University of the Witwatersrand

School of Social Sciences

Department of Sociology

Factors relating to mining safety compliance and non-compliance on South African mines

Research Report submitted in partial fulfilment of the requirements for the degree of

Masters of Arts

of

the University of the Witwatersrand

by

Kamogelo Seitireng

March 2019

Supervisor: Professor Paul Stewart

Co-supervisor: Dr Ben Scully

DECLARATION

I declare that this research report is my own unaided work. It is submitted for the Degree of Masters of Arts in Economic and Labour Sociology at the University of the Witwatersrand, Johannesburg. It has not been submitted before for any other degree or examination at any other university.

_____

Kamogelo Seitireng

March 2019

Acknowledgements

I would like to thank my parents, as well as the rest of my family for their love, support and encouragement throughout this whole process of beginning and completing my research project. It has been a very long journey filled with many highs and lows and I could not have done it without them.

I would also like to thank my supervisor Professor Paul Stewart for his dedication and constant support. His sharp wisdom, wealth of knowledge and experience has really shaped this journey and has taught me a lot about myself as well as about research. I'd like to also extend my thanks and gratitude to my co-supervisor Dr Ben Scully for ensuring that the project continues uninterrupted and for being available for consultations.

My colleagues, of whom there are too many to mention, have also played a part in this journey through their sharing of experiences and challenges encountered as a part of the research process; incites which made the challenges much easier to handle.

Table of contents Page

CHAPTER 1: INTRODUCTION

Research topic

Mining occupational health and safety.

Research question

What are the dominant factors which inform compliance and non-compliance of mining safety regulations and safety training? A focus on the structure/ agency debate

Research objectives:

To understand how mineworker behaviours interact with occupational structures of mining to inform mining safety compliance and non-compliance. To explore and understand the lived-experiences of mineworkers regarding the process involving safety compliance and non-compliance, as well as how occupational structure informs such a process; and to explore the structural constraints that shape safety compliance and non-compliance.

Rationale

The discourse on mining safety in the social sciences generally argues that mining safety incidents happen largely as a result of the production pressure profit motive of mining companies, thus, creating a system where safety regulations are deliberately flouted, all in an effort to increase productivity and thus profits. Empirical research in mining occupational health and safety does certainly support this discourse (e.g. Leger 1986: 529, 597; 1988; Phakathi 2001 and Stewart 2012: 4). However, a counter-discourse exists, which leans more in support of the managerial side of mining. This discourse asserts that safety issues primarily concern the actions, decisions and competencies of mineworkers. Essentially this discourse posits that safety incidents are largely as a result of the actions and behaviours of mineworkers (e.g. Gray 2009: 330, 228; Bezuidenhout *et al* 2015: 10;11 and Stewart and Nite

2017: 254). The rationale behind this research is to test this dichotomy, in order to see which of the two positions hold more validity. There is a need for research which, informed by theory and empirical data—can give understanding into which of these two positions is worth focusing on when it comes to changing the safety record on South African mines, and ultimately improving the safety record.

Health and safety issues in mining in South Africa, still continue to be prevalent and relevant. The mining industry has made many advances in improving health and safety issues; however there is still room for further advances, both theoretically and empirically, as there continues to be injuries and fatalities in South African mines. With respect to mining health and safety regulations, there is the assumption that policy can be merely implemented without considering the possible impediments as they relate to mineworkers. Advances at improving mining safety need to be considered and explored with respect to the understanding of mineworkers' views towards mining safety regulation and training, together with institutional constraints. This undertaking is working on the assumption that critical to mining safety is investigating to what extent individual behaviours of mineworkers or structural factors of mine operation have an impact on safety compliance and non-compliance. Furthermore, there is a need for a paradigm shift from seeing mining safety as a primarily technical or engineering exercise, to also seeing the importance of the sociological aspect of mining safety.

CHAPTER 2

Literature Review

Theoretical and conceptual framework

The theoretical framework for this research project which has been used to test the structure/ agency mining safety dichotomy, is Anthony Giddens' structuration theory. What has been

explored is the extent to which mineworkers' agency has the ability to impact on the way in which mining is structured, in relation to safety compliance. This theory serves the purpose of exploring the articulation of both positions highlighted above. This is important in order to have a theoretical framework to compare with the theoretical and empirical data, particular data emanating out of the South African context and ultimately, see which of the two positions hold more theoretical and empirical validity. This theory is appropriate because it theorizes both agency and structure in understanding social behaviours and processes, and this is relevant in assessing both positions in mining safety discourse (Turner 1986: 971, 972). This theory frames the exploration of both the micro as well as macro aspects of mining safety. This essentially places both sides of the dichotomy under a theoretical microscope, which allows for the assessing of both positions. This theory tries to bridge the gap between the micro and macro-aspects of the social behaviour, and this assists the purpose of this research in not only looking at the two positions, but assessing whether or not the theory is relevant and applicable to the data.

The mining safety issue which is central to this research is compliance and non-compliance of mining safety training and regulations. The following section gives a more detailed explanation of structuration theory, and a justification of its relevance to this research.

Anthony Giddens: Structuration theory

Anthony Giddens developed a theory that would attempt to bridge the gap between the theoretical positions of structure and agency (Giddens 1984). Some theorists assert that people create the society in which they live in through exercising their agency, whereas others state that people's agency is structured or even determined by forces larger than themselves (Giddens 1984: xvi, 2). Giddens found this to be problematic, and therefore developed the structuration theory. This theory posits that both structure and agency are

mutually dependent, and that the social structure is produced through the actions of agents across time and space (Giddens 1984: xvi, 2, 3).

Contrary to what macro-sociological theories assert about society, agency in structuration theory is seen as important. The acts that individuals take are seen to have an impact on society. Agency is seen as contributing to the creation of the structure (Giddens 1984: 3). Due to the mutual dependency of structure and agency, the possibility of structural change is seen to exist as a result of the impact that agency can have on structure (Giddens 1984: 2, 3). Giddens did not see structure as purely a force that constrains or even dictates the actions of individuals. Rather, he saw structure as having the capacity to enable individual action as well. The bridging variable between structure and agency is social practice. Social practice, which is done by individuals across time and space, becomes a structure (Giddens 1984: 16, 17, 3). This structure then has an influence over how individuals act, yet the individuals in turn, engage in social practice, which therefore reproduces or amends the structure. Therefore structure and agency produce society through their mutual interaction, particularly through the actions of agents across time and space and thus, this is what is referred to as structuration (Giddens 1984: 17, 2, 3). Due to this mutuality and interdependence, structural change becomes possible through the various ways in which agents act and interact in relation to the structure. Another factor which makes structural change possible is when there are system failures or collapses that occur within the structure (Turner 1986: 971, 972). This is the space where individuals can also exercise agency to engineer social change. Due to the interdependence of structure and agency, individuals can also decide to make choices, and challenge certain aspects of the structure, and this in turn can create structural change (Turner 1986: 972).

Giddens states that part of what mediates the relationship between structure and agency is rules and resources (Turner 1986: 972). Rules and resources are part of the elements that

build up a structure. Therefore, when an agent has the power to ignore the rules of the structure, or the capacity to control the resources, then they have the power to affect structural change (Turner 1986: 973).

In terms of this research, in relation to structuration theory, what has been analysed is the extent to which mineworkers have the agency to make an impact on the structure of mining. In particular, what has been of interest is the extent to which mineworkers can successfully exercise their agency in complying with mining safety training and regulations. Structuration theory would assert that mineworkers have the capacity to exercise their agency to the extent that it affects structural change on the mines, as their actions across time and space contribute to the creation of the structure (Giddens 1984). Furthermore, what the results have also shown is that mineworkers, under certain circumstances, do not have the agency to ignore the rules which at times compel them to not comply with mining safety training and regulation; neither do they have the control of resources, both which would enable them to have a significant change to the structure of mining.

Research from a South African context

The following section explores both theoretical as well as empirical work done in South Africa concerning the broad issue of mining occupational health and safety.

Mineworker Agency: NUM & Marikana

Mineworkers are not completely devoid of or limited in their agency in general. This can be seen through the history of the National Union of Mineworkers (NUM). The NUM became established in 1982 during apartheid. Prior to their formation, mineworkers had no formal union structures which could be relied on for representation. Black mineworkers in particular were not recognised legally.

However the 1979 Wiehahn Commission, as well as the formation of the NUM, gave black mineworkers a platform in which they exercise their agency. Although initially the NUM had it difficult concerning the gaining the recognition on many mines, particularly mines in the former Bophuthatswana homelands, eventually they would come to be a hegemony of trade unions, and the biggest and largely recognised throughout many large mining houses. This dominance persisted throughout the post-apartheid period. The rise and dominance of the NUM marked substantial in-roads which saw the improvement of working conditions and an institutionalised way of managing industrial conflict.

All these developments reveal the capacity of workers as a collective to use worker agency to decisively make an impact on the way in which work as well as conditions are organised. However the challenge of the exercising of agency can be felt when union arrangements seemingly fail workers, or when workers are confronted with structural challenges as individual workers as opposed to workers operating as a collective.

The platinum belt strike waves, which led to the 16th of August 2012 massacre of 34 striking mineworkers at Lonmin, became an excellent example of the power and potential of worker agency. The RDOs (Rock Drill Operators), first at Impala Platinum (Implats), then at Lonmin began to negotiate wages outside of the formal institutionalised structures of bargaining councils and union representation. It was seemingly a first of its kind in the post-apartheid era, where unionised mineworkers purposefully rejected their union (NUM) in favour of speaking directly to management. Although this period resulted in dismissals and deaths, as well as injuries, workers throughout the platinum sector saw a substantial increase in their wages and allowances. This was primarily due to the exercising of their collective agency outside of existing institutional arrangements.

The Mining Charter, as well as various forms of legislation which regulate the mining industry, seem to be key drivers of industrial change and innovation (Benya 2009). For instance, the need for mining companies in South Africa to reach a certain quota regarding the employment of women mineworkers, has seen a growth—though limited—of women mineworkers in the industry (Benya 2009). This raises the issue of the importance of following legislation and the Charter with respects to mining policy. This becomes pertinent when referring to the issue of mining safety. Therefore what this research has explored is the extent to which the following and implementation of the various mining safety legislation, has affected the compliance and non-compliance of safety rules learned in training and legislation on the part of mineworkers. The intent was to explore the structural forces (on the part of mining companies) that shape mining safety behaviour (on the part of mineworkers). Another issue of importance are the views of workers when following training on safety; training which seeks to implement safety legislation.

The occupational culture of underground mining is a distinct one. It is "a web of beliefs and practices workers" have regarding how to engage and navigate the challenges of underground mining (Stewart 2001b: 2-3 as cited in Phakathi 2001: 2). Research regarding this culture (e.g. Phakathi 2001) has shown that often, the discrepancy between mining policy and workers' experiences results in workers creating their own understandings regarding mining activity (Bezuidenhout *et al* 2015: 10-11). This research has explored (i) how this tacit knowledge developed by mineworkers concerning safety compliance and non-compliance can be attributed to structural forces which facilitate such a process, as well as to what extent it can be attributed to individual behaviours amongst mineworkers. Furthermore, what was explored is the dynamics involved around the possible transfer of views of compliance and non-compliance from more experienced to less experienced workers, and how these are structured by the occupational culture of mining. The lived-experiences of mineworkers, as

detailed by Moodie (1994), are such that often the mineworker is socialised into mine work *before* going down the mine. This can be regarded as the socialisation of mineworkers. The key issue in this regard is the ways in which workers develop both explicit and tacit knowledge underground, regarding mining occupational health and safety (MOHS) issues.

Leger (1992: VI, 1) is thorough in his detailing of the ways in which mineworkers (largely thought of as being unskilled) are skilful at learning ways to identify when mine hazards are about to occur. This learnt skill (tacit knowledge) not only goes against the discourse of mineworkers as lacking in skills, but it offers opportunity to management and MOHS (mining health and safety) policymakers (Leger 1992: 2). Mineworkers, with their tacit knowledge, ought to be thought as the *eyes and ears* of the mining industry underground, insofar as MOHS issues are concerned (Leger 1992: 2, 133). What is explored is how views around safety compliance and non-compliance are linked to tacit-knowledge. For instance, do mineworkers incorporate views of compliance and non-compliance within their tacit-knowledge (and if so how); or are mineworkers behaviours shaped by larger structural factors of mining? Certainly what the evidence shows is that the latter holds more weight in explaining mineworker safety and training compliance and non-compliance.

Much of the research that has been done in MOHS has been focused on individualising and blaming the mineworker for many of the mining accidents that occur underground (Bezuidenhout *et al* 2015: 10). This has mainly come from the influence of psychology studies looking at the behaviours of individual mineworkers, and emphasising factors around human error (Bezuidenhout *et al* 2015: 10). It is not completely incorrect to focus on the individual, rather it is incorrect to place superior emphasis on the individual whilst ignoring the many structural factors that contribute to mining safety and health issues underground (Bezuidenhout *et al* 2015: 10). This research explores the broad social factors, particularly how mineworkers' behaviours regarding compliance and non-compliance of safety

regulations and safety training, operate within existing mining social structures, and how these structures (to some extent) exercise a constraining and determining force on mineworkers' capacity to exercise agency. Certainly what the evidence has shown is that workers are at times, severely constrained by structural forces such as production pressure, and thus, often act in ways that can be regarded as non-compliant with safety training and regulation.

For some researchers at least, the South African mining industry has developed from viewing mineworkers, in particular black mineworkers, as unskilled, to viewing them as not only skilled, but having the tacit-knowledge of mining underground (Stewart and Nite 2017: 255). This acknowledgement of their skills opened up new understandings of mining occupational health and safety, because the mineworker could no longer be deemed passive in the face of underground mining activity (Stewart and Nite 2017: 253). The view that safety issues rest on the already burdened shoulders of mineworkers, however, still persists. In addition to the view that mining safety incidents relate to individual worker incompetence, there is a growing position that views mineworkers as increasingly required to be more responsible for their safety (Stewart and Nite 2017: 254; Gray 2009: 327, 328). What has been interesting to uncover is the view of mineworkers regarding the notion of safety responsibility, concerning compliance and non-compliance. Issues around safety responsibilization have been explored from the workers point of view, especially because they are the ones who are predominantly at the face of danger. This has allowed for the exploration of the two positions in the mining safety debate concerning compliance and non-compliance. The evidence shows that whilst mineworkers are made to be responsible for their own safety, their capacity to exercise agency through complying with safety training and regulation is largely reduced by the structures (particularly in the form of the *norm* of profit-at-all-costs) which has influenced the occupational culture of mining.

What this research has explored is the relation between structural realities on the behaviours of mineworkers regarding safety regulation and training compliance and non-compliance. This goes some way in understanding the circumstances within which compliance and non-compliance occurs.

A key issue in mining safety is often how the risk of mining is communicated to mineworkers (Lang, Fewtrell and Bartram 2001). Mineworkers go through a training process guiding and educating them on various mining related issues, including safety. Risk communication in general, has to be communicated in a particular way to a particular audience (Lang, Fewtrell and Bartram 2001). The expertise of whoever is doing the communication should correlate well with the understandings of the target audience (Lang, Fewtrell and Bartram 2001).

In the South African context, however, there is evidence of minimal correlation between the formal training that mining workers receive, and their "on-the-job" learning as well as actual experiences underground (Phakathi 2001). The views of mineworkers regarding the formal safety training that they receive has been interesting to note, as the literature does not seem to focus in detail on this. For instance, some mineworkers remarked about how they could not understand what was being communicated with them due to discrepancies between their education levels and what was being taught in training. Furthermore, it has been interesting as well as important, to note how such views and experiences are informed by larger structural forces such as inequalities in terms of access to quality education, and how this affects mineworkers, for instance, not being able to understand certain aspects of training and thus, being ill-equipped to exercise agency with regards to complying with safety regulation.

A leading mining company released a report detailing amongst other things, their safety performance for the year 2015-2016 (SibanyeGold 2016). This report noted that safety of miners continues to be a concern; especially as in this period, there had been a number of

fatalities as well as injuries (SibanyeGold 2016). Furthermore, due to the close correlation between safety and mining productivity, this mining company lost a substantial amount of money (R 872 million), due to 226 work stoppages that had to be implemented due to fatalities and injuries (SibanyeGold 2016). The stoppage or halting of mining activity is a legal requirement under the MHSA 29 of 1996 section 54, when circumstances are deemed by the inspector, to be dangerous. Apart from the loss in profitability, these stoppages have the potential to jeopardise future employment of the mineworkers (SibanyeGold 2016). The specific areas of safety incidents highlighted were "falls-of-ground as well as incidents caused by tools and equipment, slip-trip-and-fall, and materials handling incidents" (SibanyeGold 2016: 73). The specific areas highlighted reveal a slant towards individualising mining safety, which essentially places the blame of a large number of safety incidents on the individual behaviours of mineworkers. The evidence however shows a more complex picture which leans more on structural issues playing a significant role, for instance, in incidents involving FOGs. This certainly shows the precedence of structural forces over human error in explaining safety compliance and non-compliance.

There is a close relationship between mining safety, and mining productivity and profitability. There is evidence however, that points to the reality of productivity *over* safety (Leger 1986: 592). Leger provided evidence which points to a relationship between work organisation, and safety (Leger 1986: 598). For instance, it was found that regulations which required mineworkers who were in charge of operations to regularly check safety conditions were flouted (Leger 1986: 592, 599). The impression given by the workers participating in the study was that the mineworkers in charge would place more emphasis on ensuring that operations were continuing than on ensuring a safe working environment (Leger 1986: 592). As will be noted below, this practice still prevails currently in the mining industry (e.g.

Stewart and Nite 2017: 256 and Stewart 2013: 68). What this research has done is seek to evaluate the dichotomous positions that exist in mining safety, which place human error and occupational structure at odds in terms of explaining mining safety incidents. Evidence from this research shows a continuation of this trend as identified by Leger. Structuration theory states that both agency and structure are implicated in the creation of social phenomena; however, what the evidence shows is that organisational structure takes precedence over agency as mineworkers' capacity to exercise agency is hampered by the overarching structural issues of mining such as shift boss pressure and production pressure.

Empirical studies exist that reveal the reality of structural constraints concerning the adherence of mining safety training and regulations (Stewart 2013: 35; Phakathi 2001). There are many instances where mineworkers are often compelled to not comply with prescribed safety regulations due to structural constraints (Stewart 2013: 35, 68). These appear in the form of pressure to meet certain production requirements, a practice which still continues in mines presently (Stewart 2013: 35, 68). Other structural pressures include the bonus incentive systems which have often incentivised workers to reach production targets without complying with safety regulations (Stewart 2013: 26; Stewart and Nite 2017: 256). The question then becomes, how can mineworkers be expected comply with safety regulations, when there are various structural factors that make it difficult for such compliance to take place? Certainly, what this research has done is explore the relationship between structural factors such as production target pressures, and non-compliance of safety regulations on the part of mineworkers, in order to give clarity of whether occupational culture or human error which takes precedence in explaining mining safety compliance and non-compliance.

The behaviour and attitudes of team supervisors is called into question concerning the issue around non-compliance (Stewart 2013: 35, 68). For instance, when it comes to the

implementation of the Right to Refuse Dangerous Work, as well as the Right to Leave Dangerous Work, which are aspects of the Mining Health and Safety Act 22 and Act 23, many mineworkers have reported feeling intimidated and victimised by some team supervisors for exercising those rights (Stewart 2013: 68). This victimisation would ultimately lead many of them into not complying with the safety regulations which require them to not place their lives in danger (Stewart 2013: 30, 68). This victimisation is linked to the above discussion as supervisors also receive bonuses if their team has achieved a certain level of production. Furthermore, this links to the discussion below on a lack of material, as supervisors would also cut back on material purchases in order to receive bonuses for not exceeding the budget (Stewart 2013: 30, 35, 68; Stewart and Nite 2017: 257). There is a clear link here between structural factors and instances of non-compliance. This link, and the extent of such a relationship, is explored by this research.

Linked with the above discussion is the issue of budgetary constraints, and by extension, cost-cutting, and the impact that this has on mineworker safety (Phakathi 2001). There is evidence that mineworkers are often compelled to put themselves in danger by making due with the limited materials that they have. These practices constitute what Phakathi terms *planisa* or making a plan to get by (Phakathi 2001). In such situations, workers who complain of a lack of material are often told that the company budget does not allow for further purchases of material (Phakathi 2001). There is also a work culture that discourages workers from speaking up about such issues. Mineworkers are often regarded as being problematic or political when they raise such concerns (Phakathi 2001). Mineworkers have then resorted to using materials such as supports and winches, accessed from old disused and closed off sections of the mine which are commonly referred to as “madala” sites (Phakathi 2001; Stewart 2012). Clearly such practices put the lives of mineworkers in danger, however not much choice is given to them when demands of productivity are being made on them

(Phakathi 2001). What has been of interest to explore is the organisational structure of mining production, where budgetary constraints and the need for productivity at all costs still continue. The research explores this as it is very relevant to the issue of safety compliance and non-compliance. The need for productivity has been shown by the data of this research to be a factor in mining that continues that have an impact on safety incidents in general, and safety compliance and non-compliance in particular. In terms of the evidence, the structuration theory seems limited in that it fails to account for spaces in society where structure does take precedence over the capacity of individuals (in this case mineworkers) to exercise their agency.

Theoretical contributions of South African research to the structure and agency debate

Benya's work speaks on the issue of women in the mining industry, reveals a dominant role of the structure of mining occupational culture. Although there has been an increase in women in the sector, there is still a dominance of men, who make up an overwhelming majority of worker. Mining companies have a role and responsibility to change the structure of male dominance in the workplace, in such a way that an increase in women workers can take place. However, this is not happening at a rapid pace. This highlights the overwhelming power of structure on the part of mining companies, in being able to structure workplace conditions and organisational culture. The agency of the part of women who would like to join the industry in their numbers is thus, seemingly overpowered by the way in which work in structured on the mines.

Phakathi's work on teamwork and work culture has given great theoretical and empirical insight into the ways in which underground mineworkers in particular, deal with the challenges of not having enough material underground through improvising or *planisa*. His work gives weight to the fact that mineworkers, once thought of as unskilled, are not only

skilled, but equally possess tacit knowledge of the way in which mine work is done, and the different ways in which productivity can be accomplished.

Leger's work on mineworkers' tacit-knowledge further highlights the agency that mineworkers have, particular when it comes to being able to identify hazards that are about to occur. Leger's research in particular, has added value to the understanding of mineworkers, by showing that mineworkers have the ability to understand and foresee, when the hanging-wall or the roof of the mine is about to collapse. Leger refers to this as "talking rocks" as the rocks give off an indication that there is about to be a collapse of the roof, enable the mineworkers to take lifesaving evasive action in order to avoid injuries or fatalities. As such, this research challenged an old misconception, stemming from the apartheid era, which viewed mineworkers, particularly black mineworkers, as being largely unskilled. Furthermore, it showed how even against the often unstable geological conditions, especially common in aging goldmines, that workers have the extraordinary capacity to exercise their agency, through using their tacit-knowledge.

Stewart and Nites paper, reviewing the state of safety on South African mines from the year 1955 to 2016, explores the changing landscape of safety, particular in terms of worker involvement on matters of health and safety. There were periods who, under the apartheid regime, and prior to unionisation, had to stand on their own and often come to physical confrontation with white senior miners, in refusing to not work under dangerous conditions. Unionisation, in the rise of the National Union of Mineworkers, saw an improvement in conditions, as now workers had powerful representatives to champion their cause. However in a modern, post-apartheid and neoliberal era, there has been a growing tendency to view mineworkers as being largely responsible for their own safety. This is in line with the view that health and safety is a phenomena largely caused by mineworkers themselves, as opposed to structural pressures and impediments that they face. Section 23 of the Mine Health and

Safety Act no. 29 of 1996, certainly does place the health and safety squarely on the shoulders of mineworkers, who can face severe ramifications for not adhering to this legislation. It would seem however that such an over-emphasis on this aspect of the Act ignores the existing structural forces that make it hard for many mineworkers to implement this Act, such as victimisation. What this review shows is the existing agency of mineworkers, particular in their earlier periods where workers asserted their agency when refusing to work in a dangerous environment, even if it meant physical confrontation. Although emphasis on legislation which individualised health and safety of workers ignores the structural role of mine work, and the way in which work is organised, what is highlighted is the capacity of workers, through using tacit-knowledge, to be able to be aware of the dangers around them in their working space, and make hard decisions about refusing to do dangerous work or leaving a dangerous working environment.

Leger's study on safety on the mines, which was commissioned by the National Union of Mineworkers, clearly highlights the structural power of many South African mines over worker agency. This study highlighted that there are many instances where health and safety protocols where not observed, and instances where workers were forced to work in an unsafe manner. The primary reason for this is that workers were being pressured to keep up with production demands. This pressure is maintained even in clear instance where continuation of work would place the lives of mineworkers in danger. In some instances, inspection of work would occur on an irregular basis, and when it did occur, it was merely to ensure that production activities are carrying on as required, and not to check on whether mineworkers are working safely. Unfortunately this situation of profits over safety still occurs and highlights the power of mining structure over worker agency, especially in the context of the stope area where the most important part of mining happens; the accessing of the precious ore body.

The work by Stewart, Coulson and Bakker, highlights a complex matrix of structure and agency insofar as mining safety on South African mines is concerned. A key issue which contributes to health and safety hazards on mines is bonus incentives linked to production output, as well as victimisation when it comes to implementing Section 23. Mineworkers are incentivised to produce a higher production output through provision of bonuses. The higher the production output, the higher the bonuses. There are instances where workers, in pursuing bonus payments, will forego many safety procedures, all in a rush to get an added bonus. This often results in injuries and fatalities. The complexity in this issue of bonuses is that although in some instances workers are not forced to work in an unsafe manner; it is in those instances where they exercise their agency and still decide to work in an unsafe manner, in pursuing a bonus. Therefore, in is in these instances that it can be said that mineworkers exercise their agency in ways that are detrimental to their safety. However the structural component of the issue of bonuses, is that although workers are not compelled directly or forcefully, the fact of their relatively low wages, indebtedness and having to support for more than one family; the bonus incentive can then be seen as adding to the structural pressures that mineworkers are facing in their lives, and thus structurally contributing to unsafe work practices. This study also showed that many mineworkers are aware of their rights when it comes to Section 23, which gives them the right to refuse dangerous work. However, as my study has indicated as well, there is much victimisation that occurs in contexts where workers refuse to continue to work in an environment that they have deemed to be dangerous. Many get victimised through receiving charges when on surface, or through instituting of disciplinary actions that threaten to have them lose their jobs. The legislation allows potential for mineworkers to exercise their agency, but the structure of the mines, seen in victimisation, limits this agency potential.

CHAPTER 3

Methodology

Introduction

The methodology that this research project employs is a qualitative approach. This approach is the most suitable in addressing the research question because it allows for the exploration of mineworkers' articulations of their experiences regarding their agency, or lack thereof, concerning safety compliance and non-compliance (Legard, Keegan and Ward 2003). There is a need for mineworkers own words, thoughts, impressions and opinions with respect to issues around compliance and non-compliance of mining safety regulations, and this methodology allows for that.

Research methods

This research employs two data collection methods. The purpose of this is to try and ensure a degree of trustworthiness regarding the data as more than one method is used. Therefore, as two perspectives are being used to look at the same phenomena, the possibility of the integration between the two views potentially enables the findings to have a higher degree of trustworthiness. The two methods used are: (1) Participant observation and (2) In-depth interviewing. The justification for using each method is as follows: Participant observation entails going down the mine as a mineworker and conducting mining activities as they are assigned. More significantly, it also entails working closely, as part of a group, with mineworkers. Participant observation does not of course, entail merely occupying space without clear direction and merely absorbing every possible piece of information (Mason 2002). There needs to be direction, and guidance which is linked intrinsically with the research topic, questions as well as objectives (Mason 2002). Therefore, much of what was

observed during participation was around safety compliance and non-compliance, within the framework of structuration theory.

Since safety training is also a key part of this research project, interest has been on the actual training and educational process of the mineworkers regarding safety regulations. This process, which includes the actual training, has been observed through participation. This has given qualitative insights and understandings into just what mineworkers know and understand, about safety regulations underground, which enabled (I) the researcher to juxtapose that with any instance of non-compliance or compliance.

The data which has been observed while participating has been recorded textually through the taking of field notes. The reason behind this is that not only was there be a need to take immediate information down as insights arose or a significant observation was made note of, but also for practical reasons (Mason 2002). Underground mining in some instances, for instance in the stope section, often involves a lot of noise, therefore which would have made the use of any recording equipment impractical (Mason 2002). I also discovered through the course of my research that all of the participants felt uncomfortable at the use of any recording equipment, and thus, I had to respect their wishes. Of course, in taking on the qualitative approach there needed to also be a degree of open-mindedness to the potential data that exists in the setting.

The second method used is in-depth interviewing. This method was used during participant observation (down a platinum shaft in Rustenburg), in other words, whilst conducting various underground mining activities as assigned. The reason for this is that there were some instances where points of clarity and probing were needed (Legard, Keegan and Ward 2003). There were instances where, for example, there was a grey area regarding whether a certain mining procedure (safety or perhaps otherwise) ought to have been taken in one way as opposed to another. In-depth interviewing has been necessary and useful in such contexts.

This method was also used outside of the context of mining activities, and this was primarily in the training centres of the different sites visited. The reasoning behind this is that there were a few points of clarification, as well as points of intellectual interest related to the study, that needed to be explored and probed in relation to mining safety (Legard, Keegan and Ward 2003). The overall reason for using this method is because the researcher took the position that knowledge and reality, is constructed by the individual and their particular experiences (Mason 2002). These constructions can largely be accessed through the accessing of people's own articulations; their own words, thoughts and opinions (Mason 2002).

Instruments

The instruments used are linked with the methodology used (Mason 2002). For participant observation, the instrument has largely been the activity of going through the safety training as well as being underground and having the lived-experience of being a mineworker. The observations were guided by themes which were developed prior to entering those spaces, and they are linked to the research topic, question, and objectives (Mason 2002).

The instruments for in-depth interviews are interview schedules. These have operated as broad guides to the questions and themes that (I) the researcher has used to conduct the interviews (Mason 2002).

Methodology experiences in the field

This section covers the fieldwork experiences I had as a researcher. The fieldwork experience begun in 2017 with my supervisor and I first trying to gain access to the research site. As I began to discover, gaining access to a mining site as a researcher is very difficult. My supervisor, who had previously done research within the industry, reached out to a contact within the industry. The contact reported much later that there was some interest among certain quarters, in my research. At the same time, since my access to that research site was at

the time, not guaranteed, I took it upon myself to approach other contacts to attempt to gain access to any mine. My contact put me in touch with a union member of one of the major mining unions. I started engaging with the union member who was working at a major mining company in the West Rand. We then decided to meet up at a particular location. I briefly discussed with him my project, at which he stated he would help me gain access to the mines. After that meeting, subsequent attempts at trying to engage with him proved futile as he stopped taking my calls.

I felt a surge of disappointment as my own individual attempt at gaining access to a mining site had failed. My supervisor and I continued to engage his contact at the mines. These engagements took a total of 8 months in 2017. The mine contact came back to us to inform us that the vice-president of safety, of a certain mining company, wanted for us to meet with him and present to him my research proposal. Through a series of e-mail threads that spanned a few weeks, a date was set for April 2017. When the day came, the proposal was presented, and a discussion was had on certain issues pertaining to the research. Part of what stood out for me in that meeting was how nervous I was at being in a room with key individuals of a major South African mining company.

This was the first time I had been exposed to a corporate culture. At the concluding of the meeting, I was then told I would be in communication with a technical training director of the division. The following 4 months would prove to be the most immensely frustrating as the director did not seem to have much enthusiasm in engaging with me in particular. At one point, I felt that the key individuals at the mine had lost interest in my research. It was at that point that my supervisor intervened in the communication, and proper communication was restored. I was then asked for a copy of my now complete research proposal, which I sent. The vice-president then communicated with me that he wanted to have another meeting with me where my research proposal would again be presented.

This meeting happened in July 2017, where I also presented my timeline for the research. At that time, my expected timeline was to begin research in August and end in December 2017; however, that was not to happen as there were further delays. In November of 2017, I was then put in touch with the human resource co-ordinator who, I was told, would facilitate the rest of the process. I met up with him and his team, and I presented my proposal once again, feeling more and more confident with every repeated presentation. The now revised timetable had set my research to begin late November 2017. However due to further delays, this did not occur and 2017 closed without my research beginning. In February 2018, contact was made from the co-ordinator. This was the first time they had initiated contact.

A meeting was arranged for later that week, and at that meeting, further questions about my research were asked as a matter of clarification, after which, the logistics of the research were discussed, which then resulted in the research beginning on the 8th of February 2018 with the screening process.

In essence, it took a year of back of forth communication and negotiation to gain access to a mine! This process taught me that, for the most part, research requires a great deal of patience and persistence when it comes to gaining access to a site. Certain sites are fraught with politicised histories and contemporary issues that make it impossible to simply walk in and start doing research. Furthermore, it helps a great deal to have contacts that are within the industry or site that a researcher wants to gain access to. Gaining access into the mines was the first major challenge of this research project.

The mining industry is heavily politicised, with a variety of interest groups involved in the process, from shareholders, to labour unions to civil society groups and political interests, as well as regulatory bodies such as the Mining Health and Safety Council (MHSC) and the Department of Mineral Resources (DMR). Before beginning this research, however, I was

unaware of this political environment. I became acutely aware of this as part of my lived-experience as a researcher. The complexity of this environment is the challenge I was constantly met with. The positionality that I occupied was that of an outsider to the mining industry, a young, black, middle-class, educated, predominantly English-speaking, researcher, who was here to research a politically sensitive question concerning mining safety compliance and non-compliance, as well as interact with mineworkers who were older, predominantly non-English speaking, uneducated, and from poor backgrounds. I began to realise that I could not have chosen a more politically charged research topic in that context. As I began to interview participants, I immediately realised the necessity of social assimilation and integration. I believe that I achieved social assimilation and integration through being frank about who I was, that I was a student whose primary purpose was to learn from them about key issues relating to them and the mining industry. Once I reached a certain degree of assimilation and more importantly, trust, most of my participants opened up to me.

The culture of secrecy amongst mineworkers in particular, was what necessitated this process. There are safety regulations which mineworkers need to abide by, which, if non-compliance is found, would result in a variety of penalties. However, as is shown by the evidence gathered, in many instances, compliance with safety regulation can, and often does, result in penalties as well. Therefore, understandably, mineworkers and officials would not want to be as open and forth-coming about speaking on issues concerning safety compliance and non-compliance. Furthermore, the DMR conducts investigations and, in instances of non-compliance with safety regulation, have the power to close down a mine, or a section of the mine, as per section 54 of the MHSA 29 of 1996. It is these implications that make mineworkers wary about merely talking to anybody, much less a student from Wits (University of the Witwatersrand). I had a few instances in the field where it was assumed

that I was an “impimpi” or informer, who was there to spy on mineworkers and officials on behalf of management or the DMR. Those were very tense times which I managed to work through without compromising the integrity of the research. How I navigated through these instances was by once again, reiterating that I was only a student whose sole purpose was to conduct research for the purposes of completing my Master’s degree.

During the 2017 interactions with key mining officials or gate-keepers, it was suggested by them, that I visit 3 as opposed to just one mining site. The 3 mining sites are each in 3 provinces; Gauteng, Free State and North-West. Another challenge I encountered, which I can assume is a part and parcel of many research projects, is travel and accommodation costs. Finding accommodation was also quite a challenge. My parents were very supportive through financing the fuel costs of my constant travels throughout the process. The process taught me that it is very important to thoroughly plan for the financial costs that are a part of every research project. There is also a need to be mindful and honest about the scale of the research and what would fall within one’s budget and resources.

The research process, although very interesting, and in many ways, life-changing, also had the challenge of keeping me away from loved-ones, for weeks at a time. There were times out in the field where I experienced general as well as acute moments of loneliness and home-sickness. This was indeed very challenging, but nonetheless, I pushed past it and kept myself focused on the research and in particular, the data collection process.

The following excerpts are diary notes that I took in the field, which further detail my lived-experiences as a researcher:

11 March 2018

Everyone seemed in a rush today. I was then off to the recruitment centre to try and complete my medicals. For about a period of two weeks I've been struggling with this issue, because mine policy states that one must be at least 50kg, and I was around 48kgs. The day before I went in for the weigh-in and I managed to hit the fifty mark. I was elated, only to be told by the nurses that I'd still need to come in the following day for heat tolerance. So today I went in for heat tolerance screening, and this entailed stripping down to some boxers, then entering this room with about seven other guys, a room which produces hot, steamed air. Before going into that room we sat in the change rooms, after which our temperatures were taken. My temperature was good. So in the heat room, I do my steps where I step up and down, for about twenty minutes, its hard work but I manage

12 March 2018

Right so twelfth of March 2018 I just got out of the second session of training and we've been given a thirty minutes break. It was very interesting and very interactive, and for me as a researcher, this method is brilliant, the practical method that is. I certainly learned a lot from it, and I would expect that they (the training companies) would use this type of method for all the other aspects of training. I was thoroughly impressed. We had to enact a safety rescue scene, based on specified three tasks, where we had to treat a patient underground with a variety of injuries. We first discuss it before we do the practical aspects of it, we then collect material from the first aid kit, then we implement what we discussed, then we get judged by the instructor, giving us points of correction. Most of the time we did a good job, we did an okay job, in terms of feedback, I really liked the practical training aspect of it and

I would argue that this can be effective going forward. There was lot of team work involved, and it worked out well, there was a sense of compelled engagement, a type of team bonding, and much to be said about the psychosocial aspect of training. I learnt a lot more from practical training than from the lecturing. The guys there weren't taking any notes, and some of us completely forgot about what we were taught about regarding the type of injuries so we had to refer back to the notes that I had taken.

CHAPTER 4

Sampling

The type of sampling which is used is non-probability sampling, and this refers to sampling based on the relevance of the participants to the research as opposed to the statistical representivity of the population (Neuman 2006). This research sought to explore the complexity of the social process of underground mining. Therefore, the concern was the relevance of the mineworkers to this study in producing the data needed to explore this complexity as opposed to whether the data produced will be generalizable to all mines in South Africa, or across the world (Neuman 2006).

The sampling technique employed is purposive or theoretical sampling (Neuman 2006; Mason 2002). This refers to deliberately choosing participants which are relevant to the research (Neuman 2006; Mason 2002). The participants chosen are mineworkers, who have had more than 5 years of experience in underground mining, and who primarily work as part of a group operation.

CHAPTER 5

Ethics

The ethical issues that are involved in this research essentially concern two issues, which are (1) the issue of having to ask the mineworkers on practices, attitudes or views that are contrary to the official mining safety regulations and training i.e. non-compliance, and (2) the issue of having to speak on potentially disempowering and frustrating structural issues such as the frustration that comes with being compelled to comply with safety training yet, being prevented from complying for fear of victimisation (Stewart 2013: 67, 68). During the data collection, in some instances, this topic did ignite feelings of frustration during the interview process as well as general engagements with the mineworkers as these issues are highly emotional and evocative. (Ogletree and Kawulich 2012). This issue was addressed through asking the participants if they feel like they want to continue with the research process.

The first issue was addressed by informing the participants that they will be anonymous to the public, and that the information they give will be made confidential through use of pseudonyms as opposed to their actual names (Neuman 2006). Other identifying details such as for instance the shift or area of the mine they work in has also not been disclosed (Neuman 2006). This gave the participants the confidence to want to interact freely and honestly with me as a researcher. Research conducted in the area of mining safety non-compliance, reveals that mineworkers as well as other role players such as trade union officials, are forthcoming about safety irregularities such as non-compliance (e.g. Stewart 2013: 68 and Phakathi 2001).

CHAPTER 6

Results and analysis

The data analysis pertains to the research that has been taking place since the 8th of February 2018. The data has been collected from 3 South African mines (2 gold mines and 1 platinum

mine). The method has primarily been interviews, with an inclusion of observations in the field. The data which has emerged, differs at some points, yet correlates with other data sets.

The raw data is voluminous considering the large amount of interview participants (n=64). The themes that emerged fall within as well as outside of the theoretical framework as well as main question and objectives. The themes are as follows: Mineworkers' behaviours (as accounted in the interview process), the structural constraints on the part of the mine as an organisation, issues concerning the physical mining environment, issues concerning mining machinery, and issues concerning financial competence concerning the spending of salaries. The themes were then marked alphabetically with a code as follows: A=mineworkers' behaviours, B=structural constraints, C=physical environment, D=machinery, E=financial illiteracy, F=safety training. Therefore, this constitutes a thematic framework. It is this framework which is used to order and categorise the data into a theme. The results of the organisation of data are as follow.

Structural/organisational impediments to safety compliance

This section relates to the structural factors which prevent or impair mineworkers from successfully complying with safety training and regulations. In others words, it details from mineworkers' own accounts, instances where what prevented safety compliance was external as opposed to behavioural in nature. The following sub-themes will be discussed: Pressure from the shift-boss, production pressure, bonus pressure, and incompetence in operating machinery, regulatory intimidation and decreased number of workers.

Pressure from the shift boss

Interacting and speaking with the participants revealed that much pressure is put on working teams by the shift-boss (cheebas). Participants spoke about how the cheebas will often go against what the *miner does, all in an effort to push production forward (miner- a technical*

term in mining referring to a mineworker who is responsible for key duties such as blasting, and handling of explosives). Regarding this, "Tshepo" spoke the following "Cheebas e ea khahlanong le seo minera a se etsang" ("cheebas goes against what the miner does". Many of the mineworkers I spoke to felt that this was problematic because the pressure often pushes them to not comply with safety regulations. *"Smangaliso",* a mineworker I engaged with at the training centre in Carltonville, stated that "kodwa i-cheebas ayikhathaleli ngoku okukhathalela i-production" (but cheebas doesn't care about this he cares about production). He said this when I asked him questions about how effective this training is when he is confronted with safety hazards underground [this was during first-aid training regarding heart functions]. It also seems that the production supervisor holds the type of power and authority that cannot be challenged, even with section 22. This specific section of the Mine Health and Safety Act 29 of 1996 state that mineworkers have the right to refuse dangerous work. One mineworker expressed that the team leader in many instances "oa potlakela ba sebetse, bakeng sa ho lelekisa production" (the team leader rushes workers in order to chase production). *"Seriti"* stated that "safety e bohlokwa, taba ke hore, ha se re le mokoting, cheebas e fetula dinto" (safety is important, but the problem is, the cheebas changes things when we are underground). Another worker Maemo" stated that although he appreciates training he states that "the cheebas will hold a grudge if I always follow safety underground; I'll get in-trouble in the future, production is more important".

It is clear to see the compromising of mineworkers' safety in a way that can hardly be challenged. There seems to be great difficulty for a mineworker to challenge the authority of the cheebas or their team leader. In a few paragraphs, it will be explained how workers who complain against their shift bosses on matters of safety are put in a compromised position that could put their future employment at risk. Workers have limited power in terms of production because for the most part, there are structural forces far more powerful than them, which

severely constrain their capacity to exercise social power. The social power of production, it seems, lies predominantly in the power of the shift bosses. The workers also remarked that they are often rushed by the shift boss to get as much production done in a day. This results in them ignoring safety standards e.g. checking for loose rocks on the hanging-wall (the hanging-wall is the roof of the tunnel), in an effort to rush to get the work done.

This pressure is external to the mineworkers as pressure is placed on them, which compromises their safety, and in many instances, compels them to not comply with mining safety standards.

Production pressure

Closely linked to the pressure from shift bosses is production pressure. Like in many other industries, mines need to produce a certain amount of output in a day in order for them to be profitable. This structural pressure is then seemingly transferred down onto the mineworkers insofar as the data reveals. What the data from this research shows is that mineworkers feel that they work under tremendous pressure to meet certain production goals per shift. For instance *"Immanuel"*, who had been working as a general worker underground stated the following, "ho tswanetse hore re latele production, ka dinako tseding ere kenyetsa pressure…ha hole jwalo ba bang ba sebetsa sub-standard ka hobane ba lelekisa production" (it's important that we keep up with production demands, sometimes it puts us under pressure…in such times others work sub-standard because they are chasing production). What workers will then do is forego safety regulations because following safety regulations in some instances will slow down production and decrease their time to reach production goals. This is a clear instance of the organisational structure having a constraining effect on mineworkers' ability to comply with safety regulations. For instance, a mineworker *"Lesley"* stated the following "entry exam takes too long; it usually is 2hrs to do proper job, but some do it quicker; then injuries can happen" Entry examination is a process where mineworkers

examine the safety of the working area before work can commence, in order to ensure that workers are working under safe conditions.

Therefore mineworkers are left with having to decide whether to comply with safety regulations or meet production targets, and the data shows that it is the latter choice that is made, which, according to *"Garudi"* a mineworker from the Free State, is a contributing factor to mining accidents and fatalities - "when it comes to safety my brother, production is a challenge my brother because we must reach a certain target, you see, so safety is good but production is very very important, it makes us to feel pressure to push, then mistakes of safety sometimes happen, sometimes they don't".

It is clear that the pressure to meet production targets is incongruent with compliance with safety standards, as compliance takes long and slows down shift work, which ultimately makes it difficult to reach production targets. Therefore, it can be said that the organisational structure of mining insofar as production pressure is concerned, contributes to safety non-compliance, and ultimately, safety incidents.

Bonus pressure

Mineworkers, during the interview process, spoke repeatedly about production bonuses within the context of safety. Many participants remarked on how, during shift-work, what tends to happen is that the team will continue to extent the face and do blasting, without having adequately supported the area as stated by "Ntate Bonolo" when asked about how mining safety can be improved…" botata ke bonus-basebetse ba tla extenda face ntle le ho fumana tafole hore ba fumane bonase. ("a lot of this safety issue is linked with the bonus; workers will extend the face without having secured the table, in order to get a bonus"). In underground mining, the standard is as follows: when blasting or extending the face/ working area, the team of mineworkers should put in place support [support in the form of wooden

and metal poles] to prevent the hanging-wall/ the roof from caving in. When rock is blasted and a tunnel is formed, there needs to be support to prevent the natural inclination of the (newly-created) tunnel roof/ hanging-wall from caving in. This support is in the form of temporary and permanent support packs. The support has to be placed 4 meters from the stope (wall which is to be blasted). The temporary support is in the form of steel poles which are inserted using a jack-like device. The pole is firmly put in place to secure that hanging-wall. Between the steel poles are the permanent supports which are in the form of wooden planks which are placed on top of each other in a square pattern until they reach the hanging-wall. Once they reach the hanging-wall, a piece of metal is placed in the remaining crevice and pumped with either air or water until it is completely in place. This then completely stabilises the wooden planks, and helps prevent the hanging-wall from caving in. As mentioned briefly in the previous paragraphs, this safety procedure takes time. What mineworkers who are in a rush to get bonus-achieving targets do is they carry on with blasting and moving of the ore either without placing enough support packs, or without placing ***any*** support packs. This results in support packs being further than the mandatory 4 meters. This then often results in rock-falls (the hanging-wall caving in) which in most instances, kills the mineworkers immediately. In an early morning interview with a mineworker named *"Kgosi"* at a Rustenburg training centre, the following was stated when I asked him about how the bonus system works – "to get the bonus the team must reach a production target of +; 100%, +120% or 150%; it depends on what you do in the mine; the more you do the more bonus you get; so you don't do certain things like putting enough roof bolts to make safe the hanging".

The issue of production bonuses is both a group behavioural and a structural issue. It is a structural issue because it is a mechanism used by mining companies to encourage higher productivity, yet it is also a group phenomenon because mineworkers are not necessarily

compelled in all instances, the work towards production bonuses. Therefore, the decision to aim for production bonuses in a manner that does not comply with safety regulation is a decision that, in some instances, ultimately rests on mineworkers. Bonus or incentive payments in the mining industry vary across mines (Segal and Malherbe 2000). Some mines reward a fixed percentage of the monthly salary of a mineworker, on top of what the mineworker already earns per month. Whereas others reward a bonus based on the type of work and rank of the mineworker (Segal and Malherbe 2000). However, the issue becomes more complex because the decision to work towards the bonus is often not a unanimous one, and is one often taken by the team leader. The issue of power dynamics therefore comes into focus as part of intra-group dynamics. The group and structural aspects of production bonuses then interact to create an issue where non-compliance of safety regulations takes place.

Incompetence in operating machinery

Mineworkers revealed that there are times when other mineworkers operate machines which they are not competent in operating. One participant revealed that part of why this happens is that workers are often short-staffed due to other mineworkers not being present for shift work. Mineworkers in a team, include the team leader, the Rock Drill Operator, the Miner, the Mono-winch operator, the winch operator and the general workers. Everyone in a team is trained for a specific task, and over a specific period, at the training centre. Each mineworker develops a particular competency over time. Machine operators as well as those workers who handle explosives also receive certificates certifying that they are qualified to work within that particular task. However, due to staff shortages, mineworkers will often take the place of the absent worker and operate machinery which they were not trained for. *"Edgar"* a mineworker in Carltonville, spoke about how --- "batho ba bang ha ba na li-license tsa mechine empa ba sa ntse ba sebetsa, ba saenngoa ke lihlooho, ebe lihlooho li kena mathateng ha u tsoa kotsi" (some people don't have machine licenses but they still operate them, signed

off by heads, then heads get in trouble when you get injured). ”*Potlako*” from the Free State, after a training session in the morning, remarked that “.-- hu na le ba bang ba sa tsebeng ho sebelisa mechine, be sebetsa ka hobane matsatse a mang hara fella” (“there are some who don’t know how to properly operate a machine, but they do the work because some days we are short of workers”). One mineworker complained that some workers will often think that, due to having observed how the machinery is operated, they can operate the machine in question. Accounts of accidents and injuries were not forthcoming, but this issue did come up within the context of speaking on issues that affect mineworker safety.

Decreased number of workers

Linked to the discussion above is the issue of the decreased number of workers working as part of a team. One experienced mineworker “Isaac” spoke of how “in the past, there used to be around 15 mineworkers working in a team. At present the numbers have decreased”, although he did not give a specific amount. He stated that “this is a problem because with decreased members in a team, it becomes more difficult for members to be able to be on the lookout for each other in terms of identifying safety hazards”. Another mineworker, “Sampo”, gave a specific account of what happened when he encountered a safety problem as a result of not having enough members in a team. He stated that “litekanyetso ha li re lokelle ho arohana; empa ka linako tse ling maemo a hloka hore re arohane, joaloka ha ke tlameha ho kenya li-cable tsa motlakase, fono e lla; setsebi se ne se tlameha ho tloha ho ea araba ha re sa ntse re kenya li-cable, no ho sa gona hale hore ke tlohe sebakeng seo-haeba makalanyane a tla”. Loosely translated, Sampo, who works in the engineering field of the mine, where he installs electrical wires, as well as pipes, spoke about an altercation he had with a colleague a few years ago. The colleague asked him to do something that deliberately violated safety standards. He asked Sampo to walk alongside the conveyer belt whilst it was still in motion. Sampo disagreed and a heated argument began, and the issue was then taken to the foreman.

The main thrust of the issue was that it was only Sampo and his colleague who were working in a team, whereas in the past there would be more than two in a team. The phone rang whilst the two were working on installations. One of them needed to go answer it, so Sampo was sent by his colleague. However, in order to get to the phone he had to move past the moving conveyer belt. Sampo refused and chose to rather stay and keep guard in case there would be "makalanyane" (locomotive) operators who would need to be alerted that maintenance work was taking place, once again being alert to the potential safety hazard that would occur if there was no-one on guard. What Sampo did was centre this account, not necessarily on the issue of safety non-compliance, but more on the issue of a lack of enough members on a team. He stated that had there been enough members on the team, then the problem of having to answer the phone would not have occurred. This points to a structural issue where perhaps organisational changes have resulted in downsizing on the size of the workforce. This, according to the sentiments of some mineworkers, has resulted in an increase in safety issues.

Regulatory intimidation

It is very clear that in terms of the structure of mining and its impact on safety compliance; most of the issues discussed in this section are closely linked. The section of regulatory intimidation links more closely with the section of production and shift boss pressure. Here however, as the data reveals, the pressure can also emanate from within the team, such as from the team leader, Miner or Rock Drill Operator. One participant, *"Thabo"* stated that "etsa feela mosebetsi ona; tšireletseho ke puo feela; baho charger bakeng sa ho batla ho phethahatsa safety". (we just do job, the talk of safety is just talk, and that in actual fact, when one tries to raise an issue of safety, or when one tries to work safely, you get charged for doing that). Getting "charged" is what happens when a mineworker gets penalised for committing an infringement whilst conducting work. However here it is clear that this penalty is used rather, to make it hard in some instances, for mineworkers to comply with safety

regulations. Another mineworker “Sibusiso” told of how the risk of being charged is constant and that one is constantly working under fear, because being charged has implications on a mineworker’s employment security—“ Ha u khone ho hana, ka hobane o tlabe o beha bokamoso ba mosebetsi kotsing; re sebetsa ka tlas'a tšabo, ho bonolo ho latela litaelo tsa substandard.” According to Sibusiso, mineworkers often recognise when an instruction violates safety regulations, but cannot refuse the instruction because of the fear of being charged. Therefore, it becomes clear how mineworkers often don’t comply with safety regulation as a result of the structure of mining, which, at times, compels them to not comply through the threat of being charged.

Mineworkers’ behaviours

This section relates to the group behaviour of the mineworkers in relation to safety. This category of data concerns the role that mineworkers play in safety compliance and non-compliance. Under this theme, the sub-themes are as follows: Assisting each other to identify danger, non-compliance, concentration and attitudes towards training

Assisting each other to identify danger

An aspect of mineworker behaviour which affects safety, concerns the issue of mineworkers assisting each other to identify safety hazards. Mineworkers spoke about how they look out for each other when underground. This is a common theme in the data, and was an issue that the mineworkers touched on consistently. This could be interpreted as a culture in underground gold and platinum mining that could be considered a positive feature of mineworker group behaviour, which assists in preventing accidents and even deaths. One mineworker for instance said “rea thusana, le ho thusana hore sena ke kamoo o etsang” (point to each other, assist, and help each other that this is how you do this and that and this way), another, *“Katlego”* noted that “eye each other; see if others are okay”, and another *“Thabo”*,

remarked that he “thusitse motsoalle ha ke bona hore o ne a sa phela” (helped a friend out when I saw he was not well).

However, there was a participant, “Joe” who remarked that although this is a common practice underground, often-times the nature of the work is such that one cannot at all times be observing the safety practices of other mineworkers–“ka linako tse ling ha ho na hore ke ka bona hore na basebetse ba bang ba etsang, kahobane mosebetse o monganta”, which therefore makes this practice limited. Another limitation that is noted in the interviews with mineworkers is when some participants remarked that there is a tendency towards not following instructions given by other mineworkers. Mineworkers who don’t follow instructions are often referred to as “manganga” which loosely translated is Sesotho for stubborn. Some participants noted that some of their fellow mineworkers “are arrogant” and have an “attitude” when orders are given by other mineworkers, although it was not specified as to whether these orders involved orders on safety practices,--“ boikhohomoso ke taba tlaase moo” (arrogance is an issue/ problem underground). Therefore, it becomes clear that some mineworkers, who would upon observation, see another doing something erroneous in terms of safety or otherwise (as this was not specified), might find it challenging to rectify behaviour of an individual who refused for their behaviour to be rectified. This would have a generally negative impact on mining safety. Therefore two types of behavioural phenomena can be said to occur here. The one is a culture amongst workers, where mineworkers try to identify safety hazards concerning their colleagues. The second one is that some mineworkers will refuse to follow instructions given by their colleagues concerning safety or otherwise. However, in some instances, a refusal to follow instructions can occur in a context where the mineworker has been threatened with dismissal or being charged, were they to follow instructions that are beneficial for safety.

Non-compliance

Regarding instances of non-compliance, this is what the research has unearthed. Mineworkers remarked that either they or their colleagues do not always comply with mining safety rules. One of the reasons, they revealed, is that they become too used to working as mineworkers. Therefore, they state, that they do not always pay attention to safety rules the way they used to. Others remarked that complacency is an issue, where, over time, the following of safety rules starts to become a tedious process; a process which is then by-passed by short-cuts. Linked to short-cuts is the claim that following safety regulation takes too long, as they are under pressure to meet production targets. For instance, one participant remarked that "ho sebetsa ka standard e nka nako e telele haholo, haeba e tlameha; e ka qeta letsatsi kaofela'' (safety takes too long, if you had to follow it you could spend a whole day just doing safety).

Short-cuts are also taken because mineworkers claim they are often in a rush to "chaisa" or knock-off work early. One participant remarked the following "ha re ntse re hōla le ho ba le boiphihlelo bo eketsehileng lefapheng lena, ha re sebetse ka melao hobane re le potlakela ho tloha mosebetsing" (we get older & more experienced in the industry, then we ignore safety rules because we are just in a rush to leave work). Participants noted that what they do before or during a shift is actually calculate how many hours they would need to work in order to get off work early. For instance, they would calculate that if the shift work required for the day is 8 hours, but the amount of work involving safety would push it to 10 hours, then short-cuts would have to be done to make sure that they keep the working day to 8 hours. From these calculations, they then decide which short-cuts to take in order to reduce the amount of working time, which would enable them to get-off work earlier. Speaking to *"Teboho"* from the Rustenburg site on this issue, he stated that "because the distance from the catch to the working area is about an hour, sometimes we walk an hour, then we work in speed to make up for the hour, then we don't always focus on safety" This practice is a clear and deliberate

instance of non-compliance. There also seems to be a correlation between the number of years spent as a mineworker and the likelihood of taking short-cuts, as some mineworkers remarked that the more experienced you are, the more "you know too much" and therefore the more likely you'll take life endangering short-cuts. Here's what a mineworker *"Amogela"* remarked "hare ele hloko litaba tsa ts'ireletso hobane re se re tloaetse ho etsa joalo, ke seo re se tloaetseng, ka hona re nka de-short-cut mona le mane" (when it comes to safety issues, because some of us are used to the mines, we take short cuts here and there). Another mineworker, "Joshua" remarked that "ke habohlokoa hore u se ke ua tloaela haholo, hobane ha u ka tloaela ho tla etsahala likotsi" (It is important not to get too used to mining, because when you get too used to it, then accidents happen). Interesting to note, is how when workers coming from their night shift were met with a training instructor who told them to wear their full safety gear, the younger generation of mineworkers followed his instructions reluctantly, whereas the older and more experienced mineworkers immediately followed his instructions. Of note is that the opposite was found in other research (Nite and Stewart 2012). However, there's no evidence to show that the more experienced mineworkers comply with safety regulations all the time when not in the presence of a safety official or training instructor.

Early Entry Examination

Early entry examination is a procedure that teams of mineworkers who work different shifts are meant to conduct prior to commencing mine work. Typically the mineworkers would enter a working area and examine the place for signs that may indicate that the working area is not safe. If it is determined that the area is not safe, then steps have to be taken to ensure the safety of the mineworkers. In brief, what mineworkers would do is ensure that the temperature of the area is not above 32 degrees Celsius. Workers would also examine the hanging-wall for loose rocks. This would be done by using pinch bars in a process called

barring, to search for and dislodge any loose rocks which would have become loose due to seismic activities or mining activities such as drilling and blasting. This process, according to mineworkers, takes a considerable amount of time. One mineworker said that the process takes so long that they have to engineer ways to by-pass the lengthy procedure in order to ensure that they do not lose out on production time. Many participants said that, were they to follow the early entry examination procedure as well as other safety procedures correctly, they would spend the whole day making sure that the area is safe, and thus, there would be no production. Thus, short-cuts are taken, such as continuing drilling even if not enough roof-bolts have been put in place in the hanging-wall.

Concentration

A key issue which emerged throughout this research is the issue of concentration. Throughout the interview process, participants spoke openly about how there is a tendency for workers underground to become distracted by things that occur outside of the work context, for instance marital problems. A mineworker, *"Simon"* remarked the following, "Hangata ho etsahala ha u le skwereng, hore diabolose o kene ka kelellong ea hao ka mehopolo e mebe ebe u tsoa likotsi; e bonolo ho tsoa likotsi, e tšoana le holim'a metsi; haeba u sa tsepamise maikutlo" (Sometimes it happens when you're in the square, that the devil enters your mind with bad thoughts then you get injured; simple to get injured, it's the same as on surface; if you don't focus). *"Thabo"*, a mineworker from the Free State fieldwork site, remarked the following "ka nako le nako u ka lahleheloa ke maikutlo ha ntho e mpe e etsahetse lapeng; mosali oa hau joalo-joalo, u lokela ho botsoa sebakeng seo u emetseng ho sona haeba bohle ba le hantle" (Sometimes you can lose your concentration when something bad has happened at home; your wife etc, you need to be asked in the waiting area if all is well). There is a procedure as mentioned by the participants where before the start of shift work, workers are asked if they are feeling well, and if they have any personal issues they would like to share

before going underground. This process is very important he said. Furthermore, the participant stressed the absolute importance of high-level concentration when working underground. This is in line with the evidence presented on workers getting too used to the mining environment underground, in the sense that workers gradually become used to their working environment to the point where concentration would decrease.

One mineworker remarked the following - “ka dinako tse ding u fumana u se o tlwaetse marafe; ha u sa tšoha”. This was interpreted as meaning that mineworkers become so used to their environment that they become non-receptive to the constant safety hazards that are inherent in underground mining, particularly gold mining. This phenomenon is known as industrial or inattentional blindness. One participant spoke of how it was even possible to lose focus even when operating a locomotive which in underground mining is colloquially referred “makalanyane”. The locomotive which operates on rail is used to transport broken ore rock, and at times, mineworkers. How he explained this is that it often happens that one get caught up in thinking about things that are stressful, such as family problems or other stressors. This is problematic becomes is very possible to have a carriage derail, injure or kill other mineworkers who could be found walking in the area. Linked to this is the issue of complacency. Many of the participants I spoke to revealed that often, mining accidents and deaths happen because some workers simply did not feel like following safety procedures, as they felt it was too tedious and laborious for them. Safety in these instances was regarded as an inconvenience. *“Tsiamo”* spoke the following regarding the wearing of partial PPE “Ha o apere PPE e feletseng ka hobane ea sitisa” (sometimes we don’t were full PPE because it’s distracting).

Attitudes towards training

Many of the participants remarked directly to me, as well as indirectly when speaking to each other, that they do not take the training received seriously. “Sibusiso”, who I spoke to when

at the training centre at the Carltonville site, remarked the following when I asked him about training—“ ho latela setso, ha ho na nako, matsoho a hao a robeha, re u phahamisa,, ha u se na nako ea melao-motheo ena e senyehileng” (“follow the culture, there's no time, your hands get broken, we patch you up, we don't have time for these damn rules”). He further remarked that “-- batho ba bapala ka hare, ha u na nako ea ho nahana, ha u nahane ha motho a lemetse” (people play underground, you don't even have time to think, you mind goes blank when one is injured). Some remarked that when coming in for training after work leave, it is merely as matter of following the procedure of going through the training process. The training is not taken seriously because, as some of them would often remark, what they learn in training is not applied in the underground context. Sensing that I might be going underground as a student, *“Sibusiso”* remarked emphatically….”what we learn here we don't follow underground, there's no time, absolutely no time, follow the culture, don't come here with your education, follow the culture, don't come here with your books, follow the culture, be humble, don't think you're smart” .

The reasons put forward for this was that there was not enough time to apply the training, possibly implying that the safety training does not fit the fast-paced and demanding environment underground. In a group discussion which mineworkers had amongst themselves, the nature of the actual learning experience was brought to the fore. Workers complained that the pace of the teaching was too quick for them to learn anything substantial. *“Tamsanqa”*, a mineworker who was having a discussion with his colleagues during torch-cutting training, remarked the following” Xa uvela ku-training bajonga phantsi kwakho, ngokukodwa bajonga ngaphantsi kwinto efunyenwe ku-training” (When you come in from the training centre they look down on you, basically looking down on what's ever it is that was learnt in training). When some workers are mocked for having recently arrived underground from training, then it would follow that this mocking would make at least some

of them to not want to continue to be mocked, and would thus adopt an attitude of not following safety protocol taught in training.

Natural mining environment and safety

This theme of the research report deals with the impact of the natural mining environment on safety compliance. The sub-themes to be discussed are as follows: heat/humidity, slippery surfaces and hanging-wall fractures.

Heat/humidity

The interviews and personal discussions have revealed the following: Many of the participants have stated that they often work under hot conditions. A handful of mineworkers stated that, in certain areas in the mine underground, it can get heated to the point where one would be drenched with sweat whilst walking the long distance to the stope/rock face. It must be made clear that the workers acknowledge that the nature of underground gold mining is such that the heat is naturally produced even with the required ventilation system. According to safety procedure, mineworkers, before beginning with work, are required to measure the temperature. If the temperature exceeds 32 degrees Celsius, then mineworkers are required to clear the area and check if the ventilation system is working. In the data, there was no point at which non-compliance with this particular procedure was revealed. Further research would be needed to clarify whether non-compliance happens regarding this procedure. An issue that also needs to be clarified is the possible variance that may exist amongst mineworkers in terms of heat tolerance underground, and not just only in the heat tolerance testing facility. These issues are important because heat affects concentration, as has been revealed in the data by participants. "*Mokwena"* for instance, stated that "sometimes it is difficult to focus because it is hot there, then we can lose the focus sometimes, and mistakes happen" When asked about the ability to concentrate for extended periods underground, a few mineworkers stated that a lack of concentration often happens due to the heat. This issue, although not

necessarily related to the sociological aspect of safety, does have an important role to play in affecting mineworkers' ability to concentrate, and therefore to work safely and in compliance with safety regulation.

Slippery surfaces

Mineworkers also mentioned of how the surface underground has a tendency of being wet, and thus slippery. This is a naturally occurring phenomenon due to natural streams which are sometimes encountered and exposed as mining activity takes place. Mineworkers, as I was told, have to therefore always take precautions when walking, because some areas tend to have a greater degree of wetness than others. A safety hazard that some workers alluded to is one where workers slip and fall, and injure themselves. Workers emphasised that it is relatively minor errors that can cause such injuries. One mineworker, *"Ntaba"* stated the following, "make sure boots are not worn out underneath because it's slippery there". This here indicates that there is a role that mineworkers can play in preventing or at least minimizing the likelihood of this injury occurring, through ensuring that their boots are not worn-out and are up to industry or company standards. Mining safety, as this section shows, is a product of mineworker behaviours, structure/ organisational structure as well as being knowledgeable about the naturally occurring safety hazards.

Hanging-wall fractures

A few mineworkers spoke on a very interesting point. They mentioned that even though they work with temporary and permanent supports, they do not necessarily feel completely safe. One participant *"Ndalamo"* spoke of how, "even though one can secure the roof using a temporary support, that support may be in-between fractures in the hanging-wall". The implications of this are that in the event of a seismic activity, the supported table/ roof may still collapse onto the mineworkers. *"Poolo's"* statement supports this statement when he stated that "ha o laole lefatše" (you can't control the earth"). This may be read as meaning

that hazards can occur due to various geological factors that may be beyond the efforts of mineworkers to make the working area safe. This is a natural occurring mining hazard, which can be said to be mostly removed from the behavioural or structural dynamics of mining activity, and needs to continuously be taken into consideration when looking at mining safety in general.

The training of mineworkers

This theme will look at issues concerning the training of mineworkers. The following sub-themes will be discussed: Illiteracy, educational disparity, real-world disparity, and fast-tracked training.

Illiteracy

One thing that I was struck by, particularly during training, was the level of illiteracy amongst the mineworkers. In fact, in the context of an assessment concerning knowledge learnt during first aid training, this is what one mineworker *"Joseph"* said--- "Hona re tla etsa joang haeba re sa utloisise Senyesemane re sa utloisise lipotso tsee" (well what are we going to do if we don't understand English, we don't understand these questions). In the context of a worker being assessed regarding their degree of competency on how to be safe underground, this is problematic. The question becomes, if we cannot test a worker's level of competency due to his / her illiteracy, how we can be certain that the worker is competent enough to be underground? Therefore, the illiteracy of the mineworker then becomes a safety concern because the illiteracy becomes a barrier to assessing and knowing whether a mineworker is competent and adequately prepared enough to be underground. Below is an excerpt from my diary notes when at the training centre concerning this issue:

> *I just finished with my first aid training, my reflections on it: in the test I heard a lot of very sad commentary about the guys saying, "hona re tla etsa joang haeba re sa utloisise*

Senyesemane re sa utloisise lipotso tsee" (well what are we going to do if we don't understand English we don't understand these questions), what about some of us who can't read; kinda broke my heart to hear that , the fact that the DMR is compelling them to , you know , ask and answer these questions , it's sad, it really is to a great extent. One thing that I've picked are some disjunctures in so far as the training is concerned, the first one is the disjuncture between the actual curricular and the ability to get through that curriculum, insofar as the education of the mineworkers is concerned; the second one is the surface versus underground disjuncture, and that's what really stood out.

Educational disparity

Following from the above discussion, I found a strong disparity between the educational levels of the material being taught and what the mineworkers could understand. I took note of how in the medical-type training in particular, the mineworkers struggled to keep up with the demanding concepts and intricate medical knowledge. At one point there was a lecture of the different functions of the heart as well as its various parts. I gathered from the lack of interaction of the mineworkers in the room, as well as their body language, that this particular topic was completely incomprehensible, important as it was. Therefore, what becomes an issue is the degree to which mineworkers can understand what they are being taught, when there is a high disparity between some of their educational levels, and what they are being taught. It seems that the possibility exists for mineworkers to be taught about various aspects of safety, in a way that they can understand. Therefore, there needs to be educational congruence between what and how mineworkers learn, and their level of education. This could ensure that mineworkers are knowledgeable enough to work safely underground, particularly when it comes to reacting to safety hazards such as injuries to their fellow mineworkers. It cannot be expected that mineworkers be taught about safety and health behaviour when they cannot understand the content as well as the language that they are

being taught in. Below are a few notes made in the training first aid session concerning the heart functions. It is clear from these notes below, in the context of widespread illiteracy amongst mineworkers in the South African mining industry, that there is a clear disparity between what is being taught and the educational levels of mineworkers. The purpose of including these field notes below is to give the reader a glimpse into what many mineworkers, many of whom are illiterate, were taught during the training on first-aid that I observed, and how this indicates a great disparity between the education levels of many mineworkers, and the content of what they are being taught.

Arteries (bright red, clean, from heart, squirts out)

Veins (used, dirty, back to heart, dark red, flows, no oxygen)

Capillaries (smallest, inside lungs, skin, oozes out)

Types (concussion, laceration, incision, punctured, grazing, avulsion, gunshot, amputation, evisceration

Amputation (preserve, cut off, plastic, ice cold water, evidence; evisceration (cloths, wet, on top of abdomen, cover with blanket, or plastic

Types: cardiogenic, neurogenic, psychogenic, metabolic, hypovolemic, septic,

Cardiogenic--heart attack, congestive (strenuous hard, machines, strain muscles, too much grandpa, filled up with water, alcohol, affect kidneys)

Psychogenic--flight, fright, freeze and faint

Neurogenic-- damaged nerves, nervous system,

Spinal injury--" levels of Consciousness"

How many bones do we have??

3 functions the bones

Causes:

Direct force, indirect force, muscular force, pathological force

Types: (open-closed, complicated, compound, signs and symptoms (8)

Real-world disparity

According to the conversations that I've had with the mineworkers, as well as conversations that they have had amongst themselves, there seems to be a difference between the world which is assumed to exist in the context of training, and the world that actually does exist in the context of underground work. In fact, as one mineworker *"Sibusiso"* was quoted above as having said, "follow the culture, there's no time, if your hands get broken, we patch you up, we don't have time for these damn rules". The broad issue here that mineworkers are expressing is that what they are being taught or trained for on surface cannot always apply underground because the contexts at times, tend to different, especially concerning safety. It is easy to assume that mineworkers have the time and psychological resources to enact certain safety procedures (in this case first aid) whilst facing certain conditions underground. Being in the comfort of the surface environment is one thing, being underground is tends to be somewhat different. A mineworker, *"Small"* told me that "there's a difference between what you learn on surface, and what you experience in the mine, you have to go down and see for yourself". Once again, it would seem that there needs to be congruence between what is being trained, and the actual lived-experiences of the mineworker. Indeed, training would need to reflect the underground realities so that mineworkers can be adequately equipped to deal with some of the harsh realities of working underground and thus equip them to work safer.

Fast-tracked learning

The learning time in which mineworkers were trained, in which I was trained, was relatively short. In fact, in a group conversation that mineworkers were having amongst themselves during a break in training, one mineworker said the following..." re lokela ho qeta khoeli re ithuta lintho tsena, empa re mona re li etsa kapele" (we should be spending a month learning this stuff, but we're here doing it quick). All of us in that class got certificates of competency in terms of the specific tasks we were being trained for, like safe handling in torch-cutting. However I personally did not grasp the technicalities that were being taught. I was simply made to sit in a class and read from a projector in the front of the class. In fact, *"Tsietsi"* a boiler-maker working in the engineering section, said this when I asked him on issues of safety..."ignorance is the main cause of accidents; no competency, they learn absolutely nothing, you not even competent for that which you are supposedly qualified for, you go down, you're not competent, you don't know nothing basically". There seems to be a link between just how quick a mineworker (particular a new mineworker--referred to in the mining industry as "new-one") passes through the training phase, and the level of competency when working underground. New recruits in particular, although assisted by older generation mineworkers, may find themselves incompetent to follow safety procedures when confronted with a safety hazard underground that they were too rushed to learn.

Conflict amongst Mineworkers

Conflict between and amongst mineworkers has been brought up regularly during interviews with mineworkers. There is a trend of some mineworkers to be arrogant or stubborn towards others. This is especially the case regarding safety instructions given by colleagues within a team. Some are said to disobey orders to work safely, particularly if they feel that they are more experienced than those giving the instruction. As one mineworker from the Free State, *"Karabo"* remarked, in some instances stubbornness or as he put it, "manganga" in Sesotho,

is a good thing when it comes to resisting pressure to not comply with safety, but it often works in the opposite direction, where instructions to work safely are met with rejection or stubbornness. Such interpersonal antagonisms are bound to lead to interpersonal conflict between or amongst the mineworkers which could have a direct and detrimental impact on safety. This needs further research in order to explore the ways in which interpersonal conflict and safety compliance and non-compliance relate.

Financial illiteracy

A pressing issue that relates to mineworker safety, and in particular, safety compliance, is the financial know-how of some mineworkers when it comes to using the money they earn beneficially. During training, I noticed that part of the introductory training focused on how mineworkers could use their money wisely and invest it. This aspect of the training was given by an outsourced company. A conversation I had with one mineworker in particular, highlighted the fact that some mineworkers are not financially competent when it comes to being able to spend their money beneficially. What came out of the discussion was that many mineworkers have more than one family; one in their rural hometowns and another around the mining area where they work.

Coupled with that, some mineworkers are said to entertain women outside of those existing relationships, which further puts them under pressure financially. With some mineworkers being under such heavy financial strain, it can be argued that this is part of the financial strain that leads many to violate safety procedures in an effort to achieve production bonuses. A mining official *"Johannes"* with decades of experience in the industry stated the following, "workers in this day and age work for the satisfaction of having a salary. Bonus is an issue, back in the day, you didn't use bonus for buying things like houses, you used it for savings,

you'd just put it in the bank, but then again people are different, they are only satisfied with getting a pay check not with actual mining".

Therefore, due to the financial strains that are often faced by mineworkers, achieving a production bonus is not only a mechanism that benefits the mining company as a form of incentive, but it also benefits the personal and financial lives of mineworkers, as they have the chance to substantially increase their salaries with the bonuses that they would achieve. However as evidence has shown, production bonuses also incentivise mineworkers to take risks, which have the potential of causing injuries and even deaths. Therefore, apart from the inherent incentive that production bonuses have to increase a salary, they ought to also be viewed within the context of financial strains as well as the financial decisions that mineworkers take. Poor financial decisions, coupled with the pressure to support their families, add to the pressure to achieve production bonuses, often at the cost of complying with health and safety regulations.

CHAPTER 7

Analysis of evidence: A critique of structuration theory

The structuration theory states that agents have the capacity to assert their agency in relation to a structure, such that they can change or amend the structure (Giddens 1984). This is partly due to the assumption that agency is mutually dependent on structure, and that agents, through their actions, produce structure (Giddens 1984). However, the evidence from this research shows that, in terms of mineworkers exercising their agency through attempting to comply with safety training and regulation, mineworkers do not have the capacity to exercise their agency due to the overwhelming structural context within mining. For instance, the evidence has shown that some mineworkers, who want to comply with safety regulation through implementing safety procedures such as conducting thorough early entry

examination, would sometimes get threatened by their shift bosses. The threat would entail mineworkers being told that if they do not follow specific instructions which often mean non-compliance with safety regulation, they would be charged or sanctioned. This compels some mineworkers into not complying with safety regulation, in order to avoid being charged.

Mineworkers' agency is further undermined by the dominant occupational structure of mining through the constant pressure that is put on mineworkers' by the structure of mining, to achieve certain production targets. As stated by some mineworkers, the pressure comes from shift bosses who constantly apply pressure on mineworkers to reach specific targets. The problem, as stated by mineworkers, is that the time it takes to thoroughly implement safety procedures, often prevents mineworkers from being able to reach required production outputs. Coupled with the threat of being charged, some mineworkers will often forego the sometimes lengthy safety procedures, in order to ensure that required production targets are met.

Furthermore, what adds to the dominance of the occupational structure of mining is incentive payments or bonuses which are linked to production output. This is in the context of mineworkers who are often in debt as a result of having to support more than one family, having to services their debts to micro lenders (loan sharks; *mashonisa*), as well as spending money in ways that keep them in debt. Thus the production bonus often incentivises mineworkers to not comply with safety regulations, all in an effort to increase their salary through achieving certain production targets. The occupational structure of the mines can thus be said to be dominant in compelling some mineworkers to not comply with safety training and regulations. This is a clear indication that the agency of mineworkers is left mute, when faced with the dominance of the occupational structure of mining.

Safety training in some contexts also seems to be compromised by the occupational structure of mining. For instance, some mineworkers indicated that some aspects of the training they

receive is often fast-tracked, to the point where they feel that they are not given enough time to absorb some of the material that they are being taught. Since training is used to train and educate mineworkers about safety and health issues, as well as other aspects of mining, then this is a very important aspect of mining health and safety. It is also important because training has the capacity to empower the agency of mineworkers to comply with safety regulations. However, the potential to empower the agency of mineworkers is curtailed through the mine not ensuring that all mineworkers get enough time to be adequately educated and trained on matters concerning mining health and safety.

As mentioned above, mineworkers who raise the issue of health and safety underground are often met with threats and resistance from other mineworkers, and in particular, from their shift bosses. Some mineworkers have revealed that when coming from training, and resuming their underground work, they are often met with mockery from having come from training, and some are even told (as I was) that training becomes irrelevant when one goes underground. Some of the reasons given as to why this is the case is that some mineworkers feel that there is often not enough time to comply with safety procedures (this ties in with the discussion on production pressure, production bonus, and pressure from shift bosses). Another reason is that when underground, some shift bosses deliberately compel mineworkers to work in such a way that goes against what mineworkers have been taught in training. Furthermore, some mineworkers have indicated that some aspects of training, such as first-aid for instance, sometimes do not reflect the nature of underground mining. Some mineworkers feel that for instance, the time it would take to thoroughly implement safety training (for instance treating injured mineworkers as prescribed by first-aid training) would not be possible considering the high-pressured and fast-paced nature of some working contexts underground. This also links to the discussion on production pressure. Therefore, the

dominance of the occupational structure of mining can be seen to undermine the agency of mineworkers to follow their training, through complying with safety regulations.

Some mineworkers have also spoken about the problem of a decreased number of workers in a team. What was of concern is that in the past, mineworker teams underground used to be of a greater number than what they are currently. As discussed in a previous section, mineworkers have a culture of being on the lookout for each other insofar as the identification of safety hazards is concerned. However, as a result of the reduction, there are instances where mineworkers cannot always be on the lookout on behalf of their colleagues concerning issues of safety, which could lead to safety incidents that could have been prevented by an increased number of workers. This seems to point to a structural issue on the part of the mine, where decisions are made to cut back on the size of the labour force for a number of reasons. This decision it would seem has had a negative impact on the ability of mineworkers to exercise their agency in terms of preventing their colleagues from being injured or even killed.

The discussion on the decreased number of mineworkers in a team ties into the issue of some injuries that happen as a result of machine operations. Some mineworkers have stated that there are times where there are not enough members on a team either due to down-sizing or absenteeism. As a result, what some mineworkers do is that they operate machines which they are not licensed to operate. This issue also ties back into the issue of production pressure, where mineworkers feel the need to assume machine operating responsibilities in contexts where there is much pressure exerted on them as a team to produce satisfactory production outputs. It seems clear that there is a network of structural factors that combine to create instances where the agency of mineworkers insofar as working safely underground, is curtailed.

Education disparities

The disparity between the education levels of mineworkers, and the content as well as the manner and language in which the content is being taught, is an important issue in understanding mining safety, particular safety training. Some mineworkers have remarked on how at times, they feel that they are at a disadvantage when some of the lessons during training, are taught predominantly in English, whereas they are not proficient in this language of instruction. This is problematic because not only do some of the mineworkers not understand what is being taught, but they also cannot be assessed by the assessor as to whether they understand health and safety issues enough to be competent enough to work safely underground. The content of what is being taught in training is also of concern. The first-aid safety training that I as a researcher participated in was pitched at a level that most of the mineworkers in that class, as well as myself as a university student, could not understand. This is problematic because then in this specific instance of first-aid training, mineworkers are not being equipped with necessary information which could assist them in dealing with safety incidents as and when they arise. Here the structural issue at play seems to be one stemming from the history of unequal education and racial oppression, which have left many South Africans illiterate or not adequately educated. However, the mine does have the responsibility to ensure that outsourced training companies, train mineworkers in a way that is congruent with their education levels, and to ensure that the content which is being taught is comprehensible to the majority of mineworkers.

Concentration

An issue which does not necessarily relate to the occupational structure of the mine curtailing the ability of mineworkers to exercise their agency through working safely, is that of concentration, or a lack thereof. Many mineworkers have stated that often what gives rise to safety incidents is a loss of concentration. This happens when mineworkers are concerned

about issues that are not strictly related to mine work, such as family problems. This lack of concentration is cited by participants as a contributor to safety incidents such as injuries. Here there is an opportunity for mineworkers to develop the type of agency (albeit limited) that will ensure that they have the resources at their disposal, to curtail the effects of a lack of, or a reduction in concentration. However, due to the overwhelming lack of power of mineworkers to exercise their agency, support would need to come from the structure of mines, particular through mine management.

Non-compliance

Although the data shows that for the most part, especially on the safety-sensitive area of the stope or working area, it is the occupational structure of mining that curtails the ability of mineworkers to exercise their agency through complying with safety training and regulation, there are instances when mineworkers can and do exercise their agency through not complying with safety regulations. For instance, some mineworkers have revealed that some of their colleagues would often forego certain safety procedures due to feeling that such processes were tedious in nature. Other mineworker participants stated that they have become too used to the underground working environment to the point where they do not even recognise certain hazards as much as they used to as new recruits. Others remarked that they become used to the working environment to the point where they feel they are competent and experienced enough to take short-cuts. They would then take short-cuts in order to avoid following some lengthy safety procedures. However, as agency and structure are inextricably interdependent, the issue of production pressure also comes to the fore again, as some mineworkers have revealed that they sometimes take procedural short-cuts in order to ensure that they have enough time to meet production requirements.

Another issue which concerns the misuse of agency on the part of some mineworkers is that of mineworkers taking short-cuts due to feeling that they have become too used to the working environment. The logic seems to be that, because one is used to a working environment through years of experience, one then attains a certain level of competency and tacit-knowledge allowing them to know how to conduct work without having go through all of the required procedures. It would seem that there are limited spaces where mineworkers can exercise their agency, but that in these spaces, and in some instances, some mineworkers choose to not comply as a result of feeling experienced enough to take short-cuts. Another related issue is that some mineworkers feel that they need to take short-cuts in order to finish work early in order to go home early. Amongst some mineworkers interviewed, finishing work early is often regarded as very important. Therefore, it is in such instances that some mineworkers seem to misuse their limited agency through not complying with safety regulations, and therefore, this is an area that can be used to improve health and safety in a way that ensures that mineworkers won't feel the need to take short-cuts which could potentially be dangerous, in order to go home early.

Assisting each other to identify dangers

A positive area which shows the exercise of the limited agency of mineworkers, is what seems to be an occupational culture amongst mineworkers where workers assist each other in identifying dangers or safety hazards that are a part of underground mine work. This area shows that, although limited, mineworkers do have some capacity to exercise their agency towards a positive direction through ensuring that their fellow mineworkers work in a safe manner. However as has been indicated, this has a limitation due to the reduced number of mineworkers in a team, which means that this practice cannot always be implemented.

Conflict amongst Mineworkers

Workplace conflict amongst mineworkers has been highlighted as an issue that can, at times, compromise safety. As has been reflected in the evidence, some mineworkers feel that some of their colleagues have a tendency towards being arrogant or stubborn, particularly when given instructions regarding the need to work safely. Although instances of injuries or deaths were not reflected during interviews as a result of conflict, this is an area that needs to be highlighted and further explored, in the interests of creating a working environment conducive to safe and healthy mining. Conflict amongst mineworkers is also a limited area of agency, which can be improved such that mineworkers engage each other in a way that does not possibly jeopardize their health and safety.

CHAPTER 8

Data in relation to existing literature

Lack of concentration

As has been shown in the preceding sections of this thesis, many mineworkers spoke about how safety incidents underground often involve a lack of concentration or focus. This was attributed to external stressors which occur during work underground. The participants frequently noted how family problems or concerns often creep into the mind when working, and that this is likely to result in a lack of concentration, which often leads to safety incidents such as injuries. Participants also spoke of a related phenomenon of how they get too used to the working environment. They get used to it to the point where they are not as aware of the safety hazards underground as they once were. In the literature this is referred to as industrial blindness, where an individual becomes so accustomed to their working environment, that they no longer become aware of certain things within that environment. A related concept explaining this phenomenon is called inattentional blindness. Linked with the sentiment of

becoming too used to the working environment, was that of the supposed complacency on the part of some mineworkers. Due to being too familiar or used to their work environment, some mineworkers were said to find the following of certain mining procedures as being tedious, and thus opted to take short-cuts. This would then expose them to safety hazards. The familiarity with their working environment could thus be seen as resulting in 2 types of behaviours. The one is that some mineworkers would not comply with certain mining procedures because of having been exposed to them over an extended period of time, and thus, becoming aware of how to take short-cuts to reduce the length of those procedures (e.g. making safe). The second is that familiarity with the working environment results in inattentional blindness, where some mineworkers overtime, become oblivious to some safety hazards in their working environment. Both of these types of behaviours or psychological phenomenon result in safety non-compliance as well as safety incidents.

There is existing literature that looks at the impact of psychological stressors on workplace performance. These studies tend to support the findings of this particular research. For instance, in a study done by Hammer & Sauter (2013), it was found that the primary cause of unsafe work was psychological stressors, primarily concerning stressors emanating from the home environment. Similar findings were made in a study by Kaplan & Tetrick (2011), who found that psychosocial stressors had an impact on workplace safety performance.

The impact of the family environment has become a topic of much interest in the industrial safety literature. Greenhaus and Allen (2011) speak of the term *work-family conflict*, which refers to the detrimental effect that family life may have on the capacity of a worker to operate efficiently. This correlates with the evidence gathered in this research, where participants often spoke about how accidents can happen when a worker is not concentrating, due to problems at home. Amstad *et al* (2011) has similar findings that show how the

interference of the family on occupations has negative effects on job performance and absenteeism.

It is clear to see the impact that home-related stressors have on workers in general, and mineworkers in particular. Mineworkers who have difficulty in concentrating at work underground can therefore be seen as posing a danger to themselves and others due to diminished capacity and concentration. A study found that diminished safety behaviours in a work context may be as a result of workers experiencing a strain on their energy resources as a result of family-based stressors (Turner et al 2014; Witt and Carlson 2006).

Concentration is an aspect of cognition, and studies on safety behaviours have focused on cognition as a key concept. Cognitive overload is a concept that refers to a psychological phenomenon that occurs when the cognitive resources of an individual are overused or over-extended when too much information has to be processed cognitively (Johnson *et al* 2018; (Wickens 1992). As a result, certain abilities or activities are negatively affected. Such studies are relevant to this research because they speak to the effect of family or home-related stressors on the safety behaviours of mineworkers. Cognitive workload is a key variable which has an impact on human error and productivity (Xie and Salvendy 2000). Attentional resources are involved in cognitive workload, where the limited attention capacity of cognition, is given to a specific task, such that if attention has to be divided amongst various tasks, some of the tasks may receive less attention, in which case errors (e.g. diminished safety behaviours) are more likely to occur (Hollands and Wickens 2000; Patten et al 2006; Wickens 2002). The balance that mineworkers have to make between the labour-intense activity of mining, as well as having to contend with a number of challenges in their personal or home life can have the potential of having a cognitive overload effect on some mineworkers, to the point where working safely is negatively impacted. The concept of cognitive overload can therefore be used to explain the effect that personal stressor can have

on the safety behaviours of mineworkers. For example, a study by Day, Brasher, & Bridger, (2012) found that the mediating variable between the stress and accidents was cognitive failure, when looking at the behaviour of UK Royal Navy personnel.

Studies on the link between distraction and unsafe behaviours or accidents/ injuries, can also highlight and help explain the data that has been gathered in this research. Many studies have been done on the impact of distracted driving on the ability of drivers to operator a vehicle safely. For instance, studies reveal an increase probability of accidents occurring when drivers are distracted due to the use of hands-free cell-phone technology. A study by Wilson and Stimpson (2010) showed that the risk factor for getting involved in motor-vehicle accidents and deaths was significantly higher when drivers would text while driving. Furthermore, a simulation study by Yannis *et al* 2014 revealed that drivers who are distracted through reading and or paying attention to information other than driving are more likely to be involved in a motor-vehicle accident. These studies all highlight the impact of a distracted individual on safety performance. The data shows that this is no different in the mining industry. Mineworkers have to contend with work as well as non-work related stressors. Such stressor, particularly personal stressor can be seen as a distraction to the ability of some mineworkers to work safely underground, similar to a distracted drivers inability to concentrate on the task of driving. The many distractions that can possibly hamper the ability of a mineworker to concentrate on the task at hand, and therefore work safely, ought to be addressed in a manner which minimises such a distraction, and thus assist the mineworker in working in a safe manner.

Production pressure

Interviews with mineworkers throughout this research have revealed that part of what makes mineworkers work unsafely in general, and to not comply with safety rules in particular, is

because of the production pressure that they experience underground. Mines have production targets that they are required to meet, and it would seem from the data, that this requirement is passed right down to the mineworkers underground. Due to this pressure, what many mineworkers often do is that they use short-cuts concerning certain procedures, in order to devote more time to production related activities (such as blasting and removing the ore). However as has been shown through the words of mineworkers, this often results in safety hazards occurring (.e.g. slip and falls; fall-of-ground). The safety literature has also identified production pressure as a major contributor to industrial accidents and deaths (Guo and Yiu 2015; Patel and Jha 2014; Choudhry and Fang 2008). For instance, in construction (just as in mining) workers are often put under pressure to complete a certain amount of work within a certain period (Mohammadi, Tavakolan and Khosravi 2018). Often, there are unforeseen events or problems which cause schedule delays. This then creates a backlog that has to be completed within the same limited period (Guo et al 2015). In order to make up for the backlog, management in particular, will put workers under pressure to complete the work as fast as possible. This, as studies have shown, is more likely to result in accidents or fatalities (e.g. Han et al 2014). In the data gathered for this research, mineworkers highlight consistently about how production pressure often causes mineworkers to take short-cuts in order to reach production targets. Coupled with this is the regulatory intimidation that they face when they refuse to act in an unsafe manner, as well as the added pressure of reaching production bonuses. Therefore, it would seem that when it comes to achieving set production targets, safety becomes less important, and this in turn, places the lives of mineworkers at risk. The need to reach set production targets is not only adopted by mineworkers themselves, but pressure also comes from the superiors. In the data collected, many mineworkers spoke of how the shift boss (“cheebas”) would emphasise that they meet their targets, and that this was a constant issue that they faced. A study on this issue has shown a negative correlation

between safety, and work or production pressure. This means that in many instances across various industrial sites, safety and production are incongruent. A study by Mearns *et al* (2001) found that offshore oil workers behaved in an unsafe manner largely as a result of the production pressure that they experienced. Other studies show that the notion that only human error factors are to blame for industrial accidents are not entirely accurate, as there are structural factors that go against the agency of industrial workers.

The issue of worker's agency versus the structure that they operate within is complex, as there are some instances where workers can successful exercise agency regarding safety, and other times where they cannot. In one study, workers spoke about how even in instances where they wanted to discontinue work, they had to factor in whether or not there would be consequences for them deciding to stop work due to safety hazards (Bates and Holroyd 2012). This factor was highlighted in the section on regulatory intimidation, where evidence is shown of workers feeling afraid or conflicted to raise safety issues because of the threat of being charged if they do so. A related factor to this is the attitude of management concerning workers who exercise their agency to raise such issues. A study shows that workers felt that they could raise issues on safety hazards, and discontinue work in a context where their manager was supportive and approachable (Bates and Holroyd 2012). In the evidence gathered it would seem that for the most part, mineworkers do not always get the support of their shift boss or production supervisor because it is this level of seniority which, as evidence shows, puts direct pressure on mineworkers, in some instances, to not comply with safety regulations.

The decision to discontinue work is also affected by how such a decision will impact on other workers. For instance, if one worker decides that they are being exposed to a safety hazard, they may not raise this concern if they feel or are made to feel that work stoppage will have a negative impact on other workers. This is especially evidenced by this research in the context

where mineworkers working in a team, are pressured by some of their team members to continue to work and push past safety standards, all in an effort to either meet production targets, achieve production bonuses or to leave work early ("chaisa").

Other studies have shown that in many industries, there are incentives, often financial, that also encourage workers to not comply with safety regulations (Bates and Holroyd 2012; Hasan and Jha 2013). These incentives are linked to production achievements. Production bonuses in the South African mining industry, as this research has shown, act as incentive measures to encourage workers to meet and even exceed production targets. But as many other studies have shown, such incentives put workers in a position where the need to be financially rewarded is prioritised over working safely.

Human factors

Other research into human factors concerning safety incidents on industrial sites reveal similar findings to this research. In one study in particular, some participants stated that they felt the safety procedures were too long or extensive. This attitude or view resulted in some of them cutting corners (taking short-cuts) in order to avoid following the lengthy safety procedures (Bates and Holroyd 2012). In the data gathered, mineworkers revealed a similar trend, where some participants stated that many of the safety incidents underground are caused by complacency on the part of some mineworkers, particularly those who felt that they are now used to their work, and can thus afford to take short-cuts. Research by Bates and Holroyd (2012) further revealed that participants in their study felt that the culture of allowing new recruits to take their time during training in order to be adequately prepared for their work was a contributing factor in encouraging safety compliance. The data gathered for this research has yielded similar results, as some mineworkers felt that it was problematic for new recruits in particular, as well as mineworkers in general, to be rushed through training.

The study by Bates and Holroyd (2012) also revealed that participants felt that some safety procedures were not practical, and thus felt that they needed to use less complex ways of carrying out those procedures. A similar finding for this research is that some mineworkers felt that the training they received on surface concerning safety compliance was not a reflection of the actual demands of underground mining. One mineworker in particular, remarked on how for instance, there often is not enough time to follow first aid procedures as accurately as they were taught. Low staff levels have been reported in the safety literature, to be a contributing factor to unsafe work. Low staff levels often result in high workload pressure for the limited staff, which is likely to cause accidents (Bates and Holroyd 2012). This factor was identified by some mineworker participants as a contributor to safety incidents. These participants felt that the gradual reduction of team sizes in the mining industry has made it difficult for team members to identify unsafe work behaviour or safety non-compliance on the part of their colleagues. Others felt that, in order to cover for their absent team members, and in order for production targets to be met, they had to do work that they were not qualified for. This often meant operating machinery that they were not licensed to operate.

Training

In her PhD work on mineworker training, Tuchten (2011: 5, 64) uses the key concept of self-efficacy to argue for a conceptual reform in the way in which mineworker training is viewed, and by extension, in the way in which mineworkers are trained. It is argued that mineworkers need to be taught self-efficacy, particularly as it relates to health and safety. Advocating for the training of mineworkers in a way that essentially gives them a greater degree of agency insofar as their health and safety is concerned, is needed considering the role that agency has to play in preventing health and safety incidents (Tuchten 2011: 15, 21). However, as the data of this research shows, this will not be an easy task. The main impediments are the structural

obstacles that mineworkers face constantly when attempting to raise matters concerning health and safety. Production pressure, production bonuses and regulatory intimidation are the primary obstacles to self-efficacy. For the most part mineworkers are well-versed in safety matters through a combination of training and on-the-job learning underground. However, their confidence in their ability to successfully work through health and safety hazards as they occur is rendered null-and-void by these structural constraints discussed in the preceding sections. However, in the context of safety procedures that do not occur within the context of meeting production goals, such as constantly wearing full PPE (personal protective equipment) at all times, or not succumbing to complacency, then self-efficacy could prove useful. For instance, mineworkers can be trained on how to counter-act complacency as well as mental or cognitive distractions when it comes to following safety procedures. Self-efficacy would therefore be more useful in this context because this is the context where mineworkers have a greater degree of agency.

Continuing with the work of Gwyneth, what is highlighted is the of lack content on health related mining hazards in training, for instance lung disease (2011). Although this may have been the case at the time of that particular research, this research found that indeed such content in health and safety training exists, as has been evidenced in a previous section. The challenge is that there is a discrepancy between the content being taught during training, and the education levels of mineworkers. This discrepancy prevents some mineworkers from being able to understand that which is being taught during training. This has been evidenced in this research directly from mineworkers' accounts, as well as the researcher's experience during training. The language of instruction (English) has also been found in some instances, to be problematic as some mineworkers are not proficient in the use of English. This challenge can then be seen as an impediment, not only to the ability of mineworkers to learn

important safety information and skills, but also in being able to transfer what they learn and apply it practically underground when confronted with a health and safety hazard.

The importance of production in the South African mining industry in particular, can be seen in the stability of labour time on the mines. Labour time, the time workers put into production, has not decreased since 1911, and in some instances, could be said to have increased (Stewart 2012: 340). A stable labour time is necessary for such a profit sensitive industry as mining. Surplus value is derived through maintaining and lengthening the time mineworkers spend in production, all in an effort to maintain and increase mining production and thus profitability (Stewart 2012: 389). To add to this, there are many incidents and challenges within mining that delay production, which adds to the already existing pressure to meet production demands. These include rocks falls, material and labour shortages, as well as absenteeism amongst others. This, as evidence has shown, puts health and safety at a disadvantage because more effort becomes spent on trying to reach and maintain production levels (Stewart 2012: 340). The need to meet production targets is not only a structural phenomenon where workers, particular workers directly involved in production are pressured in a variety of structural ways to meet production targets, but it is also a phenomenon that becomes internalised within the production mineworkers. They take it on as a personal responsibility to meet production targets. Thus production and safety continue to be incongruent in particularly contexts, as has been the case throughout the history of South African mining. Material handling and foreign objects to the eye seem to make up a bulk of the types of mining injuries where workers have the opportunity to exercise the most agency (Stewart 2012: 389).

It would seem that maintaining production, on South African mines, has to be created by whatever means necessary, in an effort to produce surplus value in the form of huge profits for mining houses. This situation becomes even more pressing when considering that labour

costs on South African mines are generally above 50% (Stewart 2012: 100, 163). This effectively means that those costs need to be recouped through mineworkers continuously working, reaching and even exceeding production targets. Mining houses are therefore perpetually under pressure to meet production, partly in order to raise profitability levels higher in order for labour costs to be recouped. This shows the importance of maintaining a structural hold over production, and ensuring that there are no progressive changes in the structure of mining that could impede or weaken this structural hold. For instance, the Franzsen Commission appeared to be making progress insofar as reducing the labour time of mineworkers in 1978. However, on closer analysis it can be seen that although the work week was reduced from 6 days to 5 and a half days, the actual working hours per day were increased (Stewart 2012: 100, 163, 164). On the surface in seemed that there was a change, by way of a reduction in labour time, but in reality labour time continued to remain much the same, and in fact increased. This can only mean that production pressure will always be maintained on workers, and that safety incidents, especially those directly related to production activities, will be a constant feature of South African mining.

CHAPTER 9

Conclusion

This research has found that mining safety in the case study of the mining company looked at, is a primarily structural issue. Contrary to structuration theory, the agency of mineworkers is severely limited by the occupational structure of the mine, such that the limited agency that is exercised does not seem powerful enough to exert changes on the structure. The structural issues at play, which have a greater impact on mining safety than the limited agency exercised by mineworkers, are production pressures, pressure from shift bosses, production

bonuses, reduced team sizes, regulatory intimidation and incompetence related to the operating of machinery.

The pressure to reach set production targets is placed on the shoulders of mineworkers. This pressure to reach targets has been found by this research, to contribute to safety incidents such as injuries and even deaths. Some mineworkers stated that in order to ensure that production targets are reached, short-cuts concerning safety procedures are taken, as these procedures are found to be lengthy. The correct following of these safety procedures would encroach into the time needed to reach production targets. Therefore, procedural short-cuts are taken, and this places mineworkers at risk of exposure to dangers underground.

The pressure to meet set production targets primarily stems from shift bosses. Yelling and intimidation are often meted out to mineworkers, in an effort to create and sustain the pressure to meet targets. This creates an environment where mineworkers knowingly choose to not comply with safety procedures, as a result of wanting to avoid reprisals from their shift bosses. These reprisals are often in the form of regulatory intimidation, where mineworkers who raised issues of health and safety, are threatened with being charged, or are put under a spotlight, where any future minor infringement would be used as an opportunity to punish a mineworker for bringing up safety concerns on a previous occasion.

Production bonuses have been found to incentivise some mineworkers to not comply with safety procedures, all in an effort to reach bonus-reaching production targets. This occurs within the context of some mineworkers not being efficient in the way in which they use money. Some mineworkers have revealed how one can get into debt from reckless spending as well as trying to support more than one family. The pressure to achieve a bonus then becomes an even greater incentive to not only work harder, but also to work in an unsafe manner.

A reduction in team sizes has been highlighted as an important issue negatively impacting on mining safety. Mineworkers in a team tend to assist each other in identifying safety hazards as they work, however due to reduced team sizes, it is not always possible to do this on a consistent basis. This therefore places some mineworkers at risk of exposure to mining hazards.

Furthermore, due to absenteeism, not having enough members on a team in some instances, production pressure as well as the pressure to reach production bonuses, some mineworkers have been found to assume the responsibilities of other mineworkers. This at times, means operating machinery that they are not competent or certified to operate, a practice which has the potential of leading to safety hazards such as injuries.

Although this research has found that structural issues are primary contributors of safety incidents in general, and non-compliance of safety procedures in particular, there are instances where mineworkers can exercise their agency, albeit limited, in promoting or compromising their own safety.

Participants spoke on how some mineworkers deliberately conduct themselves in a manner that is non-compliant, and this non-compliance does not relate to structural pressure such as production pressures. Some mineworkers state that they, overtime, become too used to mine work, and therefore feel that they can get away with using short-cuts.

Furthermore, mineworkers also take short-cuts in order to reduce the amount of work to be done, because they are in a rush to go home earlier. Short-cuts are also used because some mineworkers report being too complacent to conduct their work in a safe manner, seeing safety as tedious, and laborious.

Mineworkers have noted that a major issue, which impedes safety, is lapses in concentration. Mineworkers spend many hours a day underground, continuously working, and often, under very hot conditions. Coupled with exhaustion and being too familiar with the environment

(inattentional blindness), this leads to lapses in concentration, which mineworkers report can lead to accidents and deaths. Attitudes towards training further impacts on safety in mining. Some mineworkers feel that what is taught in training is not implemented underground, therefore, for the most part; training on safety is not taken seriously.

Many mineworkers indicated that following safety takes too long, and were they to comply fully with safety regulations, they would not reach required production output, and neither would they reach bonus targets. This issue has been found to relate acutely to the Early Entry Examination procedure. Mineworkers have admitted to rushing through the procedure, and thus neglecting key aspects of making the working area safe. This is all in effort to rush production, in order to ensure that production targets are met.

Furthermore, some shift bosses are said to discourage the following of safety regulation through charging mineworkers on relatively minor, technical infringements, or through the withholding of favours, such as being allowed to take an off-day. This amounts to regulatory intimidation.

The training of mineworkers has also been found to relate to mineworker safety. Some respondents indicated that illiteracy during training is still a major issue, as many struggle to comprehend and read instruction given in English. Educational disparity between the mineworkers and what they are taught is also found to be problematic, as some of the training classes are pitched at a level that some of the mineworkers cannot comprehend. This makes it difficult to ascertain the level of competence a mineworker has regarding their competence to work safely or respond to emergency situations underground. Some mineworker respondents have also remarked how the training they receive does not correlate with the lived-reality of underground mining, therefore making certain aspects of their training not helpful in enabling them to deal adequately with the hazardous environment of underground mining. Furthermore the process of training in some aspects is regarded as being too rushed, or taught

too quickly for many mineworkers to be able to learn substantially. It is possible that this deprives some mineworkers from being able to learn adequately, issues related to safe mining.

Interpersonal conflict amongst mineworkers has been highlighted as a constant issue that many mineworkers have to contend with. This is especially the case when instructions are given to mineworkers to work safely and comply with safety regulations.

Further research

Further research is also needed regarding the relationship between interpersonal conflict and safety compliance. It is possible that this could be a major impediment to working safely within the context of teams. This research has shown Early Entry Examination to be a critical point at which non-compliance occurs. There seems to be incongruence between following safety procedure and reaching production targets. Therefore, further research needs to be conducted to look at making it possible to thoroughly conduct the procedure without compromising production targets.

Such research would lead to insights about how to balance the production and safety equation, such that both variables are complementary than opposed. Such research would have to look at production schedules of different mining companies, mines as well as shafts, in order to understand how to arrange production in such a way that maximum production can be produced without hampering mining health and safety. Furthermore, research is also required to explore different ways in which issues which affect concentration, such as industrial blindness, can be addressed, such that mineworkers regularly maintain adequate levels of concentration. Further research needs to be conducted regarding how some training can be made to be more alike to the lived-reality of underground mining such that mineworkers are more adequately prepared to deal with safety hazards as and when they occur.

Bibliography

Amstad, F. T., Meier, L. L., Fasel, U., Elfering, A., & Semmer, N. K. (2011). A meta-analysis of work-family conflict and various outcomes with a special emphasis on cross-domain versus matching-domain relations. *Journal of Occupational Health Psychology*, 16, 151-169. doi: 10.1037/a0022170

Benya, A., 2009. *Women in Mining: A Challenge to Occupational Culture in Mines.* University of the Witwatersrand

Bezuidenhout, A, Bischoff, C, Dlamini, N, Malope, B, Mashayamombe, Nomvete, S, Stewart, P., 2015. *Organise or Die: Findings of the NUM Health and Safety Audit-Summary Report.*

Bates.,S., Holroyd., J., 2012. Human factors that lead to non-compliance with standard operating procedures. Health and Safety Laboratory. Harpur Hill. Buxton. Derbyshire. SK17 9JN

Chamber of Mines of South Africa, 2017. Safety in The Mining Industry, Performance at a Glance. An overview of 2016 Performance

Choudhry, R. M., Fang, D., 2008. Why operatives engage in unsafe work behaviour: investigating factors on constructions sites. *Saf. Sci*. 46 (4), 566-584.

Day, A., Brasher, K., & Bridger, R. S. 2012. Accident proneness revisited: The role of psychological stress and cognitive failure. *Accident Analysis and Prevention*, 49, 532-535. doi:10.1016/j.aap.2012.03.028

Giddens, A.,1984. The Constitution of Society. Outline of the theory of structuration. Polity Press, Cambridge.

Gray, C., 2009. The Responsibilization Strategy of Health and Safety Neo-liberalism and the Reconfiguration of Individual Responsibility for Risk. Doi:10.1093/bjc/azp004 *BRIT. J. CRIMINOL*. 49, 326 – 342

Greenhaus, J. H., & Allen, T.D. (2011). Work-family balance: A review and extension. In J.C. Quick & L.E. Tetrick (Eds.), Handbook of occupational health psychology (2nd Ed., p.165-184). Washington, DC: American Psychological Association.

Greenstein. R., Roberts. B. and Sitas. A., 2003. 'Qualitative Research Methodology' in Greenstein. R. (ed). Research Methods Manual. Unpublished.

Guo, B. H. W., Yiu, T. W., 2015. Developing leading indicators to monitor the safety conditions of construction projects. J. Manage. *Eng. 32* (1), 04015016.

Guo, B. H., Yiu, T. W., Gonzalez, V. A., 2015. Identifying behaviour patterns of construction safety using system archetypes. *Accid. Anal*. Prev. 80, 125-141.

Han, S., Saba, F., Lee, S., Mohamed, Y., Pena-Mora, F., 2014. Toward an understanding of the impact of production pressure on safety performance in construction operations. *Accid. Anal. Prev*. 68, 106-116.

Hasan, A., Jha, K. N., 2013. Safety incentive and penalty provisions in Indian construction projects and their impact on safety performance. Int. J. Injury Control Saf. Promot. 20 (1), 3-12.

Hammer, L. B., & Sauter, S. L. 2013. Total worker health and work-life stress. *Journal of Environmental and Occupational Medicine,* 55, S25-S29.

Hollands, J.G., Wickens, C. D., 2000. Engineering Psychology and Human Performance Prentice Hall.

Johnson., R. C., Eatough.,E. M., Chang., C., Hammer., L. B., Truxillo., D., 2018. Home is Where the Mind is: Family Interference with Work and Safety Performance in Two High Risk Industries. *Yjvbe.* https://doi.org/10.1016/j.jvb.2018.10.012

Kaplan, S., & Tetrick, L. E. 2011. Workplace safety and accidents: An industrial and organizational psychology perspective. In Z. Sheldon (Ed.), APA handbook of industrial and organizational psychology, Volume 1: Building and developing the organization (p. 455-472). Washington, DC: *American Psychological Association*. doi: 10.1037/12169-014.

Kawulich, B.B and Holland, L. 2012. 'Qualitative Data Analysis' in Wagner, C., Kawulich, B.B and Garner, M. *Doing Social Research*: A Global Context. Maidenhead: McGraw-Hill Education (UK) Ltd.

Lang, S., Fewtrell, L., and Bartram, J., 2001. *Chapter 14 Risk Communication in: Water Quality: Guidelines, Standards and Health*. World Health Organization (WHO). Published by IWA Publishing, London, UK. ISBN: 1 900222 28 0

Legard. R., Keegan. J., and Ward. K. 2003. *'In-depth Interviews'* in Lewis. L. and Ritchie. J, (eds). Qualitative research practice: A guide for social science students and researcher. London: SAGE Publications.

Leger, J., 1986. Safety and the Organisation of Work in South African Gold Mines: A Crisis of Control. *International Labour Review*, Vol. 125, No. 5

Leger, J., 1988. *From Fatalism to Mass Action: The South African National Union of Mineworkers' Struggle for Safety and Health.* Labour, Capital and Society. University of the Witwatersrand: Johannesburg.

Leger, J., 1992.*"Talking Rocks"-An Investigation of the Pit Sense of Rockfall Accidents Amongst Underground Gold Miners*. University of the Witwatersrand: Johannesburg.

Mason, J., 2002. *Qualitative Research. Second Edition*.Sage Publication: London (Mason 2002)

Mearns, K., Filn, R., Gordon, R, & Fleming, M. 2001. Human and organizational factors in offshore safety, *Work and Stress*, 15, 144-160.

Mohammadi., A., Tavakolan.,M., Khosravi., Y., 2018. Factors influencing safety performance on construction projects: A review. *Safety Science* 109 (2018) 382-397.

Moodie, T, Ndatshe, V., 1994. *Going for Gold, Men, Mines, and Migration*. University of California Press: London

Neuman. W., 2006. 'Qualitative and Qualitative Research Designs' in Social Research Methods: Qualitative and Quantitative Approaches (sixth edition). Boston: Pearson and Allyn and Bacon.

Nite, D, Stewart, P., 2017. Consenting to Labour Appropriation? The Mineworker on South African Gold and Coalmines, *1951 to 2011*. *Journal of Asian and African Studies*, Vol. 52 (2) 142-156. DOI: 10.1177/002 19096 15570953

Ogletree, T. and Kawulich, B.B. 2012. 'Ethical considerations in conducting research' in Wagner, C., Kawulich, B.B. and Garner, M. Doing Social Research: A Global Context. Maidenhead: McGraw-Hill Eduction (UK) Ltd. (Ogletree and Kawulich 2012)

Phakathi, T., 2001. *Teamwork and Work Culture in the South African Gold Mining Industry: A Case Study of Tautona Mine.* University of the Witwatersrand: Johannesburg

SibanyeGold., 2016. *Integrated Annual Report*: SibanyeGold

Stewart, P., 2012. *Labour time in South African gold mines: 1886-2006*. University of the Witwatersrand: Johannesburg

Stewart, P., 2013. Right to Refuse Dangerous Work. Center For Sustainability In Mining and Industry.

Stewart, P., and Nite, D., 2017. From Fatalism to mass action to incorporation to neo-liberal individualisation: worker safety on South African mines, *circa* 1955-2016 Review of African Political Economy. 44: 152, 252-271, doi: 10. 1080/03056244.2017.1342234

Turner, J. H., 1986. The Theory of Structuration. *American Journal of Sociology*, Volume 91, Issue 4, 969-977.

Patel, D. A., Jha, K. N., 2014. Neural Network Approach for Safety Climate Prediction. *J. Manage. Eng.* 31 (6), 05014027.

Patten, C. J., Kircher, A., Ostlund, J., Nilsson, L., Svenson, O., 2006. Driver experience and cognitive workload in different traffic environments. *Accid. Anal*. Prev. 38, 887-894.

Tuchten., G.,2011. Concept development for facilitating the health and safety efficacy of South African mine workers. University of Pretoria.

Turner, J., 1988. *A Theory of Social Interaction.* Stanford University Press: Stanford, California.

Turner, N., Hershcovis, M. S., Reich, T. C., & Totterdell, P. 2014. Work-family interference, psychological distress, and workplace injuries. Journal of Occupational and Organizational Psychology, 87, 715-732.

Wickens, C. D. (1992). *Engineering psychology and human performance* . HarperCollins Publishers.

Witt, L. A., & Carlson, D. S. 2006. The work-family interface and job performance: Moderating effects of conscientiousness and perceived organizational support. *Journal of Occupational Health Psychology,* 11, 349-357. doi: 10.1037/1076-8998.11.4.343

Wickens, C. D., 2002. Multiple resources and mental workload. *Hum. Factors* 50, 449-455

Wilson, F. A., Stimpson, J. P., 2010. Trends in fatalities from distracted driving in the United States 1999 to 2008. *American Journal of Public Health* 100, 2213-2219.

Xie, B., Salvendy, G.,2000. Prediction of mental workload in single and multiple tasks environments. *Int. J. Cogn. Ergon*. 4, 213-242

Yannis, G., Laiou, A., Papantoniou, P., Christoforou, C., 2014. Impact of texting on young drivers' behaviour and safety on urban and rural roads through a simulation experiment. J. *Saf. Res*. 49, 25-31.