorie, Okoro & Musonda, 2016). Thus, a positive change at the upstream will manifest at the downstream (safe behaviour of workers). Along these lines, the South African mining industry ought to take on moral authority methodology, and the explanation or advantage for the moral culture is that the managers are needed to guarantee that the area is run morally as this will help the area to accomplish safety compliance aiming to prevent injuries and accidents (Shivambu, 2017).

- **Responsibility**

Managers and supervisors

- **Performance drivers**

- Develop a leadership program that will transform and assist the leaders in adopting the safety culture
- leading by example and speaking the ZERO HARM talk
- Releasing time for the leaders to be involved in health and safety activities in their departments.
- Empowering the occupational health team and the miners through involving them in all the activities such as policy formulation and decision making.

Strategy 4: Safe production strategy

- **Goal**

To resolve the conflict between production and safety by promoting the culture of safe production

- **Justification**

The safety production strategy was developed based on the challenge of conflict between the Production and the cost of safety compromise compliance

According to Cooper (2014), safe production implies that every person is aware and values the fact that the prosperity and the survival of the organization depend on the safe production where there is conflict, safety becomes a priority. The adoption of the safe production strategy can set the health and safety bar high. The Cultural Transformation Model emphases the importance of the mining organization and its structure to always remember that safety and production are not competing for objectives but an outcome of the work well done (Changing minds, Changing mines final report, 2010).

- **Responsibility**

- Management and the production supervisors

- **Performance drivers**

- Establishment and strengthening the processes which are available to ensure that miners rights to refuse unsafe work is respected.
- Through tolerating time defers when a safety issue emerges during production or at any given circumstances.
- Providing extra finance, material, and human resource when necessary to create a safe production environment.
- This strategy also implies stopping production until the safe environment is maintained regardless of whether it causes inconvenience or not.
- The mining organization management is responsible for ensuring that safety production is implemented through the provision of finances, materials, and human resources.
- The safety team has the responsibility to ensure continuous awareness programmes by setting the standard of safety culture high. is mindful of risks and consistently seeks to improve safety at mines

- The occupational health nurse practitioners are responsible for continuously promoting and preventing ill health through health education, monitoring, and referral system

Strategy 5 : Adoption of high standard of safety compliance strategy

➢ **Goal**

- To improve the standard of safety compliance

➢ **Justification**

This strategy was developed based on the challenge experienced by the miners related to the need to continuously improve safety compliance, thus creating the safety culture environment

The study findings revealed that though there are legislations, standards, and policies available, compliance needs continuous improvement. As Jacinto et al. (2011) state, the correct application of legislation in companies can prevent and control an undesired event and even diminish its impact. Another facet of the relationship between safety management and complying with standards is the possibility that more attention is being given to compliance than the safety practices themselves. The Cultural Transformation Framework maintained that there is a need for SA mining organizations to urgently commit how they can improve health and safety, more importantly, adopting the culture of being safety-minded (Changing minds, Changing mines final report 2010).

➢ **Responsibility**

Occupational health safety team and the management

➢ **Performance drivers**

- Designing safety activities that cater to both the physical, mental, and psycho-social well being of the miners
- Miners to take personal responsibility for health ad safety practices
- Improve the quality of accident investigations, participate in independent, no name, no blame teams to investigate successes in key risk areas
- According to the WHO healthy framework, a high standard of safety compliance can also be achieved by getting the opinions and ideas of the miners on how they believe the organization can assist in improving the working environment.
- The Cultural Framework recommended that SA mining organizations transform from a blame-seeking autocratic culture to creating a culture of developing preventative measures.

Strategy 6: Adoption of zero base harm safety appreciation strategy

➢ **Goal**

- To introduce and implement zero base harm safety appreciation.

➢ **Justification**

The adoption of a zero-base harm strategy was developed from the integrated results, which revealed that there is a lack of health and safety appreciation to motivate miners.

Participants suggested that the culture of health and safety compliance can be improved by motivating the miners through competitions, giving tokens of appreciation to employees who achieve zero-based harm. There is a need for the mine to develop the measures to create a high standard of safety culture. The bonus reward system that is linked to the safety record of a workgroup or a section is important in encouraging safety behaviour at work (Bratton & Gold, 1999). According to the

guidelines for the South African Small-Scale Mining, rewarding good safety performance can be used as a motivation to the miners to adopt a positive health and safety culture which is crucial for risk control at the workplace (Zungu, 2016). Miners are the key to the success of the organization; therefore, inspiring and engaging with the miners should be considered as the top priority. Kayastha, 2018 outlines that it is the responsibility of the senior management team in the organization to drive the Zero incident programme that aims to enhance safety awareness among the miners.

On the other hand, Bliar (2017) argues that the incentive programme should have indicators that are clearly outlined because adopting the traditional safety incentive programme might promote the wrong behaviours of not reporting the injuries.

➢ Responsibility

- Mine management

➢ Performance drivers

- Motivate miners through safety competitions. This will also improve knowledge and practice
- The mining organization should strive to implement ZERO HARM Bonuses and performance operations bonus systems.
- Ensuring that the bonus system must not send a message to the miners that production is more important than their overall well-being and safety.
- Health and safety indicators should be available to determine the ZERO HARM.
- Regular evaluation should be done to determine the bonus and incentive system and to ensure that the miners understand how the system is applied and the fairness.

Strategy 7: Adoption of continuous occupational health promotion and preventative strategies

- **Goal**

To improve adherence to health instructions through continuous health promotion.

- **Justification**

This strategy was developed based on the poor adherence of health instructions from OHNP, contributing to the occurrence of accidents and diseases.

The development of the preventative and preparative strategies at the primary level, secondary level, and tertiary level will assist the miners.

The interventions can be categorized as preventive and treatment interventions, wherein preventive interventions are usually offered to persons unsolicited and without symptoms raging them to seek help. Preventive interventions, in turn, are classified as primary, secondary, or tertiary prevention (Dragan et al., 2017). Primary preventive interventions are aimed at preventing disease or injury outcomes before the disease or injury process has started, whereas These interventions can be categorized into three major classes: environmental, behavioural, and clinical (Dragan et al., 2017).

- **Responsibility**

Occupational health and safety team

- **Performance drivers**

Primary prevention

- Continuous health education, promoting both the physical, psychological, and social well-being, e.g. introducing programmes such as stress management and chronic disease support groups.

- Conducting medical surveillance and monitoring of chronic diseases, thereby enhancing employees' morale and maintaining optimal health.
- Emphasis on changing personal health practices such as alcohol and drug abuse, smoking, diet, and physical exercise, to improve overall health status and reduce absenteeism.
- Education and training in specific fields of occupational safety and health and working conditions facilitate both the diagnosis of problems and the implementation of solutions and can therefore help overcome these limitations

Secondary Prevention

- Encouraging personal strategies to prevent re-injury or recurrence and implementing programs to return people to their original health and function to prevent long-term problems (Smith, Morrow & Ross, 2015.) Examples include:

- Regular exams and screening tests to detect disease in its earliest stages (e.g. mammograms to detect breast cancer)
- Daily, low-dose aspirins and/or diet and exercise programs to prevent further heart attacks or strokes
- Suitably modified work so injured or ill workers can return safely to their jobs.

Tertiary Prevention

Assisting miners to manage long-term, often complex health problems and injuries (e.g. chronic diseases, permanent impairments) to improve as much as possible their ability to function, their quality of life, and their life expectancy

- Cardiac or stroke rehabilitation programs, chronic disease management programs (e.g. for diabetes, arthritis, depression, etc.)
- Support groups that allow members to share strategies for living well

    - Vocational rehabilitation programs to retrain workers for new jobs when they have recovered as much as possible.

Strategy 8: Safety-oriented behaviour strategy

- **Goal**

To promote knowledge and safety-oriented behaviour.

- **Justification**

The safety-oriented behaviour strategy was developed based on the challenge identified: there is a gap between knowledge and safety behaviour.

According to the respondent's behavioural issues, such as taking shortcuts instead of following procedures and working under the influence of alcohol, were described. Therefore the study findings revealed that attitude and behaviour are associated with unsafe acts and non-compliance. This strategy aims at closing the gap between the knowledge and behaviour of the miners. This can be achieved by making awareness and coaching the miners on proper behaviours that are needed among the miners to ensure safety. According to the guidelines for the South African Small-Scale Mining, it is of high importance for the mining organizations to strengthen positive behaviour to promote a health and safety culture that is crucial for risk control in your workplace. Beus et al. (2015) outlined that the mining organizations must adopt the Behaviour Based Safety (BBS) approach, which aligns safety behaviour with the miner's attitudes toward safety.

More importantly, it is also important for safety awareness behaviour of management Management sets the tone for safety, and management's behaviours and words are greatly leveraged compared to the average employee's behaviour (Bliar, 2017).

- **Responsibility**

Occupational health and safety team and mine management

➢ **Performance drivers**

- Safety behaviour awareness must include safety compliance and safety participation. The awareness should involve active participation in safety activities such as policy and procedure formulation, safety drills.
- This can be achieved by working with miners to change their attitudes, behaviours, and thoughts and improve their situational awareness.
- Through creating a safety awareness programme and training the miners on the correct behaviours that are required within specific occupations to remain safe.

Strategy 9: Designing of health and safety training programmes that utilize different teaching strategies

➢ **Goal**

To promote the utilization of different teaching strategies during safety training

➢ **Justification**

This strategy was developed based on the challenge identified there is a need to shift away from the traditional way of teaching.

The study revealed that though there are various platforms for training in the mine, there is still a problem of compliance which warrants the need for improvement of training. More importantly, participants raised the issue of the involvement of mines in safety activities for better understanding. This strategy can be achieved by training the safety department and the occupational health clinic to shift away from the traditional way of teaching and adapt different teaching strategies. More importantly, conducting training which will enable that miners in different levels understand the rationale behind every safety activity and understand its significance. Moreover, understanding the importance of compliance with certain regulations and why other safety activities must be done (Beech, 2019). The Cultural Transformation Framework asserts that coordination of safety activities such as conducting safety training or safety talks

capacitate the miners with knowledge related to health and safety in their different departments.

- **Responsibility**

This strategy can be achieved by training the safety department and the occupational health clinic.

- **Performance drivers**

- Conducting training that will enable that miners in different levels understand the rationale behind every safety activity and understand its
- Coordination of safety activities such as conducting safety training or safety talks capacitates the miners with knowledge related to health and safety in their different departments.
- Teaching strategies such as the use of pictures, illustrations, and hands-on training can address difficulties in learning, such as language barriers (Qian, & Lin, 2016).
- The introduction of the new teaching methods should include solving model situations
- The use of Information and Communication Technologies (ICT), sharing information through social networks, using websites, and e-learning.
- Create a platform for miners to quickly discuss the issue of health and safety at work. The platform should be designed in such a way that the communication tool allows for quick advice and guidance on how to deal with the situation - using new ICT, including mobile applications.

Strategy 10: Implementation strategy to improve the effectiveness of union repsentatives on occupational health and safety activities

- **Goal**

To improve the effectiveness of union representatives on occupational health and safety activities

- **Justification**

This strategy was developed based on the challenge identified on the unions overusing their rights or powers to intervene in health and safety procedures

The study revealed that there are challenges related to the union's representatives who are overusing their powers by disturbing the procedures in ensuring compliance more especially in the occupational health clinic. The participants raised a concern that instead of the unions supporting the implementation of health and procedures and policies, they are interfering, making it difficult to enforce compliance. Walters et al. (2017) argued that sometimes union representatives differ with the supervisors on the appropriate actions. This is practised about the unions based on their regulatory framework to which aims to protect the miners.

- **Responsibility**

This strategy can be achieved through collaboration between the safety team, management, and union representatives.

- **Performance drivers**

- Conducting training which enables the union representatives to understand the regulations and procedures followed in the occupational health clinic and how non-compliance can affect the overall health of miners.

- Coordination of safety activities between the health and safety team and the union representatives might result in a key to fruitful results for common understanding and interest towards health and safety.
- The WHO health Framework emphasized the importance of the mining organizations to establish a healthy workplace team which includes the union representatives that will focus on the execution of changes to improve and create a healthy work environment. More importantly, ensuring compliance and promoting the adoption of safe behaviour culture.

6.6. VALIDATION OF STRATEGIES

Validation is described as the use and evaluation of a model for guiding practice and practice-oriented approaches that further contribute to empiric knowledge development. Furthermore, validation is the process of gathering validity confirmation to assess the suitability of the interpretations, procedures, and conclusions based on assessment results (Cook & Hatala, 2016). During validation, the researcher explains the anticipated explanations and conclusions. Moreover, the researcher uses the argument to interpret the results. In other words, validation is consolidated as a valuable point in research to demonstrate the ability the study has to reveal a given phenomenon.

6.6.1 Methodology applied for validation

The objective in phase 3 of this study was to validate strategies to enhance health and safety compliance with standards in the mining industry. The study applied a Delphi technique method which involves consultation with health and safety experts in the mining field. According to Ogbeifun, Agwa-Ejon, Mbohwa and Pretorius (2016) in the Delphi technique, experts in the field share their insights that stimulate thinking and help bring consensus to an issue.

Three experts (Occupational health clinic manager, occupational medical practitioner, and one academic who specialize in occupational health and safety) were consulted telephonically, and they were informed about the aim of the study through email, thereafter a written informed consent to contribute to the study was obtained.

Therefore, this study took advantage of academic opinions and experts' views to validate the developed strategies. The occupational health clinic manager holds a degree and post-basic diploma in occupational health nursing with 4 years experience, and the occupational health medical practitioner holds a degree in medicine and post-basic diploma in occupational health with more than 10 years' experience in occupational health and safety in mining.

The experts were identified as academics and authors of the articles in health and safety mining, occupational health medical practitioners, and occupational health clinic managers in various institutions. They have lived experiences in occupational health and safety in mining. They also attended and presented in a lot of conferences on occupational health locally and internationally. The academics were senior lecturers with expertise in qualitative and quantitative research methods. They have also supervised master's students in occupational health.

6.7. CRITERIA FOR VALIDATING THE STRATEGIES

The criteria which were used for validation were adopted from China and Krammer (2014); Cook and Hatala (2016), described the validation as the process of gathering validity confirmation to assess the suitability of the interpretations, procedures, and conclusions based on assessment results.

6.7.1. Goal and practice

The response to this question was based on the examination of the goals of the strategies in comparison with the outcomes that are valuable to improve health and safety compliance. All experts agreed that the goals are clear and are consistent with the optimal goal of health and safety compliance. They further agree that the strategies are in line with the existing standard practice the occupational medical practitioner said:

"*The strategies are in line with the zero harm goals which are driven by the CEOs of the various mining houses. It is worth noting that achieving a safe production can be challenging in practice as more emphasis is placed on production bonuses vs safety.*

Absenteeism is an important factor that management ought to deal with as it affects production and safety."

From this goal, the following suggestion was made by the experts:
Expert 2: *"Further description of each strategy is needed." Strategies 6 and 7 are well Justified and explained. It is clear how they will be applied and the same should be done to the other Strategies. Make sure you explain the developed strategies thoroughly and include the Theory that was used to develop them.*

The suggestion from the expert was addressed through the further description of the strategies aligning them with the WHO healthy framework and the Cultural transformation model.

6.7.2. Context of the strategies:

In this criteria, the experts were expected to rate and comment on how well the ideas of the strategies might be transferred to the context of the study. The rating and the comments on the developed strategies from the three experts are presented in table 6.1, 6.2 and 6.3

The experts agreed that the strategies were well suited to the context that is stated in the study findings. However, the following suggestions were made

Expert 1: "*Strategies do not highlight the importance of labour unions in ensuring health and safety at mining houses."*

From this comment, strategy number ten was added based on the results of both quantitative and qualitative strands and the existing literature.

Expert 2: "*Remove OHSA where it is included as it is not for mines.*

The Occupational Health and Safety Act was removed in the development of the strategies.

6.7.3. Explanation of the strategies:

The experts were expected to respond to this criterion based on the expert judgment about the explanation concerning the practice.

Two experts agreed the strategies were developed based on the findings of the study and that the explanation of the strategies is sufficient to be used in enhancing safety compliance.

One academic suggested: *" It will be better to describe each developed strategy clearly, then followed by literature (WHO, etc.). indicate what each strategy mean and how it will be applied*

The suggestion from the expert was addressed through a further description of the strategies aligning them with the WHO healthy framework and the Cultural transformation model

6.7.4. Evidence to support the strategies:

In this criteria, the experts were expected to rate and comment on the strategies based on the evidence of the study findings, existing literature, and the theory that guided the study. All experts agreed that there is evidence to support the strategies. However, the following suggestions were made:

Expert 2: "*Theory not provided except guidelines from the Mining Council. Make sure you explain the developed strategies thoroughly and include the theory that was used to develop them".*

The comment was addressed by a further description of the strategies aligning with the theory that guided the study.

Table 6.1: Rating of the Strategies during Delphi round Expert 1

No	Criteria	Yes	No	Remarks
	Goal and practice: Response to this question must be based on the examination of the goals of the strategies in comparison with the outcomes that are valuable to improve health and safety compliance			
1.1	Are the strategies goal and the practice goal congruent?	Yes		
1.2	Are the strategies goal in line with the existing standards of practice	Yes		
1.3	Are the strategies goal consistent with the optimal goal of health and safety compliance	Yes		The strategies are in line with the zero harm goals, which are driven by the CEOs of the various mining houses.
1.4	Are the strategies have the potential to influence health and safety compliance?	Yes		The strategies demonstrate the need to involve various stakeholders in order to ensure compliance with the health and safety standards of the mining industry.
	Context of the strategies: Response to this question must be based on the exploration of how well the ideas of the strategies might be transferred to the context of the study			

1.5	Is the intended context of the strategies congruent with the practice situation	Yes		
1.7	How well suited are the strategies given the context that is stated in the study findings	Well suited.		Strategies do not highlight the importance of labour unions in ensuring health and safety at mining houses.
1.8	Do all the strategies fits within the context of the mining health and safety	Yes		It is worth noting that achieving a safe production can be challenging in practice as more emphasis is placed on production bonuses vs safety. Absenteeism is an important factor that management ought to deal with as it affects production and safety.
	Graphical presentation: Response to this question must be based on whether the diagram indicates how the strategies are interrelated			
1.9	Are the strategies graphically portrayed well in the form of a visual presentation?	Yes		
1.10	Do diagrams and structures provide support with one another	Yes		

	Explanation of the strategies: Response to this question must be based on the expert judgment about the explanation concerning the practice			
1.11	Are the explanation of the strategies sufficient to be used in enhancing safety compliance	Yes		
1.12	Is there any evidence of logic coherence on the frame of reference of the model	Yes		
['/1.13	Are the variables explained in the strategies similar to the ones in the study findings?	Yes		
	Evidence to support the strategies: Response to this question must be based on the evidence of the study findings, existing literature, and the theory that guided the study			
1.14.	Is there research evidence to support the strategies	Yes		
1.15	Is the relevant information about the corresponding theory provided	Yes		

Other comments:

Health and safety are paramount in the sustainability of the mining industry, which contributes 7% of South Africa's Gross domestic product. The occupational-related diseases and injuries hamper one's quality of life beyond the workplace into the community and

potentially results in economic losses. The results of this study will certainly go a long way in improving the quality of life of mining employees, their families and communities.

Table 6.2: Rating of the Strategies during Delphi round Expert 2

No	Criteria	Yes	No	Remarks
	Goal and practice: Response to this question must be based on the examination of the goals of the strategies in comparison with the outcomes that are valuable to improve health and safety compliance			
1.1	Are the strategies goal and the practice goal congruent?	X		Further description of each strategy is needed
1.2	Are the strategies goal in line with the existing standards of practice	X		
1.3	Are the strategies goal consistent with the optimal goal of health and safety compliance	X		
1.4	Are the strategies have the potential to influence health and safety compliance?		X	Once each strategy is explained thoroughly
	Context of the strategies: Response to this question must be based on the exploration of how			

	well the ideas of the strategies might be transferred to the context of the study			
1.5	Is the intended context of the strategies congruent with the practice situation	X		
1.7	How well suited are the strategies given the context that is stated in the study findings	X		Strategies are based on study findings
1.8	Do all the strategies fits within the context of the mining health and safety		X	Remove OHSA where it is included as it is not for mines
	Graphical presentation: Response to this question must be based on whether the diagram indicates how the strategies are interrelated			
1.9	Are the strategies graphically portrayed well in the form of a visual presentation?	x		
1.10	Do diagrams and structures provide support with one another	x		
	Explanation of the strategies: Response to this question must be based on the expert judgment about the explanation concerning the practice			
1.11	Are the explanation of the strategies sufficient to be used in enhancing safety compliance		X	It will be better to describe each developed strategy clearly, then followed by literature (WHO, etc.).

				indicate what each strategy mean and how it will be applied
1.12	Is there any evidence of logic coherence on the frame of reference of the model	X		
1.13	Are the variables explained in the strategies similar to the ones in the study findings?	X		
	Evidence to support the strategies: Response to this question must be based on the evidence of the study findings, existing literature, and the theory that guided the study			
1.14.	Is there research evidence to support the strategies	X		Study findings
1.15	Is the relevant information about the corresponding theory provided		X	Theory not provided except guidelines from the Mining council

Other comments:

Strategies 6 and 7 are well Justified and explained. It is clear how they will be applied and the same should be done to the other Strategies. Make sure you explain the developed strategies thoroughly and include the Theory that was used to develop them.

Under Performance drivers at least include the content of those policies, corrective actions, safety activities, etc. Do not just mention that there will be policies or corrective or safety activities etc. without giving the contents. It will make it easier to understand if each (under the heading Performance drivers of each strategy) is well explained.

Table 6.3: Rating of the Strategies during Delphi round Expert 3

No	Criteria	Yes	No	Remarks
	Goal and practice: Response to this question must be based on the examination of the goals of the strategies in comparison with the outcomes that are valuable to improve health and safety compliance			
1.1	Are the strategies goal and the practice goal congruent?	Yes		
1.2	Are the strategies goal in line with the existing standards of practice	Yes		
1.3	Are the strategies goal consistent with the optimal goal of health and safety compliance	Yes		The strategies are in line with the current practiced in the mine and have potential to improve the current state of health and safety
1.4	Are the strategies have the potential to influence health and safety compliance?	Yes		The strategies are important in the occupational health field to improve the current practices and the overall safety of the miners

	Context of the strategies: Response to this question must be based on the exploration of how well the ideas of the strategies might be transferred to the context of the study			
1.5	Is the intended context of the strategies congruent with the practice situation	Yes		
1.7	How well suited are the strategies given the context that is stated in the study findings	yes		
1.8	Do all the strategies fits within the context of the mining health and safety	Yes		Well suited for occupational health field in the mining industry
	Graphical presentation: Response to this question must be based on whether the diagram indicates how the strategies are interrelated			
1.9	Are the strategies graphically portrayed well in the form of a visual presentation?	Yes		
1.10	Do diagrams and structures provide support with one another	Yes		
	Explanation of the strategies: Response to this question must be based on the expert judgment about the explanation concerning the practice			

1.11	Are the explanation of the strategies sufficient to be used in enhancing safety compliance	Yes		
1.12	Is there any evidence of logic coherence on the frame of reference of the model	Yes		
['/1.13	Are the variables explained in the strategies similar to the ones in the study findings?	Yes		
	Evidence to support the strategies: Response to this question must be based on the evidence of the study findings, existing literature, and the theory that guided the study			
1.14.	Is there research evidence to support the strategies	Yes		
1.15	Is the relevant information about the corresponding theory provided	Yes		

Other comments:

I recommend the strategies the study contribute to the body of knowledge in occupational health and the strategies are applicable and can be used to improve the practices

6.8. CHAPTER SUMMARY

In this chapter, ten strategies to enhance compliance with health and safety standards were developed. The development of the strategies was guided by the study findings, existing regulations and standards, and the two theories that directed the study. The strategies were validated by (1 academic, I occupational medical practice, and 1 occupational health nurse clinic manager were provided with the validation tool to rate and comment on the goal and practice, the context of the strategies, explanation of the strategies and evidence to support the strategies. The recommendations from the experts were implemented to explain the strategies comprehensively, aligning with the study findings, context and applicability of the strategies. The next chapter deliberates on the summary, recommendations, limitations, and conclusion of the study.

CHAPTER 7: SUMMARY, RECOMMENDATIONS, LIMITATIONS, AND CONCLUSION

7.1. INTRODUCTION

The previous chapter focused on the processes which were followed on the development of the strategies to enhance compliance with the health and safety standards in the mining industry. Moreover, the developed strategies were outlined, and the validation procedure was also described. This chapter will summarise the research findings, the proposed recommendations that can be applied by different stakeholders to enhance compliance with the health and safety strategies. The study limitations and conclusions that were drawn from the theories and literature are outlined.

7.2. RESTATEMENT OF THE OBJECTIVES

The discussions in this section emanate from the objectives which were achieved according to different phases of the study. The objectives are listed below, and an attempt is made to show how they were each achieved.

Phase 1: Situational analysis

It is in the situational analysis that objective one was achieved, which was to explore and describe the OHNP and the safety team perspectives regarding compliance with health and safety standards in the mining industry. This objective was achieved through engagement (individual interviews) with the OHNP and the safety team (safety officers, and safety representatives).

In chapter 5, the qualitative results were presented in themes and sub-themes. The health and safety team, who are the main coordinators of the health and safety activities in the mine, were able to describe both the positive and negative challenges related to safety compliance in their work environment. More importantly, through their lived experience and theoretical background, they were able to propose the strategies

that can be adopted to improve the current state of health and safety compliance in their workplace. These results were used to develop the quantitative data collection instrument to achieve objective number 2.

Objective two was also achieved during situational analysis, which was to explore and describe miners and organizational practices related to compliance with health and safety standards in the mining industry. This objective was achieved through survey questionnaires in the quantitative phase. In chapter 5, the quantitative results were presented in tables and graphs describing the miners and the mining practices related to compliance with health and safety standards

The study results which emerged from objective 1 and objective 2 were integrated and interpreted in chapter 6 of the study, and the following conclusions were drawn from the major findings.

- **Description of challenges related to health and safety standards compliance among the mineworkers and the mining organization**

The integrated, analyzed data suggest that though there are regulations, standards, and policies which guide the mining organization, the compliance is average from both miners and the organization. Furthermore, the study also revealed that most of the accidents, injuries, and diseases in this mine are a result of non-compliance with the health and safety standards. It can therefore be concluded that there is a relationship between the occurrence of diseases and non-compliance. However, the occupational health practitioners in the clinic were concerned about the trend of non-compliance with the chronic medication, which exposes the miners and others to the risk of accidents or injuries. They gave an example of a miner who got injured while in the clinic he was referred for further management of chronic disease. It, therefore, indicates that health and safety practitioners in the mine still have major responsibilities in improving the current state of compliance among miners and the organization.

Safety compliance was viewed as costly, which, therefore, to maintain the high standard of compliance was a major challenge because sometimes the mining organization is unable to implement some of the safety standards due to the costs which are involved in quantitative survey lack of resources and proper equipment's which is viewed as the cause of non-compliance scored 64.8%. It can therefore be concluded the resources and quality of equipment provided could be viewed as a factor that affects how miners perceive health and safety standards. Lack of support and role modelling from the management and supervisors was described as a challenge in maintaining health and safety. The miner's behaviour and work experience were noted to be a challenge in achieving safety compliance because during investigations, most of the incidences were related to behaviour, more especially taking shortcuts was noted.

It is the responsibility of the health and safety team to maintain a high standard of safety. However, the production pressure was described to conflict with the maintenance of the high standard. The study concluded there is an association between production pressure and safety compliance.

Phase 2: Development and description of strategies

Phase two of the study involved the development and description of the strategies. Objective 3, which was to develop and describe strategies to enhance organizational and employees' practices towards compliance with health and safety standards in the mining industry, was achieved. The strategies were developed based on the results, reviewed literature, and the healthy framework, and the cultural transformation framework model, which guided the study.

In the current state of health and safety in the South African mining industry, different mining industries need to have healthy, competitive, and motivated miners. This can be achieved through the implementation of different strategies, well-being programs, and practices that can benefit both the organization and the miners.

Chapter 7 of this study described the proposed strategies that can be adopted by mining organizations to enhance health safety compliance. The developed strategies will guide occupational health care facilities/clinics in the mines in ensuring compliance with the health and safety preventative strategies. The strategies will also assist the occupational health practitioners, health, and safety team in increasing awareness of health risks that impact the well-being and safety of employees. Moreover, the proposed strategies might also assist the mining council policymakers in developing appropriate strategies and or allocate resources to implement the strategies that will be developed in this study. More importantly, non-compliance results in the occurrence of accidents, injuries, and occupational disease. Therefore the implementation of the proposed strategies might have the potential to reduce the strain in the families caused by accidents and occupational diseases.

The following are key aspects describing phase 2 strategies:

- **Health and safety leadership support building strategy**

How the leaders/supervisors describe and act concerning safety influences how it is perceived and practised by miners. Therefore the optimal health and safety compliance of the miners can be achieved through the right attitude and behaviour of the shift leaders and supervisors.

- **The adoption of safety report implementation fast track strategy**

The study results revealed that in this mine, safety reports were used for filling purposes without elimination of the identified hazards. This strategy strives for rapid elimination of the identified risks at a rapid pace. The significance of safety survey reports is not realized through paperwork and the reporting system but instead through the timeous implementation of the identified hazards (Mokoena & Oberholzer, 2015; Tibane & Niemand, 2017).

- **The adoption of a high standard of safety culture compliance**

The study findings revealed that though there are legislations, standards, and policies available, health and compliance need continuous improvement. The mining organization should demonstrate a safety culture in such a way that all the mines are aware of safety issues and continuously behave in such a way that they constantly prioritize their health and safety at all times.

- **Zero-based harm safety appreciation strategy**

The miners indicated that the introduction of a bonus reward system that is linked to the safety record of a section would encourage and motivate them to practice safe behaviour.

- **Safety behaviour awareness strategy**

Safety awareness behaviour will promote the miner's behaviour in promoting the working environment, which will be healthy and safer for everyone (Lee, Halim, Thong, & Chai, 2017; Li et al ., 2019). Safety behaviour awareness must include safety compliance and safety participation. Safety compliance is an indication that the miners adhere to safety procedures and carry out health and safety activating by ensuring that the working environment is safe for everyone. The awareness should involve active participation in safety activities. This can be achieved by working with miners to change their attitudes, behaviours, and thoughts and improve their situational awareness through creating a safety awareness programme and training the miners on the correct behaviours that are required within specific occupations to remain safe.

- **Occupational health and safety preventative strategies**

The subject of health and safety problems in the mining industry has been explored by many authors, mostly looking at the traditional ways of enforcing the legislation. In this thesis, the arguments have indicated that though there are legislations, standards, and policies available to guide the mines on health and safety compliance, there is a need to develop various strategies to strengthen the culture of high standard compliance.

Phase 3: Validation of the strategies

Objective 3: Validate strategies to enhance organizational and employees' cultural practices towards compliance with health and safety standards in the mining industry. Delphi technique was used to validate the developed strategies. The strategies were validated by 3 experts (1 academic, an occupational medical practitioner, and 1 occupational health nurse clinic manager). Informed consent was sought, and they were provided with the validation tool to rate and comment on the goal and practice, the context of the strategies, explanation of the strategies and evidence to support the strategies. More details were described in chapter 7 of the study.

7.3. RECOMMENDATIONS TO ENHANCE COMPLIANCE WITH HEALTH AND SAFETY STANDARDS

Recommendations are proposed based on the study findings and literature. From the study findings and literature, the following recommendations are proposed

7.3.1. Recommendations to management and practice

Occupational health and safety is a human right issue that has got to be given legal, social, and ethical concerns. Therefore the management and leadership should support health and safety activities both financially and display modelling the desired safety behaviour to ensure the overall compliance by miners.

Fundamentally, the supervisors exhibit their obligation to safety through their conduct, disposition, and the distribution of assets, counting the time spent on health and safety issues, especially in the time spent on endeavours to further develop safety programmes.

A safety behaviour awareness programme must be initiated emphasizing the correct safety behaviours in different occupations. This can help to change the miner's attitudes, behaviours, and thoughts and improve situational awareness.

By linking health and safety performance with the performance reviews and financial incentives with safety goals and objectives, employees and managers can observe

senior management's commitment to change. Safety can also be a conduit that shows the link between efficiency and employee or volunteer morale.

- The mining organisation management is responsible for ensuring that safety production is implemented through the provision of finances, materials and human resources.
- The safety team has the responsibility to ensure continuous awareness programmes by setting the standard of safety culture high. is mindful of risks and consistently seeks to improve safety at mines
- The occupational health nurse practitioners are responsible for continuously promoting and preventing ill health through health education, monitoring, and referral system

7.3.2. Recommendations for education and training

It is recommended that The occupational health safety team develop a preventative programme. This is achieved through continuous health education, conducting medical surveillance, and monitoring of chronic diseases, thereby enhancing employees' morale and maintaining optimal health.

Safety awareness behaviour awareness programme will promote the miner's behaviour in promoting the working environment which will be healthy and safer to everyone. The involvement of the miners in the safety behaviour awareness programme might assist in transforming their behaviour and attitude to be safety-minded.

The study results show the need to re-educate the miners in the following areas in which most of the miners do not comply with the health and safety standards; Chronic disease management the behavioural factors such as taking shortcuts.

New education methods should include solving model situations using information and communication technologies, sharing information through social networks, using websites, and e-learning. It would also be beneficial to create a platform for miners to quickly discuss the issue of health and safety at work. The platform should be designed

in such a way that the communication tool allows for quick advice and guidance on how to deal with the situation - using new ICT, including mobile applications.

7.3.3. Recommendations for policy

The mine must involve the miners in the development of a safety incentive or bonus policy. This formed part of recognition which will motivate the miners to modify their behaviour and align them with the safety culture of the organization. Positive reinforcement through recognition is a powerful tool in changing the safety culture (IAEA, 20021).

7.3.4. Recommendations to research

The role of the OSH professional within the mining organization focusing more on addressing the challenges of non-adherence requires further attention. None of the studies identified in the present review focused on the role of the OSH professional in ensuring compliance with the health and safety standards.

7.4. LIMITATIONS OF THE STUDY

Though the study had positive results, there were some limitations

- The study was limited to one mine, which is situated in one of the five districts in Limpopo Province. Due to Covid-19 other mines in four districts did not permit for the study to be conducted. However, some of the mines refused the permission without giving a reason. As a result, the finding of this study is limited to one mine. However, the proposed strategies can be implemented in other settings.
- Access to the participants inside the mine was a challenge. Field workers who have direct contact with the participants were appointed and trained on ethics and quantitative data collection for the study.
- There is limited literature that specifically addresses the role of the OSH team professionals in ensuring compliance with the health and safety standards in the mining industry. This field needs further exploration.

- The proposed strategies were validated by a group of experts in the field of occupational health. However, they have not to be applied and evaluated for their effectiveness.

7.5. CONTRIBUTION OF THE STUDY TO THE BODY OF KNOWLEDGE

The contribution to the body of knowledge is aligned to the South African Qualifications Authority (SAQA) NQF level 10 (2012), which are designed to meet the needs of academics and occupational qualifications. In this study, the SAQA level descriptors are important to ensure consistency in the achievement of the objectives in accordance with the allocation of qualifications (Level Descriptors for the South African National Qualifications Frameworks, 2012). The criteria are listed below, and an attempt is made to show how they were each achieved.

Criteria 1: The candidate must be able to conceptualize new research initiatives and build new knowledge and practice.

The study findings clearly outlined that the knowledge and availability of safety regulations, standards, and policies in the mine do not alone create the culture to their compliance. The findings also made it clear that health and safety compliance can not be achieved by just mere complying with the laws and standards without being mindful of the risk, unsafe behaviour, and hazards. Health and safety compliance goes with responsibility by both the leaders and the organization. More importantly, the study findings also revealed that the value of compliance is not realized through papers and documentation of work which is used for filling or audit purposes, but rather through fast-tracking the implementation of the findings to eliminate the identified risks and behaviour, the value of a strategy is not realized through the pieces of paper on which it is documented, but rather through organizational-wide awareness, buy-in, and implementation (Mokoena & Oberholzer, 2015).

Understanding the challenges faced by the miners might assist the mine in developing on-site interventions to improve the state of health and safety. Moreover, the attitudes

and the behaviour of the miners can be transformed to safety-oriented behaviour and practices through the establishment of the safety behaviour awareness program which was proposed.

Criteria 2: The candidate must demonstrate scholarly debates around theories of knowledge production and practice.

Objective three, which was the development of the strategies, was guided by the findings of both quantitative and qualitative phases, the World Health Organization Healthy Workplace Framework, and the cultural transformation model which guided this study. Chapter 4 described the two theories and how they will guide the study, and chapter 6 incorporated the results with the theory, which guided and supported the development of 10 strategies to enhance health and safety compliance in chapter 7 of the study.

Criteria 3: The candidate should develop new methods, techniques, processes, systems, or technologies in original, creative, and innovative ways appropriate to specialized and complex contexts.

Based on the identified research gap, the current state of occurrence of occupational diseases, and safety concerns in the SA mining industry, the current study resolved in developing the health and safety strategies to enhance consistency in health and safety compliance. The strategies we developed aim to improve the current state of compliance with the health and safety standards in the mining industry. Moreover, they will also assist in reducing the health and safety risks and the associated factors underlying the occurrence of accidents at work, occupational diseases, and other occupational health hazards among miners in the selected mine. Additionally, the strategies will guide occupational health care facilities/clinics in the mines in ensuring compliance with the health and safety preventative strategies. The strategies will also assist the occupational health practitioners, health, and safety team in increasing awareness of health risks that impact the well-being and safety of employees. Furthermore, the proposed strategies might also assist the mining council

policymakers in developing appropriate strategies and or allocate resources to implement the strategies that will be developed in this study. More importantly, non-compliance results in the occurrence of accidents, injuries, and occupational disease. Therefore the implementation of the proposed strategies might have the potential to reduce the strain in the families caused by accidents and occupational diseases.

Criteria 4: The candidate should apply specialist knowledge and theory in critically reflexive, creative, and novel ways to address complex practical and theoretical problems.

The study provided a unique role of the occupational health and safety team and the challenges associated with which were never clearly described before. This was established from a phenomenological viewpoint where the occupational health team described their lived experiences in facilitating the health and safety activities. The proposed strategies have the potential to improve the practices of both the organization and the miners by adopting the culture of safety. The study contributes to the occupational health field in that the results afford evidence of the importance of adopting a safety culture approach.

The study findings indicate that health and safety compliance is an important aspect that needs to be contextualized. More importantly, the study findings indicate that health and safety compliance is a complex aspect that needs the involvement of both the miners and leaders and is continuously improved

From the literature, it is clear that research in this area is relatively underdeveloped. Therefore, this research study seeks to add to the body of literature which deals with the challenges relating to health and safety in the South African mining industry.

7.5. CONCLUSION

Phase 1 of this study described and explored the miners and organizational practices related to compliance with health and safety standards in the mining industry. Semi-

structured one-on-one interviews were conducted among the OHNP and the safety team in different departments. The safety team described their lived experiences and challenges related to safety compliance. The main findings were challenges related to leadership compliance and also related to the cost of maintaining safety, Miner's behaviour related challenges; the impact of non-compliance on the overall health of the miners was also described, the conflict between production and safety, the significance of the role of safety communication channels in the mine, significant roles played by safety team in promoting compliance and the perceived health and safety measures that can be adopted and implemented.

To further explore and describe the experiences and challenges, the results from the interviews were used to develop a data collection instrument for the second phase. Thereafter a quantitative survey was conducted, and the respondents were drawn from across all the departments in the mine (management, safety, supervisors, shift leaders, engineering, machine operators, mechanical, leaners, electrician, mechanical, welding, consultant, and drying dispatch. The major results revealed that health and safety regulations have a major role in ensuring miners' safety, thereby preventing the other occurrence of accidents (82,5%). There is a high correlation between non-compliance with the safety regulations and the occurrence of injuries and accidents. The language used to communicate the safety standards and instructions plays an important role in safety compliance, leadership influences were also found to be related to how miners are oriented to safety culture, accidents and the temporary unsafe environment had the strongest correlation (0,65), The actual rights of the miners and interest were rated high.

The study afforded the researcher insights and an understanding of diverse challenges and experiences related to safety compliance in the mine. Moreover, the study revealed that safety compliance is not just mere compliance with regulations and standards but a culture that warrants the miners and organization to take responsibility for their behaviour and actions towards health and safety. Thus taking responsibility for your well-being and other miners. Furthermore, the findings revealed that in this mine, the regulations and standards are available and communicated to the miners

through different channels, but compliance with these regulations needs further improvement.

Health and safety compliance was viewed as a process that warrants continuous improvement with more focus on transforming the behaviours of the miners to the safety culture behaviour-oriented. There was strong support for regulatory communication with different platforms. The occupational health clinic and the safety department were viewed as the core departments in facilitating and supporting the safety activities in the mine. More importantly, the occupational health team described different safety programs available to promote the health and safety of employees, such as chronic diseases management programmes, women in mining, induction, peer counsellors, and occupational risk exposure. Moreover, the occupational health team specified that it is their responsibility to ensure the overall health and safety in the mine. They, therefore, ensure that every morning in the occupational health clinic and different work stations, health education training on occupational diseases, chronic diseases, prevention of injuries, different safety techniques are done. They further explained that before the beginning of each department, there are safety talks. However, the study revealed that though these talks are implemented, there are areas that need improvements such as compliance with health instructions from the clinics and chronic medications, leadership role modelling, the behaviour of taking a shortcut by miners, the class between production and safety, implementation of safety report findings and the initiation of safety bonus and incentives

Phase 2 of the study involved the development and the description of the strategies to enhance organizational and miners' practices towards compliance with health and safety standards. The development of the strategies was grounded on the integrated results that that was developed based on the results, reviewed literature, the healthy framework model, and the cultural transformation framework model, which was used to support the study.

Phase 3 : Delphi technique was used for validation by sending the proposed strategies to the experts, who are the academics, health and safety inspectors, and the occupational health and safety clinic managers. The recommendations were made and effected during Delphi rounds. Study recommendations for policy, management practice.

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APPENDICES

Appendix A: Consent form (English)

DEPARTMENT OF NURSING SCIENCE ENGLISH CONSENT FORM

Statement concerning participation in a Clinical Research Project*.

Name of Project / Study: Strategies to enhance compliance with the health and safety standards within the mining industry in Limpopo Province, South Africa.

I have read the information and heard the aims and objectives of the proposed study, and was provided with the opportunity to ask questions and be given adequate time to rethink the issue. The aim and objectives of the study are sufficiently clear to me. I have not been pressured to participate in any way.

I know that sound recordings will be taken of me. I am aware that this material may be used in scientific publications, which will be electronically available throughout the world. I consent to this, provided that my name and hospital number are not revealed.

I understand that participation in this Study / Project is completely voluntary and that I may withdraw from it at any time and without supplying reasons. This will have no influence on the regular treatment that holds for my condition, nor will it influence the care that I receive from my regular doctor.

I know that this Study / Project has been approved by the Turfloop Research Ethics Committee (TREC). I am fully aware that the results of this Study / Project will be used for scientific purposes and may be published. I agree to this, provided my privacy is guaranteed.

The Study/Project envisaged may hold some risk for me that cannot be foreseen at this stage.

Access to the records that pertain to my participation in the study will be restricted to

persons directly involved in the research.

Any questions that I may have regarding the research, or related matters, will be answered by the researcher/s.

If any medical problem is identified at any stage during the research or when I am vetted for participation, such condition will be discussed with me in confidence by a qualified person, and/or I will be referred to my doctor.

I indemnify the University of Limpopo and all persons involved with the above project from any liability that may arise from my participation in the above project or that may be related to it, for whatever reasons, including negligence on the part of the mentioned persons.

I hereby give consent to participate in this Study / Project.

Signature of researched person.....

Signature of researcher……..
Signed at……..this……day of……..2018

Appendix B: Sepedi consent form

DEPARTMENT OF NURSING SCIENCE SEPEDI CONSENT FORM

Setatamente mabapi le go tšea karolo ka go Protšeke ya Dinyakišišo tša.
Leina la Protšeke / Dinyakišišo:

Ke badile e bileke kwele ka ga tshedimošo mabapi le maikemišetšo le morero wa dinyakišišo tšeo di šišintšwego. ke filwe monyetla wa go botšiša dipotšišo le nako yeo e lekanego ya go naganishisha mabapi le dinyikishisho tseo di swanetsego go dirwa. Ke tloga ke kwešiša maikemišetšo le morero wa dinyakišišo tše gabotse. Ga se ka gapeletšwa go kgatha tema ka tsela efe goba efe.

Ke a kwešiša gore go kgatha tema Protšekeng/Dinyakišišong tše tša go amana le dipetlele go ka ba le kgatisho ya poledishano yaka le monyakishishi goba go phatlalatswa ga dipoelo tsa dinyakishisho. Ke dumelelana le seo fela ge leina laka le nomoro ya ka ya sepetlele di ka se phatlalatswe. Ke kwesisa gabotse gore go kgatha tema mo dinyakishishong ke ka boithaopo le gore ke a dumelelwa go ka tlogela go kgatha tema nakong efe goba efe ntle le gore ke fe mabaka. Go kgatha tema go ka se be le khuetšo efe goba efe go kalafo yaka ya ka mehla ya maemo a ka gape e ka se huetše le ge e ka ba tlhokomelo yeo ke e humanago go ngaka yaka ya ka mehla.
Ke a tseba gore Teko/Protšeke/Dinyakišišo tše di dumeletšwe ke lefapa la dinyakishisho leo le bitswago Turfloop Research Ethics Committee (TREC), Yunibesithi ya Limpopo le lefapa la maphelo ka poroventsheng ya Limpopo .Ke tseba gabotse gore dipoelo tša Teko/Dinyakišišo/ Protšeke tše * di tla dirišetšwa merero ya tsa bo ramahlale gomme di ka phatlalatšwa. Ke dumelelana le se, ge fela geke tiisetwa gore ke dula ke shirelеditswe ka di nako ka moka .
Ke fa tumelelo ya go kgatha tema Tekong/Dinyakišišong/ Protšekeng *.
Leina la molwe moithaopi
.....
Mosaeno wa molwetši goba mohlokomedi.

.... Lefelo.

Letšatšikgwedi. Tlhatse

_____

Appendix C: Xitsonga consent form

NURSING SCIENCE DEPARTMENT XITSONGA CONSENT FORM

Xiletelo mayelana na ku nghenelela eka ndzavisiso

Vito ra ndzavisiso:

Ndzi nyikiwile xikongomelo na maendlelo ya ndzavisiso, ndzi thlela ndzi nyikiwa nkarhi wo vutisa swivutiso na ku nyikiwa nkarhi lowu eneleke ku ehleketisisa hi mhaka leyi. Xikongomelo na maendlelo ya ndzavisiso swi basisiwile eka mina. Andzi sindzisiwanga ku nghenelela hi ndlela yihi kumbe yihi. Ndza swi twisisa leswaku ku nghenela eka ndzavisiso lowu i ku tsakela ka mina naswona ndzi nga tihumesa eka swona nkarhi wun'wana na wun'wana handle ko hlamusela ku hikwalaho ka yini.

Ndza swi tiva leswaku ndzavisiso lowu wu pfumeleriwile hi komiti ya swa vulavisisi leyi vuriwaka Turfloop Research Ethics Committee (TREC) na ndzawulo ya rihanyo xifundzha-nkulu xa Limpopo na va rangeri va xipedhlele. Ndza swi tiva hi ku hetiseka leswaku mbuyelo wa ndzavisiso wu ta tirhisiwa eka swikongomelo swa tisayense nakona swi nga hangalasiwa. Ndza pfumela eka leswi, ntsena loko ndzi tiyisisiwa leswaku ndzi nga ka ndzi nga humelerisiwi kumbe ku tivisiwa eka van'wana.

Ndzi nika mpfumelelo wo nghenelela eka ndzavisiso lowu.

……... …..……..……

Vito ra Mungheneleri. Nsayino wa mungheneleri/ muhlayisi

……. …….. ……...

Mbhoni. Ndhawu. Siku

Xiletelo hi mulavisisi

Ndzi nyikile vuxokoxoko hi ku vulavula na hi leswi tsariweke mayelana na ndzavisiso lowu.

Ndza pfumela Ku hlamula swivutiso hi vuswikoti bya mina eka nkarhi lowu taka mayelana na ndzavisiso.

Ndzi ta landzelerisa eka maendlelo lawa ya pfumeleriweke.

…….. …… ……

Vito ra mulavisisi. Nsayino. Siku

APPENDIX D: PERMISSION TO CONDUCT RESEARCH

Excellence. Every day. Every way.

Clinix HEALTH GROUP

29 October 2019

Ms LIVHUWANI MUTHELO

P.O. BOX 614

BENDOR

POLOKIWANE

0699

Re: PERMISSION TO CONDUCT RESEARCH WITH CLINIX OCCU8PATIONAL HEALTH AT FOSKOR MINE.

With regard to the above-stated request, it gives me pleasure to inform you that you are herewith granted the permission to conduct the research titled: **Strategies to enhance compliance with the health and safety standards amongst employees in the mining industry Limpopo Province.**

We would also wish to get feedback of the results to enable us to improve our practice.

Regards

MJ MAKOFANE

(Occupational Health Manager)

0828705866

Clinix Health Group
47 St. Patrick Road, Houghton,
P.O. Box 805, Houghton, 2041,
South Africa.

T 011 274 6560
F 011 487 3641

www.clinix.co.za

Appendix E: Ethical clearance certificate

University of Limpopo
Department of Research Administration and Development
Private Bag X1106, Sovenga, 0727, South Africa
Tel: (015) 268 3935, Fax: (015) 268 2306, Email: anastasia.ngobe@ul.ac.za

TURFLOOP RESEARCH ETHICS COMMITTEE

ETHICS CLEARANCE CERTIFICATE

MEETING:	**6 August 2019**
PROJECT NUMBER:	**TREC/219/2019: PG**
PROJECT:	
Title:	Strategies to Enhance Compliance of Health and Safety Standards at the Selected Mining Industries in Limpopo Province, South Africa: Occupational Health Nurse's Perspective.
Researcher:	L Muthelo
Supervisor:	Prof RN Malema
Co-Supervisor/s:	Prof TM Mothiba
School:	Health Care Sciences
Degree:	PhD in Nursing

PROF P MASOKO
CHAIRPERSON: TURFLOOP RESEARCH ETHICS COMMITTEE

The Turfloop Research Ethics Committee (TREC) is registered with the National Health Research Ethics Council, Registration Number: **REC-0310111-031**

Note:

i) **This Ethics Clearance Certificate will be valid for one (1) year, as from the abovementioned date. Application for annual renewal (or annual review) need to be received by TREC one month before lapse of this period.**

ii) **Should any departure be contemplated from the research procedure as approved, the researcher(s) must re-submit the protocol to the committee, together with the Application for Amendment form.**

iii) **PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES.**

Finding solutions for Africa

Appendix F: Editing Certificate

18 December, 2021
Pretoria, South Africa

To whom it may concern,

I hereby confirm that I undertook the language editing for:

STRATEGIES TO ENHANCE STRATEGIES TO ENHANCE COMPLIANCE OF HEALTH AND SAFETY STANDARDS AT THE SELECTED MINING INDUSTRIES IN LIMPOPO PROVINCE, SOUTH AFRICA: OCCUPATIONAL HEALTH NURSE'S PERSPECTIVE

by **LIVHUWANI MUTHELO**

The work was well written overall.

Cillié Swart BA (Harvard) MBA (Kuehne)
Proz Certified Translator
Professional Editors' Guild (PEG)
South African Translators Institute (SATI)
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https://www.facebook.com/transkaroocommunications
https://www.proz.com/translator/1987402
cilliemasterkey.wixsite.com/transkaroo

Appendix G: Information leaflet for the expert participants

Project co-ordinators: PhD candidate: Muthelo L (9961623)
: Supervisor: Prof TM Mothiba
. Co-Supervisor: Prof RN Malema

Title: Strategies to enhance compliance of health and safety standards at the selected mining industries in Limpopo Province, South Africa: Occupational health nurse's perspective.

Instution: University of Limpopo

Contact numbers: 015 268 3973 (office)

: 0796483751 (cell)

Dear expert participant

I'm Livhuwani Muthelo, a PhD student registered at the University of Limpopo. To fulfil the requirements of the PhD study, I am expected to develop strategies that will enhance compliance with health and safety. The proposed strategies are supposed to be validated by experts in the field. As an expert in the field of mining health and safety, you are invited to participate in the validation of the strategies to enhance compliance with health and safety standards at the selected mining industries in Limpopo Province, South Africa. The development of the proposed strategies was based on the study results, literature, and the framework that guided the study.

Who is an expert

An expert is someone having comprehensive knowledge and experience in a particular area (New man, 2014).

Explanation of the procedure to be followed

Delphi technique was followed to ensure that the quality of the validated strategies. In the Delphi technique, the selection of the appropriate group of experts in the field who will share their insights and help bring consensus to the proposed strategies. The researcher is a facilitator of the Delphi rounds while the expert's participants remain anonymous to each other.

What will be expected from you

A draft of the proposed strategies will be provided, and as expected, you will be expected to go through the strategies rate and give comments. Furthermore, an evaluation tool to guide the ratings will also be provided. The evaluation tool feedback and summary of illustrations will be distributed among the penalist of the experts. This will provide each expert to generate additional insights, and adjustments or additions can be made. The Delphi process will take two rounds. You will be expected to respond within 1-2 weeks within each round. You are expected to complete the last part of consent and return to the researcher with the rated evaluation of the strategies.

Possible benefits that may come from your participation

You will contribute to the body of knowledge in occupational health and safety through the revision of the proposed developed strategies to enhance compliance with health and safety compliance.

The ethical approval process of the study

Permission to conduct the study was obtained from the University of Limpopo Turfloop Research and Ethics Committee (TREC/219/2019: PG). Permission to conduct the study was also obtained from the selected mine in the Mopani district

Additional information contact numbers

In case you need more clarity, you can contact the following people;

PhD candidate: Muthelo L (015 268 3973)
Supervisor: Prof TM Mothiba (015 268 2352)
Co-Supervisor: Prof RN Malema (015 268 4658)

APPENDIX H: Validation instrument

The instrument for validation of the health and safety compliance strategies

Table: Adopted from Chin & Krammer 2014

Please indicate your response to the following questions using the key below:

Yes; No;

1.

No	Criteria	Yes	No	Remarks
	Goal and practice: Response to this question must be based on the examination of the goals of the strategies in comparison with the outcomes that are valuable to improve health and safety compliance			
1.1	Are the strategies goal and the practice goal congruent?			
1.2	Are the strategies goal in line with the existing standards of practice			
1.3	Are the strategies goal consistent with the optimal goal of health and safety compliance			
1.4	Are the strategies have the potential to influence health and safety compliance?			
	Context of the strategies: Response to this question must be based on the exploration of how well the ideas of the strategies might be transferred to the context of the study			
1.5	Is the intended context of the strategies congruent with the practice situation			
1.7	How well suited are the strategies given the context that is stated in the study findings			
1.8	Do all the strategies fits within the context of the mining health and safety			

	Graphical presentation: Response to this question must be based on whether the diagram indicates how the strategies are interrelated			
1.9	Are the strategies graphically portrayed well in the form of a visual presentation?			
1.10	Do diagrams and structures provide support with one another			
	Explanation of the strategies: Response to this question must be based on the expert judgment about the explanation concerning the practice			
1.11	Are the explanation of the strategies sufficient to be used in enhancing safety compliance			
1.12	Is there any evidence of logic coherence on the frame of reference of the model			
1.13	Are the variables explained in the strategies similar to the ones in the study findings?			
	Evidence to support the strategies: Response to this question must be based on the evidence of the study findings, existing literature, and the theory that guided the study			
1.14.	Is there research evidence to support the strategies			
1.15	Is the relevant information about the corresponding theory provided			

Other comments:

……

……

……

……

……

……

……

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Thank you for your time in completing the model validation report

Appendix I: Expert participation informed consent

I, the undersigned, Prof., Dr., Mr., Mrs…….have read the expert participant leaflet, which indicated the nature and the purpose of the study, My responsibilities as expert participation, and the benefits of participating in the strategies developed to enhance compliance with the health and safety standards in the mining industry, Limpopo Province South Africa. I hereby agree to participate in the Delphi process as needed.

Participant Name……
(PRINT)

Participant Signature:…… Date:…….....

Researcher Signature:…… Date:……

Witness Name……
(PRINT)

Witness Signature:…… Date:…….....

Appendix H: Interview Transcript

1. In your own words, can you briefly describe your understanding of health and safety compliance?
2. Can you describe the existing organizational and employee's cultural practices
3. What are the existing health and safety standards within the Limpopo Province mining industry?
4. How do the organizational and employee's cultural practices influence compliance with the health and safety standards?
5. What are the contributing factors influencing non-compliance of organizations and employees towards health and safety standards in Limpopo Province mining industry?
6. How are the health and safety policies, regulations and standards implemented in the selected mines?
7. In your own words can you briefly describe your understanding on employees culture.
8. Describe the activities in this mine which relate to the occupational health and safety organizational culture.
9. How does the environmental context influence the compliance with the health and safety standards?

Appendix J: Research questionnaire

Part 1: Demographic information

1. Name of the mine currently employed

2. Age

20-28	
29-38	
39-48	
49-58	
59-65	

3. Gender

Female	
Male	

4.Ethnicity

African	1
Indian	2
Coloured	3

4. Nationality

South African	
Other	

5. Highest level of education

College	
Technikon	
University	
High school	
Primary	
Never went to school	

6. Occupation

Management position e. g Mine engineer, safety manager	1
Shift boss	2
Team leader	3
Stopper	4
Driller	5
Mechanical	6
Miner	7
Shift boss	8
Loco driver	9
Winch operator	10
Other(specify)	11

7. **Marital status**

Single	1
Married	2
Living with partner	3
Separated	4
Divorced	5
Widow/widower	6

8. **Years of experience in the mining sector**

Under 1 year	1
1-5 years	2
6-10 years	3
11-15 years	4
16-20 years	5
Over 20 years	6

9. **Religious belief**

Christianity	1
Traditional	2
Muslim	3
Other	4

10. In which department in the mine do you work?

.....

.....

11. What is your employment status?

Full-time	
Part-time	
Temporary/casual	

Section B: Organizational culture

Please note that organizational culture refers to the shared values, beliefs or perceptions held by employees within the mine

Instruction: Tick one box against each statement according to the scale below.

Scale: 1= strongly disagree, 2= Disagree, 3= Agree, 4= strongly agree.

Health and Safety regulation standards and regulations	**Strongly disagree**	**Disagree**	**Agree**	**Strongly Agree**
➢ A safety regulatory and standards plays an important role in avoiding accidents the mines	1	2	3	4
➢ Violation/Non-compliance of health and safety regulation and causes accidents	1	2	3	4
➢ I know the regulations designed to protect the health and safety of employees in this mine	1	2	3	4
➢ I receive full training on health and safety regularly in this mine which fully prepared me to identify risks and comply with the regulations	1	2	3	4
➢ Policies forbidding health and safety are published at the mine administration.	1	2	3	4
➢ I understand the language used to publish policies, standards and instructions at my work station.	1	2	3	4
➢ My employer has developed specific health and safety standards which relate to the work that I do on daily basis. ➢ The health and safety is taken seriously and respected in this mine	1 1	2 2	3 3	4 4
➢ The existing health and safety standards covers all the risks in this mine ➢ There are adequate policies of investigating and preventing further accidents ➢ There is a need for the mine to develop the measures to create high standard of safety culture.	1	2	3	4
Leadership influences				

➢ The mine management makes honest and reasonable efforts to promote a healthy working environment	1	2	3	4
➢ My immediate supervisor consistently model respectful safety culture in my duty station	1	2	3	4
➢ The mine the cultural construction of a mine organization take miners' actual rights and interests into consideration	1	2	3	4
➢ People oriented safety culture is practised and considered	1	2	3	4
➢ The culture created in this mine is to value profit of the company ahead of the safety of the miners	1	2	3	4
Political influences				
➢ The unions and different organizations in the mine influence the behaviour of employees towards compliance with the standards	1	2	3	4
Economic influences				
➢ Lack of resources and proper equipment's causes non-compliance in this mine	1	2	3	4
Environmental influences				
➢ The physical environment is poorly designed	1	2	3	4
➢ The environment is safe and c free from risks such as heat, noise, slippery floor and poor ventilation	1	2	3	4
➢ Accidents are caused by the temporary unsafe environment created as a result of work process	1	2	3	4
Technological influences	1	2	3	4
➢ The equipment's provided are of good quality	1	2	3	4
➢ There are procedures available on regular inspection of the equipment's.	1	2	3	4

Section C: Employees cultural beliefs

➢ There is association between employees cultural beliefs or religious background with compliance to the health and safety standards	1	2	3	4
➢ The attitude and behaviour associated with unsafe acts or non-compliance is related with the employees level of education	1	2	3	4
➢ The attitude and behaviour associated with unsafe acts or non-compliance is related with the employees work experience	1	2	3	4
➢ The young employees are more likely to engage in sub-standard practices than the older ones	1	2	3	4
	1	2	3	4

Appendix K: Interview transcripts with one of the participants
Participant: 6

Researcher: Firstly, I would like to explain that I'm a PhD student who is doing doctorate in health and safety as a practitioner. So I'm here to ask permission from you and ask questions on health and safety compliance. And then before you give me the permission, I will have to explain that this is a research , the main aim is to improve the current state of health and safety in the mining industry. So, the identity of the mine and of you as a participant will protected. I don't need to know your name,I will use the numbers to identify the participants. So I would like to ensure you that the identity will be protected. The study results will be not be linked to any participant.

Participant: Yes I agree to participate in this study

Researcher: Here is the consent form, read and sign at the end for the consent to participate

Participant: K

Researcher:. Could you kindly describe the state of health and safety standards compliance among the miners workers in this mine?

Participant: Are you referring to the compliance employer of employees

Researcher: Employees

Participant: “I will say if I had to rate the state of compliance in this mine out of 10 I will give you 7. The reason I'm saying this is that currently where I’m working, you will find that the employees are working in a noisy area and they not wearing the earplugs. They are expected to do hazard identification risk assessment, we'll find that that is working and they didn't do their hazard identification. Sometimes you will find that they have completed the paperwork but they are not wearing those earplugs so it’s a serious challenge”.

Researcher: As a follow-up question what do you think are the causes of this none compliance

Participant

Behaviouor is a major problem . So now I've seen as behavior like in terms of incidents in their life, most of the incidents will do the root cause analysis will find that was a behavior issue. For example, when a person is expected to follow the procedure you will find the person doing short cut, like using one hand instead of using both hands when operating the machine which can result in a serious injury”

Researcher

Okay, thank you. And then could you kindly describe the state of that safety compliance by t organisation ?

Participant

Isn't that the first one, we explained the one for the employees from the employer side., we are now looking at the employer. The employees see as their role model. Like, now we go to the plant , I expect you to wear your PPE, but you will find people like the general manager without wearing the ppe inside the palnt, in that case do you think employees will take safety serious they wont.

Researcher: What is your role in the mine in ensuring health and safety compliance

Participant: Im expected to do the safety inspection, during inspection will find deviations. My role is also to enforce compliance. Secondly, the employer, they give us all the procedures we need to go through the procedures and know what they're expecting from us and also the miners.So my goal is to make sure that people the safe must enforce compliance. So I'm like a police who check around if people are compliying.

Researcher: Kindly explain how safety production is ensured in this mine

Participant: “When I look at safety, like here, we are seeing six different production lines. But it's quite surprising to find out that most of the time they strive to push production while compromising safety. For example, you will find that people are using the machine and the emergency stop is not working but they just tick so that they can work and reach the targets”.

RESEACHER Okay. And then what are the challenges faced with the main or the Health and Safety Department concerning health and safety? compliance?

PARTICIPANT: We don't know from our side from an administrative department, we don't get support from the supervisors or shif leaders. It becomes difficult for us to do our work and enforce compliance.

RESEARCHER: Kidnly explaim more what you mean when you say they do not give you support.

PARTICIPANT: I can say with safety we do not get support because we do inspections and identify major hazards that can endager the health and safety of te miners. You will find that nothing is done but the manager signed to aknowledge. This is demolrilising because the next thing a major accident will happen with things that could have been precented. So it's a sign that they don't take our work serious

RESEACHER: Describe how different cultural practices affects or promotes the health and safety compliance

PARTICIPANT: What are you referring to

RESEARCHER: Isn't that when you are saying cultural practices, like in every family, there is a culture of how people do things. And then in even the mine and is individual from different backgrounds, from different families and culture. So is there any influence of cultural practices like belief system, education and experience?

PARTICIPANT: We've got thiose who are only speaking Afrikaans. So like myself, when I go to a person who's speaking Afrikaans. Like in this mine we are supposed to seak English but sometimes when we attend the meeitngs they will start speaking Afrikaans amogst themselves so that we don’t hear what they are saying. And when

we ask them to speak English they freak out. white guys class freaking out. They don't want you to hear what they're saying.

RESEARCHER : And then how are the health and safety policies or regulation implemented and communicated to the employees

PARTICIPANT: We have different platforms of communication. Firstly when these policies are drafted the union representatives are involved so that they can also update the miners. We also have notice baords displaying the regulations and also during the saferty talks in the morning we nuppdate the miners on the new policies and give them **chance to comment.**

RESEARCHER = what do you think can be done to improve the health and safety compliance in this mine.

PARTICIPANT: It must start from their management, we must learn from them as they are the custodians of the procedures. So they must start to comply and to enforce compliance, not from that lower level. So they need to commit themselves what is in the paper is what they supposed to be practical. So for now, there's nothing in spirit.

RESEARCHER: What else do you think can be done to improve safety?

PARTICIPANT: We used to have tokens of appreciation and say we had zero incidences, we see something we used to have things to watch to make the employees that are their competition. We don't have any tokens of appreciation, shift 60 to boost their morale. So it's not getting back to the procedure that may be just trying to fool the DM to say what matters.

RESEARCHER: Okay, thank you very much for your participation and your participation. Do you have any questions to ask:

PARTICIPANT: NO

RESEARCHER: Okay, thank you for the session. Thank you. I really appreciate for your participation. Thank you.