EXPLORING FACTORS ASSOCIATED WITH POTENTIAL HEARING LOSS IN NAMIBIAN CLASS A MINES

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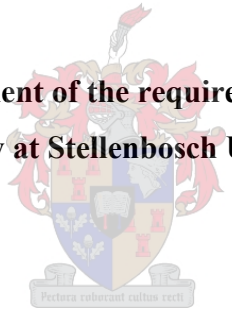

Thesis presented in partial fulfilment of the requirements for the degree of Master of Audiology at Stellenbosch University

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DECLARATION

By submitting this thesis electronically, I declare that the entirety of the work contained therein is my own, original work, that I am the owner of the copyright thereof (unless to the extent explicitly otherwise stated) and that I have not previously in its entirety or in part submitted it for obtaining any qualification.

Date: February 2015

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ABSTRACT

In developing countries, like Namibia, there is limited data pertaining to the number of individuals with hearing loss and its associated factors. This study aimed to determine the prevalence of potential hearing loss in Namibian Class A mines and to describe the extrinsic and intrinsic factors associated with hearing loss.

A cross-sectional design was utilised and data were collected from 132 respondents (mining employees) from five different Class A mines throughout the country. A questionnaire and a retrospective review of respondents' medical records were utilised to determine the risk factors. The most recent audiogram found in the respondents' records was used to determine the presence of potential hearing loss. Three definitions of potential hearing loss were used in this study and included all major frequency hearing loss (AFHL), high frequency hearing loss (HFHL) and low frequency hearing loss (LFHL). Potential hearing loss was identified when the pure tone average (PTA) of 0.5, 1, 2, & 4kHz, 0.5, 1 & 2kHz and 4 & 8kHz respectively was greater than 25dBHL in either one or both ears. Chi-square measurements or, where necessary, Fisher's exact tests, as well as Odds Ratios were used for the analysis of data. In general a significance level of 5% was applied for all analyses.

Results indicated the prevalence of potential hearing loss in Namibian mining employees to be 27% and that both extrinsic and intrinsic factors were associated with hearing loss. The extrinsic factors significantly associated with potential hearing loss were both occupational and medical. The occupational factors found to be significant were the number of years employed in whole life >10 years (p=0.012; OR=3.1, 95% CI=1.3-7.9), the number of years employed in current job > 10 years (p=0.01; OR=3.9, 95% CI1.7-8.8) and the non-availability of formal training in prevention of hearing loss (p=0.022; OR=0.3, 95% CI (0.1-0.9). Diabetes was the sole significant extrinsic medical factor (p=0.035, OR=5, 95% CI 1.1-22.1). The only intrinsic factor which was found to be significantly associated with hearing loss was Age, specifically being older than 40 years (p=0.002; OR=3.5, 95% CI 1.6-7.8) and 50 years (p=0.001, OR=5.5, 95% CI1.9-15.8). A multiple logistic regression model of all significant factors found that only no formal training of prevention of hearing loss was found to be significant in the presence of all other factors (p=0.036, OR=0.036, 95% 0.1-0.92).

Findings from this study suggest that multiple factors may be associated with potential hearing loss and not just the exposure to hazardous occupational conditions. Recommendations for

future research and clinical practice should, therefore, include thorough investigations into the aetiology of hearing loss. As this study focused on Class A mines, it is recommended that future research be conducted in other mines that are not categorised as Class A mines.

Keywords: prevalence, extrinsic factors, intrinsic factors, extrinsic occupational factors, extrinsic social factors, extrinsic medical factors, potential hearing loss, mining industry, Class A mine, Namibia.

OPSOMMING

In ontwikkelende lande, soos Namibië, is daar beperkte data met betrekking tot die aantal individue met gehoorverlies en sy verwante faktore. Hierdie studie het gepoog om die voorkoms van gehoorverlies in Namibiese Klas A myne te bepaal en die ekstrinsieke en intrinsieke faktore wat verband hou met potensiale gehoorverlies te beskryf.

'n Deursnee-ontwerp is gebruik en data is ingesamel uit 132 respondente (mynbou werknemers), uit vyf verskillende Klas A myne regdeur die land. 'n Vraelys en 'n retrospektiewe oorsig van die respondente se mediese rekords is gebruik om die risiko faktore te bepaal. Die mees onlangse oudiogram wat in die respondente se rekords gevind is, is gebruik om die teenwoordigheid van potensiale gehoorverlies te bepaal. Drie definisies van potensiale gehoorverlies is gebruik in hierdie studie, ingesluit al die groot frekwensie gehoorverliese (AFHL), hoë frekwensie gehoorverlies (HFHL) en 'n lae frekwensie gehoorverlies (LFHL). ‘n Gehoorverlies was teenwoordig wanneer die suiwer toon gemiddelde (PTA van 0.5 , 1 , 2, & 4kHz , 0.5, 1 & 2kHz en 4 & 8kHz onderskeidelik , groter was as 25dBHL in een of albei ore. Chi -square metings of, waar nodig, Fisher se presiese toetse, asook kans verhoudings is gebruik vir die ontleding van data. In die algemeen is 'n beduidendeidsvlak van 5% gebruik en toegepas vir al die ontledings.

Resultate het aangedui die voorkoms van gehoorverlies in Namibiese mynbouwerknemers tot 27 % was en dat beide ekstrinsieke en intrinsieke faktore ‘n verband toon met potensiaal gehoorverlies. Die ekstrinsieke faktore wat ‘n beduidende verband getoon het met gehoorverlies was albei beroeps- en mediese faktore. Die beroepsfaktore wat betekenisvol was, was die aantal jare diens in hele lewe > 10 jaar (p = 0,012 ; OR = 3.1 , 95 % CI = 1.3-7.9) , die aantal jare in huidige pos> 10 jaar diens (p = 0,01 ; OF = 3.9 , 95 % CI1.7-8.8) en die onbeskikbaarheid van formele opleiding in die voorkoming van potensiaal gehoorverlies (p = 0,022 ; OF = 0,3 , 95 % CI (0,1-0,9). Diabetes was die enigste beduidende ekstrinsieke mediese faktor (p = 0,035 , OR = 5 , 95 % CI 1,1-22,1). Die enigste intrinsieke faktor watbeduidend was en verband hou met gehoorverlies was ouderdom, spesifiek om ouer as 40 jaar (p = 0,002 ; OF = 3.5 , 95 % CI 1,6-7,8) en 50 jaar (p = 0.001 , OR = 5.5 , 95 % CI1.9-15.8) te wees. 'n Veelvuldige regressie model van alle beduidende faktore het bevind dat slegs

geen formele opleiding in die voorkoming van gerhoor verlies beduidende was in die teenwoordigheid van al die ander faktore (p = 0,036 , OR = 0,036 , 95 % 0,1-0,92) .

Bevindinge van hierdie studie dui daarop dat verskeie faktore geassosieer kan word met gehoorverlies en nie net die blootstelling aan gevaarlike beroepstoestande nie. Aanbevelings vir toekomstige navorsing en kliniese praktyk moet dus 'n grondige ondersoek na die etiologie van gehoorverlies uitvoer. Aangesien hierdie studie gefokus het op die Klas A- myne , word dit aanbeveel dat toekomstige navorsing gedoen word in ander myne wat nie gekategoriseer is as Klas A myne nie.

Sleutelwoorde: Voorkoms, ekstrinsieke faktore, instrinsieke faktore, ekstrinsieke beroepsfaktore, ekstrinsieke sosiale faktore, ekstrinsieke mediese faktore, potensiale gehoorverlies, Klas A myn, Namibië.

LIST OF ABBREVIATIONS

AFHL	-	All major Frequency Hearing Loss
APTA	-	All major frequency Pure Tone Average (0.5 ,1, 2 & 4 kHz)
CDC	-	Centre of Disease Control
HFHL	-	High Frequency Hearing Loss
HPTA	-	High frequency Pure Tone Average (4 & 8 kHz)
HREC	-	Health Research Ethics Committee
ICMM	-	International Council on Mining and Metals
LFHL	-	Low Frequency Hearing Loss
LPTA	-	Low frequency Pure Tone Average (0.5, 1 & 2 kHz)
LTI	-	Lost time injury
MoHSS	-	Ministry of Health & Social Services (Namibia)
MOL	-	Ministry of Labour (Namibia)
NIHL	-	Noise-Induced Hearing Loss
NIOSH	-	National Institute for Occupational Safety & Health (U.S.A.)
NPC	-	National Planning Commission (Namibia)
OSHA	-	Occupational Safety and Health Administration (U.S.A.)
PTA	-	Pure Tone Average
WHLPP	-	Worker's Hearing Loss Prevention Programme

GLOSSARY

AFHL - All major frequency hearing loss, is a term that was derived from the World Health Organisation's (WHO) definition of hearing loss. This hearing loss was present when the PTA of the thresholds at 0.5, 1, 2 and 4 kHz is ≥ 25 dBHL in either ear or both ears (Mathers, Smith, & Concha, 2000).

Class A mine - Mines that are managed by companies that make a "significant contribution (financial and technical capacity, employment, output and strategic considerations) to long term sustainability and/or development of the mining sector" (Chamber of Mines, 2008, pp. 5–6)

Extrinsic factor - External or environmental factors that act on the individual (Leyk, Erley, & Bilzon, 2009).

HFHL - High frequency hearing loss is present when the PTA of the hearing thresholds at 4 and 8 kHz ≥25 dBHL in either ear (Bainbridge, Cheng, & Cowie, 2010).

Intrinsic factor - Non-modifiable characteristics that describe or pertain to or even add to an individual's make up (Jones, Bovee, Mca, Iii, & Cowan, 1993) e.g. age and gender

LFHL - Low frequency hearing loss is present when the PTA of the hearing thresholds at 0.5, 1 & 2 kHz is ≥25 dbHL in either ear (Popelka et al, 2000; Ahmed, Dennis, & Ballal, 2004; Bainbridge, Cheng, & Cowie, 2010);

LTI - Lost time injury, which is work-related injuries which result in the loss of one or more shifts were reported in 2010 (Chamber of Mines, 2010).

Noise zone - Areas where noise levels have been measured to be ≥85 dB(A) (MOL, 1997)

Point prevalence - Where all cases with a particular outcome are counted at a specific point in time (Webb & Bain, 2011)

WHLPP - A programme aimed at reducing hearing loss in the workplace, which can comprise of the components training and education, supervisory involvement, measurement, engineering and administration controls, assessment, monitoring and record keeping, and the use of protective clothing (Centers for Disease Control and Prevention, 2011).

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

1 INTRODUCTION

Hearing loss due to occupational hazards remains a contentious issue as the factors contributing to this loss may not only be due to the occupational setting. An increase in the number of workers' compensation claims has been reported globally and millions are spent in an attempt to hold the employing institutions accountable for the "unsafe" and unhealthy working conditions (Commonwealth of Australia, 2010; Daniell, Fulton-Kehoe, Smith-weller, & Franklin, 1998). In Washington State alone, the number of claims for hearing loss were reported to have increased 12-fold during the period 1984-1998 (Daniell, Fulton-Kehoe, Cohen, Swan, & Franklin, 2002). Other developed countries report similar findings (Commonwealth of Australia, 2010; Palmer et al., 2002). In the United Kingdom (U.K.), 230, 000 insurance claims, which were specifically related to noise-induced hearing loss were awarded during the period of 1991-1995. While many developed countries can account for the burden of occupational disease, including hearing loss, many developing countries still lack published and accurate population-based data on this topic (WHO, 1997; Smith, 1998; Dekker, Edwards, Franz, van Dyk, & Banyini, 2013).

Namibia is one such developing country that presents limited documentation pertaining to the burden of occupational disease. Following global trends, the Social Security Commission in Namibia (2010) reported a 28.3% increase in the number of workers' compensation claims received during 2010. During the same year, N$ 4 million were awarded as compensation to registered members of the workforce and their dependents (Social Security Commission, 2010).While the increase in worker's compensation claims had been noted, the type of occupational injuries for which the claims were received, such as hearing loss, were not specified. The prevalence and cost spent on specific occupational diseases were, therefore, not known.

Mining and Quarrying, is one of three primary industries that contribute greatly to the Namibian economy and contributed about 2.7 % to the Namibian Labour force in 2008 (NPC, 2012a). Mining, however, can be considered to be a high risk occupation with the Centre for Disease Control (CDC) stating that one in four miners presents with hearing loss. Although, the mining sector reports the use of a surveillance system to record individual employee clinical data (Chamber of Mines, 2010), audiological findings and efforts to prevent hearing loss have

not been published. It is, therefore, uncertain what the prevalence of hearing loss in such industries are, and what prevention strategies are in place to reduce the occurrence of acquired hearing loss.

Several factors have the potential to be associated with possible hearing loss in the Namibian mining sector. While some may involve factors related to the exposure to noise and toxic chemicals in the workplace, there may be non-work related factors that may be associated with hearing loss and which need to be investigated. These non-work related factors may explain why some workers acquire hearing loss while others do not.

1.1. Research question and Aims

The overall aim of this study was to describe the prevalence of potential hearing loss in the mining industry in Namibia and describe which extrinsic and intrinsic risk factors were associated with it. The research questions for the current study were: (i) What is the prevalence of potential hearing loss for persons working in noise zones in the Namibian mining industry? and (ii) Why do some workers working in noise zones acquire hearing loss while others do not?

The study objectives were as follows:

To determine the prevalence of persons identified with potential hearing loss in noise zones within the Namibian mining industry

To investigate whether extrinsic factors: specifically occupational, social and medical factors are associated with potential hearing loss in the Namibian mining sector.

Occupational factors includedthe absence of worker's hearing loss prevention programme components as well as how long an employee has been employed in the current environment. These components include training and education, supervisor involvement, noise measurement, engineering and administration control, assessment, monitoring and record keeping and the use of protective devices/clothing.

Social factors included substance use, for example smoking and alcohol consumption as well as engaging in leisure activities that exposed the individual to loud sounds.

Medical factors included whether an individual was treated for conditions like chronic ear infection, head trauma/injury, lifestyle disease such as cholesterol, hypertension and diabetes; or utilised ototoxic drug treatment for medical conditions like Tuberculosis, HIV/AIDS, Cancer and Malaria.

To investigate whether intrinsic factors such as Age, gender, hereditary hearing loss or consanguineous marriage was associated with hearing loss in the Namibian mining sector.

1.2. Outline of thesis

Chapter 1- Introduction: This chapter provided the reader with a brief overview of the research question, which includes the factors associated with potential hearing loss in the Namibian mining sector. It also sketches the context of the study and highlights the non-existence of data pertaining to the prevalence and factors associated with hearing loss in Namibia. The aims and objectives of the study were introduced.

Chapter 2- Literature review: This chapter provided a background of existing literature pertaining to this field of study. It provided a critical evaluation and interpretation of existing literature, which dealt with hearing loss in occupational settings like the mining industry. It also discussed the prevalence of hearing loss as well as the extrinsic and intrinsic factors that have been known to be associated with hearing loss.

Chapter 3- Methodology: In this chapter, the methodological approach implemented to conduct the empirical component of this research project is described. The overall aim of this study is briefly stated and precedes a discussion on material, apparatus and procedure used for the collection, capturing and processing of data. Ethical considerations and methods utilised to ensure reliability and validity are also discussed.

Chapter 4- Results and discussion: In this chapter the findings of the study, which were obtained through statistical analyses are presented, reflected upon and discussed in relation to existing literature.

Chapter 5- Conclusions, critique and research implications: This chapter provides a summary of relevant findings of the study and its possible research and practical application. It identifies the study's limitations and makes suggestions for further research.

References- This section provides a list of all material cited in this report.

Appendices- This section contains supplementary data and information.

2. LITERATURE REVIEW

Employment or engaging in an occupation serves as a means for an individual to earn a living, become financially independent, provide for one's family and contribute to the productivity and economic stability of a country (International Labour Organisation (ILO), 2003). Unfortunately a great number of people are employed globally in conditions that foster ill health (Eijkemans, 2004). This can entail exposing the employee to potentially hazardous conditions such as environments where there is excessive noise (Rio Tinto, 2014) in order to earn an income to become financially independent (ILO, 2003). According to Nelson, Nelson, Concha- Barrientos and Fingerhut (2005) global estimates indicate that 37% of back pain, 16% of hearing loss, 13% of chronic obstructive pulmonary disease (COPD), 11% of asthma, 10% of injuries, 10% of lung cancer and 2% of leukaemia are due to working in a hazardous environment. These can lead to substantial and chronic disability, which can compromise the ability to function daily and thereby, negatively affect the person's quality of life (Fingerhut et al., 2005). Unfortunately the magnitude of the global burden of occupational disease and its effects are underestimated due to the lack of reliable data as well as under-reporting of incidents in existing systems (Eijkemans & Takala, 2005).

Millions are spent on the workmen's compensation claims in an attempt to hold the employing institutions accountable for the "unsafe" or unhealthy working conditions (Eijkemans, 2004, p.28). In Washington State, in the United States of America (U.S.A.), the number of compensation claims for hearing loss increased 12-fold during the period 1984-1998 (William, Daniell, Fulton-Kehoe, Cohen, Swan, & Franklin, 2002). Every year an estimated U$ 242 million is spent on worker's compensation for hearing loss (Pallarito, Ratliff, & Boyd, 2013) . A Canadian study reported an average of 55 injuries as a result of exposure to noise and a cost of CA$6, 985, 579 per year during the period 2005-2007 (Lebeau, Duguay, & Boucher, 2013). In the United Kingdom (U.K.), 230,000 insurance claims related to noise-induced hearing loss were awarded during the period of 1991-1995 (Palmer et al., 2002). In Australia, 16,500 compensation claims were accepted between the period July 2002-2007 (Commonwealth of Australia, 2010) and the estimated annual cost per individual employee is AUS$1,880. While many developed countries can account for the burden of occupational disease, including hearing loss, many developing countries still lack published and accurate population-based data on this topic (Dekker, Edwards, Franz, van Dyk, & Banyini, 2013; Smith, 1998; WHO, 1997; Zimmer & Höffer, 2009).The lack of published data in developing countries hinders the ability

to make appropriate decisions regarding liability, compensation and management, both medically and within the occupational setting.

While 4000 cases of noise-induced hearing loss were reported in South Africa and R75 million rand was spent on compensation during 2004 (Hermanus, 2009), most developing countries have limited or no such data (Zimmer & Höffer, 2009). Moreover, while certain developing countries are reported to have compensation funds for injuries, the definition of occupational injuries such as hearing loss is inconsistent and can contribute to the criteria of not being compensated in the work place. In Namibia, a 28.3% increase in worker's compensation claims in the labour force was reported in 2010 (Social Security Comission, 2010). In that year alone a total of 9,438 workers compensation claims were awarded to registered members of the workforce and their dependents to the value of N$ 4 million. In 2010 the labour force comprised of 868, 268 individuals (Namibian Statistics Agency, 2012). This suggested that a significant amount (10%) of the population were compensated. However, the report did not indicate for which medical conditions these claims were awarded or how much was spent on hearing loss. It also did not indicate which industries received the most claims.

Although an increase in the number of claims has been reported, it was observed that a significant number of individuals who work in similar conditions do not claim for disability. While some studies indicated that the majority of individuals working in hazardous noise areas present with hearing difficuties (Ahmed, Dennis & Ballal, 2004; Olusanya, Bamigboye, & Somefun, 2012) other studies indicate that the majority of employees working in hazardous conditions do not present with hearing loss (Bonde, Kock, Koefoed-Nielson, Kolstad & Rubak, 2006; Chang & Chang, 2009; Cruickshanks et al., 1998; Kim, 2010; Masterson et al., 2013; Nondahl et al., 2009; Pyykkö, Toppila, Zou, & Kentala, 2007).

2.1.1. The mining industry

The mining industry is a major force in the world economy as most industries rely on the primary supply of resources to initiate production (International Council on Mining and Metals (ICMM), 2012). Mining contributes to the economic growth of a country through trade as well as employment of people. With a population of 2.1 million people, Namibia has three primary industries, namely Mining and Quarrying. Agricuture and Forestry as well as Fishing and Fish Processing (Namibian Planning Commission (NPC), 2012a). In 2008, Mining and Quarrying contributed about 2.7 % to the Namibian Labour force (NPC, 2012a) and 9.3 % to the country's gross domestic product (Chamber of Mines, 2014).

The mining industry is a high risk occupation (Chen & Zorigt, 2013), particularly since employees are constantly exposed to elements like dust, chemicals and noise (Donoghue, 2004; Scott, Grayson, & Metz, 2001). Unfortunately, most countries that conduct mining activities do not have comprehensive occupational health data as most data are fragmented and, when taken together, incomplete (Hermanus, 2009). Therefore, it is challenging to establish how much mining contributes to occupational injuries in general. In the U.S.A., the mining sector among all occupational sectors had the second-highest prevalence of reported decline in health (5.7%) and the highest prevalence of individuals with hearing difficulties (22%) (NIOSH, 2007a) during 1997-2007. The mining industry also had the highest number of work loss days (5.1) in comparison to other sectors. The total number of lost day injuries in Namibia was 88 and the total number of disability injuries were reported to be 123 in 2013 (Chamber of Mines, 2014). The number of hearing difficulties is not known.

While Namibia has published health and safety regulations that protect employees (Government of the Republic of Namibia, 1997), these are outdated and inappropriate for mining activities within the country (Malongo, 2013). Guidelines have been published recently to address this issue, particularly in the uranium mines (Namibian Uranium Association, 2014).

2.1.2. Hearing loss in the mining industry

According to World Health Organisation (WHO) estimates, there were 360 million people with hearing impairment in 2012 (Olusanya, Neumann, & Saunders, 2014). Developed countries with high income presented with less hearing impairment (4.9%) in comparison to developing countries that include middle income countries in Sub-Saharan Africa (15.7%) and low income countries in South Asia (17%) (Stevens, Flaxman, Brunskill, Mascarenhas, & Mathers, 2011). This disparity may be due to the fact that higher income countries have more resources to assess, regulate and monitor an individual's health status. In Namibia out of 98, 413 people who are estimated to have a disability, 6.4% are categorised as Deaf and 9.6% are reported to have hearing difficulties (Namibia Statistics Agency, 2011). Unfortunately, there are no data available to indicate the causes or factors associated with hearing loss, though there are many. Distinguishing the aetiology of hearing loss is challenging and, within the occupational setting, can be contentious as misdiagnosis and mismanagement (McBride & Williams, 2001; Osei-Lah & Yeoh, 2010) can prove costly to employers.

The Centre for Disease Control (CDC) (2012) in America states that one in four miners present with hearing impairment and that four in five miners with hearing impairment are diagnosed with noise-induced hearing loss (NIHL). It is estimated that 22% of all hearing difficulties were attributed to noise in the mines (National Intitute Of Safety & Health (NIOSH), 2007a). This means that 88% did not present with hearing loss. In Ghana, Zimbabwe and Goa the prevalence of hearing loss was reported to be 54%, 37%, 38.16% respectively (Amedofu, 2002; Chadambuka, Mususa, & Muteti, 2000; Oliveira, Cacodcar, & Motghare, 2014). This suggests that 46%, 63% and 61.84% do not present with hearing loss. In South African gold mines, depending on the definition of hearing loss (low frequency and high frequency) as well as in which noise group one was classified (Noise≥85dB (A) group 1, Noise ≥ 85dB (A) group 2), individuals that presented with normal hearing levels ranged from 45.5% - 77.9%. In the control group (noise <85dB(A) and less noise), 46.5% of individuals presented with high frequency hearing loss while 19% presented with low frequency hearing loss (Strauss, Swanepoel, Becker, Eloff & Hall, 2012). Therefore, the research suggested that noise cannot be the sole contributing factor to hearing loss and that additional individual factors should be considered.

Considering that only a percentage of workers claim compensation, despite most working in similar hazardous environments, should the following question not be contemplated: "If the noise exposure in the working environment is equally hazardous to all, why is it that some workers acquire hearing loss and others do not?" Several extrinsic and intrinsic factors have been associated with acquired hearing loss and these will be discussed below.

2.2. Extrinsic factors

Extrinsic factors are external or environmental factors that act on the individual and can result in hearing loss (Henderson, Subramaniam, & Boettcher, 1993; Leyk et al., 2009). Occupational factors included exposure to noise and chemicals in the work environment as a result of the absence of WHLPP components. The WHLPP components include training and education, supervisor involvement, noise measurement, engineering and administration control, assessment, monitoring and record keeping and the use of protective devices/clothing.

2.2.1. Occupational factors

Occupational factors are those factors that relate to an individual's working environment. The two main factors associated with hearing loss within the mining sector are excessive exposure to noise and to hazardous substances.

Noise is an undesired sound, which, depending on the individual's perception, can be pleasant or annoying (Fernández, Quintana, Chavarría, & Ballesteros, 2009). Excess sound causes the stereocilia connected to the hair cells and the basilar membrane to tear, which can result in damage to the cell structure, cell death and NIHL (Rabinowitz, 2000; Heinrich & Feltens, 2006). Sound affects hearing initially at the frequency of 4 kHz (also known as the 4 kHz notch) due to the resonance of the ear (WHO, 1997). However, it can eventually spread to the other frequencies - particularly the high frequencies (Daniel, 2007; Dobie, 2008).

Exposure to noise over a number of years can also place one at risk for hearing loss as noted in a retrospective study where hearing loss was initially noted after 10 to 15 years of exposure and deteriorated over every 10 years (Taylor, Pearson, Mair, & Burns, 1965). Noise-induced hearing loss can also be associated with tinnitus (Bauer et al., 1991; Mazurek, Olze, Haupt, &

Szczepek, 2010) or the perception of sound in the absence of external stimulation (Levine, 2001).

Another factor associated with acquired hearing loss in the work environment, is the exposure to hazardous chemicals or toxins. A toxin is a substance, which can cause harmful effects on individuals and is common in the workplace (DoPH, 2008). The toxicity of a substance and its effect on the body depends on the dose or how much enters the body, the duration or how long an individual is exposed, the latency or the period in which effects occur, the reaction or interaction of various chemicals at one time and the sensitivity of an individual. Like noise, one of the units of measurement used in chemical exposure is the time-weighted average (TWA). This is the amount of time that an individual can be exposed to a toxin over a period of time usually 8 hours or the average amount of hours an individual works. However, each substance has its own chemical properties which can influence the dose (permissible exposure level) and duration (TWA) (NIOSH, 2007b). (OSHA, n.d.).

Exposure to toxic, organic and/or chemical solvents may result in damage to the auditory system and more specifically the outer hair cells in the cochlea (Mäkitie et al., 2003). Several studies have reported a significant relationship between these two factors (Fransen et al., 2008; Kim & Kwon, 2012; Morata, Dunn, Kretschmer, Lemasters, & Keith, 1993; Sliwińska-Kowalska, 2008). Toxic chemicals can occur in the form of a solid, liquid or gas form and can, therefore, enter the body through inhalation, skin contact, eye contact or ingestion (DoPH, 2008). Studies also report that the combination of noise and toxic, organic and/or chemical solvents can have an additive effect (Sliwinska-Kowalska et al., 2004) or a synergistic effect, which can present as high-frequency hearing loss (Rabinowitz et al., 2008). Miners are often exposed to chemical substances such as crystalline, coal, dust, diesel fumes, arsenic, cyanide and metal ores. In Australia, among the various industries that expose employees to chemical and hazardous substances, the mining sector does the most to prevent exposure through the provision of protective clothing, labelling or placing warning signs about hazardous areas, providing appropriate washing facilities and providing chemical safety training (MacFarlane, Benke, & Keegel, 2012), which are similar to the components of the WHLPP described earlier.

Levels of exposure to these elements are influenced by an individual's training and education, the supervisor involvement, measurement of these factors, engineering and administration controls at work, assessment, monitoring and record keeping and the use of protective devices

and/or clothing. These form part of the Worker's Hearing Loss Prevention Programme (WHLPP). Implementing all the prescribed components of a hearing loss prevention programme in the workplace can prove challenging. One of the challenges that seems to feature the most, is the non-usage of hearing protection devices (HPDs). Employees may choose not to wear these due to discomfort (Zungu, 2012).

Training is essential in addressing the non-usage of HPDs. Employees who comprehend the reasons for WHLPPs will understand why they must wear their HPDs and participate in regular audiometric evaluations (OSHA, 2002). Training can be informal or formal. The latter is an organised event with a prescribed framework, allocated trainer and some form of accreditation (Eraut, 2004). Informal training deals with tacit learning and can take place at an individual and/or social level.

Due to the recognised risks associated with certain occupational environments, legislation exists to protect workers. In South Africa, occupational regulations specify that the permissible loudness level for workers to be exposed to, in an eight hour period, is 85 dB (A) (Department of Minerals & Energy, 2003). In Namibia, regulations have been published to protect employees in the occupational setting (Ministry of Labour (MoL), 1997), but some have been found to be outdated and inadequate.

Namibian regulations stipulate that the permissible loudness level should not exceed 85 dB (A) (Ministry of Labour, 1992). However, it does not indicate the permissible time exposure nor provide recommendations for occasions when the noise levels exceed the recommended 85 dB (A). As a result, the majority of Namibian occupational health professionals refer to and utilise the South African regulations as the standard of good practice. These regulations include initiating, implementing and monitoring a WHLPP (Centers for Disease Control and Prevention, 2011).While several of these components may overlap or be integrated, some workplaces exclude several components (Daniell, Swan, McDaniel, Stebbins, Seixas, & Morgan, 2002; Prince, Coligan, Stephenson, & Bischoff, 2004; Dekker, Edwards, Franz, van Dyk, & Banyini, 2011) and other workplaces do not offer a WHLPP at all (Daniell et al., 2006).

Components of the WHLPP have recently been included in guidelines that were published to address the need for health assessment and monitoring particularly in uranium mines (Namibian Uraniurm Association, 2014). As these guidelines have only recently been

published, limited statistics regarding proposed WHLPPs are available. Moreover, mining companies are not yet compelled to comply with these guidelines as they are not yet legislation. On the other hand, several uranium mines have initiated and are implementing the Uranium Stewardship Programme. This programme integrates Health, Environment and Radiation Safety and Security (HERSS) standards, which is a way to "converge "Namibian and International standards (Namibian Uranium Association, 2014, p. 2). Employees exposed in noise zones or areas where the noise levels exceed 85 dB (A) (Government of the Republic of Namibia, 1997) or whose impulse noise exposure exceeds 130 dB (C) are encouraged to undergo regular hearing evaluations (Namibian Uranium Association, 2014).

Eighty-five (85dB(A)) can be equated to speaking louder or shouting in an environment due to loud noise in the area (May, 2000).While limited statistics are available, one mine recently reported that staff are exposed to noise levels between 79.1 among laboratory staff and 90.9 (Leq]dB(A) among mine maintenance workshop workers (Rio Tinto, 2014). This demonstrates that the WHLPP component on measurement of noise levels is being applied.

2.2.2. Social factors

Social factors included substance use, for example smoking and alcohol consumption as well as engaging in leisure activities that exposed the individual to loud sounds.

2.2.2.1. Smoking

Tobacco continues to be one of the leading global causes of preventable death, and kills nearly 6 million people annually (WHO, 2011a). Although the association between smoking and hearing loss remains unclear (Sung et al., 2013), most studies that have looked at smoking and acquired hearing loss suggest a significant relationship and association between the two factors (Cruickshanks et al., 1998; Mizoue, Miyamoto, & Shimizu, 2003; Nakanishi et al., 2000; Nomura, Nakao, & Yano, 2005; Pouryaghoub, Mehrdad, & Mohammadi, 2007; Sung et al., 2013). Only one study found almost no association between smoking and hearing loss (Kim & Kwon, 2012). According to Cruickshanks et al. (1998), smoking can affect hearing through its effects on the anti-oxidative mechanism or on the vascular supply to the auditory system. It has also been suggested that smoking can accelerate the process of acquiring hearing loss (Nakanishi, Okamoto, Nakamura, Suzuki, & Tatara, 2000; Mohammadi, Mazhari, Mehrparvar,

& Attarchi, 2010) and that with noise exposure, it can have an additive effect on acquired hearing loss (Palmer, Griffin, Syddall, & Coggon, 2004). Furthermore, research suggests that the impact of smoking on hearing is dependent on the number of cigarettes smoked, as well as the length of time the person is smoking. A study by (Agrawal, Platz, & Niparko, 2008), found no association among individuals that smoked less than 20 cigarettes per day. On the other hand, in studies where a significant relationship was noted, it was found that the greater the amount of cigarette packs an individual smoked, the higher the risk for acquired hearing loss (Itoh et al., 2001; Palmer et al., 2002; Sung et al., 2013). Individuals that are employed in labour intensive jobs, such as mining, tend to smoke more than individuals who are in desk jobs (Cheyip, Nelson, Ross, & Murray, 2007). In 2008 14.1% of the Namibian population were reported to engage in smoking activity, of which the prevalence of smoking daily among males and females was 21.6% and 6.0% respectively (WHO, 2011b). Smoking should, therefore, be considered as a possible factor when investigating the aetiology of hearing loss in miners

2.2.2.2. Alcohol consumption

Globally the amount of alcohol consumption has increased over the past decades, particularly in developing countries (WHO, 2002). In 2002, alcohol consumption contributed to 1.8 million deaths, which equates to 4% of the global disease burden. Furthermore, it was estimated to have caused 20-30% of oesophageal cancer, liver disease, epilepsy, motor vehicle accidents, homicide and other intentional injuries. To date results regarding the association of hearing loss and alcohol consumption have been inconsistent (Curhan, Eavey, Shargorodsky, & Curhan, 2011). While some studies indicate that an increase in alcohol consumption appears temporarily to raise auditory thresholds (Murata, Kawashima, & Inaba, 2001; Popelka et al., 2000; Upile et al., 2007) other studies indicate that moderate alcohol consumption can be beneficial in preventing hearing loss (Popelka et al., 2000; Itoh et al., 2001;Fransen et al., 2008).

In research conducted in a mining town in Namibia, 55% of Namibian adults were reported to consume 10 litres of alcohol per week (Ananias, 2010; Lightfoot, Maree, & Ananias, 2009). As moderate alcohol is defined as one drink per day for women and up to two drinks per day for men (U.S. Department of Agriculture and U.S. Department of Health and Human Services, 2010), the consumption reported in the study is considered to be excessive. Within the context

of a Namibian mining town, excessive alcohol consumption should, therefore be considered as a factor that may place individuals employed in mines at risk for acquired hearing loss.

2.2.2.3. Leisure activities

Leisure activities are typically activities carried out when an individual is not at work, and can include recreational activities which take place for relaxation (Hurd & Andersen, 2011). Some activities can place the individual at risk for hearing loss either through physical injury, which occurs as a result of a head trauma/injury or through exposure to environments where sound is excessive. The latter is most common, where individuals are exposed to sound ≥80dB(A) (Clark, 1991) and can occur when an individual plays an instrument (D. McBride et al., 1992; Schmuziger, Patscheke, & Probst, 2006), listens to music on personal players (Levey, Levey, & Fligor, 2011), attends rock concerts (Bogoch, House, & Kudla, 2005; Yassi, Pollock, Tran, & Cheang, 1993) or sports matches (Swanepoel & Hall, 2010; Ramma, Petersen, & Singh, 2011) utilises power tools for gardening or do-it-yourself activities (Clark, 1991). Within the Namibian context, hunting or shooting is a common recreational activity, which can result in acoustic trauma or place the individual at risk for hearing loss (Stewart, Konkle, & Simpson, 2001; Stewart, Borer, & Lehman, 2009).

2.2.3. Medical factors

2.2.3.1. Medical conditions

Medical factors included whether an individual was treated for conditions like chronic ear infection, head trauma/injury, lifestyle disease such as cholesterol, hypertension and diabetes; or when and individual has been on ototoxic treatment for medical conditions like Tuberculosis, HIV/AIDS, Cancer and Malaria.

Chronic ear infection

Chronic ear infection is often associated with hearing loss and is usually a patient's main complaint (Monasta et al., 2012). It is usually classified as a conductive hearing loss as a result of rupture of the tympanic membrane, or changes to the ossicular chain as a result of fixation or erosion, or chronic inflammation (da Costa, Rosito, & Dornelles, 2009). The WHO estimates that between 65 million and 330 million people suffer from chronic suppurative otitis media,

of which 50% suffer from hearing loss (Acuin, 2004). Moreover, the prevalence of otitis media is unknown in sub-Saharan African countries like Namibia, but can range between 0.4% to 4.2%. A study that looked at the relationship between ear infection and hearing loss found the relationship to be significant (Rabinowitz, Slade, Galusha, Dixon-Ernst, & Cullen, 2006), while another study found such a relationship significant only in the low frequencies in a German population (Bauer et al., 1991). Zungu (2012) reported that 98.2% of women employed in the gold and platinum mines in South Africa experienced itching and ear infections from earplugs used to prevent hearing loss in the noisy areas. Hence, the women preferred not to wear hearing protection devices, which placed them at risk of acquiring NIHL. Chronic ear infection may, therefore, not only have a direct effect on hearing but may also indirectly place individuals at risk for hearing loss through the non-use of hearing protection devices.

Head injury/trauma

An estimated 10 million people are affected annually by Traumatic Brain Injury (TBI) with the burden being especially prominent in low and middle income countries, and more particularly in Latin America and sub-Saharan Africa (Hyder, Wunderlich, Puvanachandra, Gururaj, & Kobusingye, 2007). Bauer et al. (1991) reported that approximately 10% of noise-exposed Austrian employees who presented with hearing loss also reported having had a head injury, which suggests an association between the factors (Bauch, 1981; Chujo, Nakagawa, & Komune, 2008; Lancaster, Alderson, & Curley, 1999; Segal, Eviatar, Berenholz, Kessler, & Shlamkovitch, 2002; Yetiser, Hidir, Birkent, Satar, & Durmaz, 2008). According to estimates, 5.9% of non-fatal occupational injuries occurring within the mining sector in the U.S.A., involved head injuries (CDC, 2009) (Centre for Disease Control (CDC), 2009). At present, data regarding head injuries within the mining sector in Namibia is unknown but based on the literature, head injuries should be considered as placing miners at risk for hearing loss.

Cholesterol

Cholesterol is a fatty substance found in the bloodstream, body organs and neural fibres of the body (WHO, 2002). Cholesterol measurements include the total cholesterol, low density lipoprotein (LDL) or “bad” cholesterol, high density lipoprotein (HDL) and triglycerides (National Cholesterol Education Program, 2001). Individuals with hypercholesterolaemia, high levels of blood lipids or triglycerides, are at risk for early onset of general arthrosclerosis, which affects the blood flow through the major arteries and vessels in the body including the ear (Axelsson & Lindgren, 1985). Cholesterol levels place an individual at risk for acquiring

hearing loss, as studies indicate that individuals with high and low cholesterol levels can present with sensorineural hearing loss (Hirata et al., 2012). While one study indicated no association between hypercholesterolemia (N.-C. Chang, Yu, Ho, & Ho, 2007), some studies have shown that high cholesterol (Toppila, Pyykkö, Starck, Kaksonen, & Ishizaki, 2000; Pyykkö, Ilmari, Toppila, Esko, Zou, Jing & Kentala, 2007; Hirata et al., 2012) as well as low cholesterol (Axelsson & Lindgren, 1985; Hutchinson et al., 2010) can contribute to NIHL. The prevalence of high cholesterol levels in the country is 2.7 % (Hendriks et al., 2012). Aging, hypertension and smoking, in addition to high cholesterol levels place the individual at a greater risk for acquired hearing loss, particularly when exposed to excessive noise levels (Gold, Haran, Attias, Shapira, & Shahar, 1989; Pyykkö, Ilmari, Toppila, Esko, Zou, Jing & Kentala, 2007).

Hypertension

The amount of force or exertion of blood circulation in the arteries is known as blood pressure and is felt as a pulse (WHO, 2002). While studies have indicated a strong association of hypertension and NIHL (Agrawal, Platz, & Niparko, 2008; Chang et al., 2011; Pyykkö et al., 1989; Pyykkö, Ilmari, Toppila, Esko, Zou, Jing & Kentala, 2007), the association remains unclear (Rosenhall & Sundh, 2006). Pyykkö et al. (2007) state that hypertension and antihypertension medication can have an additive effect on the acquisition of hearing loss particularly when the individual is constantly exposed to noise. On the other hand, one study found no association and attributed hearing loss to noise exposure rather than hypertension and suggested that raised blood pressure could be as a result of annoyance due to exposure to noise (Rosenhall & Sundh, 2006). In 2008, 40% of 25 year old adults, who were of employable age were diagnosed with hypertension of which the majority (46%) came from the African region (WHO, 2013).The prevalence of high blood pressure reported in Namibia in 2008 was 43.4% (WHO, 2011b). Although hypertension was reported to be more common in the female rather than the male population (Hendriks et al., 2012), it was also associated with an increase in Body Mass Index (BMI) in males. A high BMI was also associated with smoking (Fransen et al., 2008), which was more commonly practiced by males, who were also from the major workforce within the mining sector.

Diabetes mellitus

Diabetes mellitus is a metabolic disorder that affects the sugar levels in the blood and can manifest as chronic hyperglycaemia, carbohydrate, fat and protein disturbances (WHO, 2006).

This is particularly common in aging individuals where one's body composition changes with fat accumulation around the abdomen (Kesavadev, Short, & Nair, 2003). Some studies have indicated a relationship between diabetes and high frequency hearing loss (Kakarlapudi et al., 2003; Mozaffari, Tajik, Ariaei, Ali-Ehyaii, & Behnam, 2010; Bainbridge, Hoffman, & Cowie, 2011). Ishii, Talbott, Findlay, D'Antonio and Kulle (1992) found that individuals with Non-insulin Dependent Diabetes Mellitus (NIDDM) are placed at even more of a risk for NIHL when other factors such as blood pressure and lifestyle are accounted for. In 2000, the estimated prevalence of diabetes in all age groups world-wide was 2.8% and it is expected to increase to 4.4% in 2030 (Wild, Roglic, Green, Sicree, & King, 2004). In 2008, diabetes accounted for 3% of all non-communicable disease mortalities in Namibia (WHO, 2011b) and is one of the factors that contributes the most to worker absenteeism in several private sectors in the country (Guariguata et al., 2012). Similarly, in one study conducted in Chile within a mining cohort, it was found that diabetes was a significant predictor for health costs and absenteeism within the employing company (Zárate et al., 2009).

2.2.3.2. Ototoxic medication used in the treatment of certain medical conditions

Tuberculosis

The incidence of Tuberculosis (TB) has markedly increased in sub-Saharan Africa over the past two decades with 173.6 to 351.7 per 100 000 cases between 1990 and 2007 (Stuckler, Basu, McKee, & Lurie, 2011). With every 634 cases per 100 000 individuals reported with TB in 2009, Namibia presents with one of the highest TB case notification rates in Africa (Ministry of Health & Social Services, 2010). Twenty-five percent (25%) of cases report decreased hearing levels (Sagwa et al., 2012). Several studies indicate that treatment with Kanamycin, Streptomycin and Amikacine or aminoglycocides for conditions such as TB can result in sensorineural hearing loss (Duggal & Sarkar, 2007; Harris, Peer, & Fagan, 2012; Harris, Bardien, et al., 2012). Treatment with aminoglycocides occurs when patients present with a recurrent history of TB and where the body develops immunity to first line medications (Ministry of Health & Social Services, 2012). This is known as multi-drug resistant TB (MDR-TB) and is often treated with the stronger medications such as aminoglycosides. The working environment within the mines puts employees at risk for the transmission of pulmonary TB due to irritation from dust and poor ventilation (Stuckler et al., 2011). The incidence of TB in miners in sub-Saharan Africa is estimated to be 10 times higher than the population in which

it originates (Stuckler et al., 2011). Research suggests that TB treatment particularly aminoglycosides, in addition to noise exposure, increase susceptibility to NIHL (Mills & Going, 1982; Li & Steyger, 2009; Brits, Strauss, Eloff, Becker, & Swanepoel, 2012). However there are individuals who have been treated for TB, but do not present with hearing difficulties as they are treated with non-ototoxic medications (Ministry of Health & Social Services, 2012). Considering the high incidence of TB within the mining community, the impact of its treatment should be considered when reflecting on the possible factors associated with NIHL.

Cancer

Cancer is a group of illnesses that occur as a result of abnormal cell division, and which invade the body tissue (National Cancer Institute, 2013). In 2004, cancer accounted for 7.4 million mortalities and is one of the leading causes of death around the world (WHO, 2009). Cancer is the second most common cause of death in developed countries and is estimated to contribute to 10% of deaths in developing countries, despite the lack of /poor quality of data available (WHO, 2002). Out of a total 5,136 malignant neoplasms reported during the period of 1995-1998 in Namibia, 2,585 (50.3%) occurred in males and 2,551 (49.7%) occurred in females (MRC/CANSA/NHLS/WITS Cancer Epidemiology Group, n.d.). While it can be argued that cancer can be the result of exposure to other contaminants or as a result of excessive smoking in taxing jobs like mining (Cheyip et al., 2007), records indicate a higher prevalence of cancer within male open-pit uranium mining employees than the general population (Zaire, Notter, Riedel, & Thiel, 1997). Cancer can be treated with a series of interventions that include surgery, radiotherapy and chemotherapy (WHO, 2009). Among these interventions, studies show that radiotherapy treatment (Li et al., 2010; Petsuksiri et al., 2011) and/or treatment with cisplatin during chemotherapy (Bokemeyer et al., 1998; Mukherjea & Rybak, 2011) can result in permanent sensorineural hearing loss.

Malaria

Malaria is caused by five species of parasites from the genus plasmodium and is spread via mosquitoes (WHO, 2012). Globally 3.3 billion people were at risk for malaria of which the majority are from sub-Saharan Africa. Malaria cases in Namibia have shown a steady decline in recent years (MoHSS, 2010). In 2008 there were 128,531 reported outpatient malaria cases, compared to 448,265 cases in 2000. Quinine, which is used in the treatment of malaria, has been associated with various adverse side effects such as sensorineural hearing loss and tinnitus (Karlsson, Hellgren, Alván, & Rombo, 1990; Roche et al., 1990; Tange, Dreschler, Claessen, & Perenboom, 1997). However, it has been reported that these hearing levels were restored and tinnitus disappeared once treatment with Quinine ceased (Roche et al., 1990; Tange et al., 1997; Aftab & Quiraishi, 2006). In Namibia, the northern areas along the Angolan-Zambia border present with a higher population density as well as the highest transmission of malaria (MoHSS, 2010). Thes areas are home to communities from Owamboland, Kavango and Zambezi, who make up 63% of the Namibian population (Hanns Seidel Foundation Namibia, 2010). Although the prevalence of malaria within the mining sector is unknown, these individuals who live in malaria-prone areas contribute to the labor force that are employed in various industries including mining.

Chronic pain

Global estimates indicate that 37% of back pain can be attributed to individuals working in hazardous occupational environments (Eijkemans & Takala, 2005). In the U.S.A., 17% of the population utilises aspirin at least once a week, 28% are men aged 45 and above (Curhan et al., 2011). Regular use of analgesic medications like aspirin, non-steroidal anti-inflammatory drugs (NSAIDs) and acetaminophen can be ototoxic and can result in hearing loss (Curhan, Eavey, Shargorodsky, & Curhan, 2010). In contrast to this finding, one study reported that the consumption of salicylates did not significantly contribute to the genesis of sensorineural hearing loss (Pyykkö et al., 1989), as hearing could recover once salicylate consumption had ceased (Aftab & Quiraishi, 2006). However, other studies indicate that there is a relation between the use of analgesics and the susceptibility to NIHL and that the effect of salicylates as well as anti-hypertensive medication, provides an additive effect, particularly when the

individual is exposed to excessive noise (Pyykkö et al., 2007; Toppila et al., 2000). The use of pain medications in Namibia and more specifically among the mineworkers is not known.

2.2.4. Intrinsic factors

Intrinsic factors are non-modifiable characteristics that describe or pertain to or even add to an individual's make up (Jones et al., 1993) and these include age, gender, hereditary factors and consanguineous practices within family. In Namibia, mining employees are predominantly male and aged between 20-39 years old and of the Oshiwambo and Otjiherero population groups.

2.2.4.1. Age

Age is a factor that plays the most significant and inevitable role in acquiring hearing loss (Ahmed et al., 2004; Daniel, 2007). This condition is known as presbycusis and is common in the elderly or individuals who are sixty years old and older (Dobie, 2008; Helzner et al., 2005; Nash, Cruickshanks, Klein, Klein, Nieto, & Huang, Pankow, Tweed, 2011). Age-related hearing loss has been associated with many factors other than only biological degeneration (Fransen et al., 2008). These include systemic diseases such as cardiovascular disease (van Kempen et al., 2002; Hirata et al., 2012) and diabetes mellitus (Ishii, Talbott, Findlay, Antonio, & Kuller, 1992; Bainbridge, Hoffman & Cowie, 2011) medication ototoxicity, socio-economic status, lifestyle factors and noise exposure (Humes,1984; Toppila et al., 2001; Helzner et al., 2005) . Namibia has a youthful population, with the majority of the labour force 17.02% falling within the age group of 20-24 years old (Namibian Statistics Agency, 2012). The elderly population or individuals older than sixty years old constitute 5.41% of the general population. Within the mining sector, out of 11 240 workers, the majority (33.5%) of individuals fell within the 30-39 age group, while the elderly only comprised of 2.8% employees (L. Shitenga, personal communication, 15 November, 2013). This low percentage of elderly workers is probably due to the taxing nature of mining. Instead, the older employees fall between the age groups of 40-49 and 50-59 years old. Studies have indicated that hearing loss is common within these age groups, particularly when they have been exposed to noise (Dobie, 2008; Fransen et al., 2008; Spoor, 1967). These age groups make up a total of 32.32% of the mining population (L. Shitenga, personal communication, 15 November, 2013).

2.2.4.2. Gender

Several studies indicate that males generally present with poorer hearing levels than females (Bauer, Körpert, Neuberger, Raber, & Schwetz, 1991; Helzner et al., 2005; Kim et al., 2010; Pratt et al., 2009). Furthermore, studies suggest that hearing loss is greater in males because they engage in work activities (Dalton et al., 2001; Palmer et al., 2002; Cruickshanks et al., 2010) and social activities such as recreational hunting, target shooting, utilising power tools, gardening and motor boating (Clark, 1991) that expose them to excessive loud sound. This makes them more susceptible to NIHL than their female counterparts. In Namibia, although women have a larger working age population, employment rates of men were higher (41.6%) than women (28.5%) in 2007 (NPC, 2012a). Fifteen percent (15%) of women are employed within the mining and quarrying industry (Namibia Statistics Agency (NSA), 2013). Therefore, the greater prevalence of hearing loss in men than women working in the mines can be attributed to fewer women being employed in these sectors.

2.2.4.3. Hereditary deafness

Hereditary deafness or family hearing loss is a highly heterogenous disease, whereby several genes can affect auditory function (Gürtler & Lalwani, 2002; McMahon, Kifley, Rochtchina, Newall, & Mitchell, 2008; Sobe et al., 2000) and it affects one in every 1000 newborn babies (del Castillo et al., 2002). Hereditary deafness can range from simple deafness, without other clinical abnormalities to genetically determined syndromes of which deafness is a recognised sign (Arnos, 1994; Al-Gazali, 1998). Most types of hereditary syndromatic and nonsyndromatic hearing losses are the result of mutations in single genes, which are inherited as autosomal dominant, autosomal recessive or sex-linked traits (Al-Gazali, 1998; Friedman et al., 2000; Li & Friedman, 2002; Lenz & Avraham, 2011). Genetic susceptibility can also contribute to acquired hearing losses such as recurrent otitis media, NIHL and presbycusis (Li & Friedman, 2002). It is estimated that 50% of deaf individuals attribute their deafness to a combination of genetic and environmental factors while another 50% of individuals attribute deafness solely to their genetic makeup (Barlow-Stewart, 2007). No local statistics pertaining to hereditary hearing loss have been found.

2.2.4.4. Consanguineous marriage between parents

One of the factors related to hereditary hearing loss and which places the individuals at risk is consanguineous marriage. Consanguineous marriage is defined as "marriage between people who are closely related, usually between first or second cousins, or sometimes even closer relationships" (WHO, 2006 p. 34).Consanguineous marriage is discouraged in Europe and North America, but in many Asian, African and South American traditional communities (Chen, Fu, Dong, & Chen, 2011) it is encouraged as a social custom among particular tribes (Zakzouk, 2002). Several studies have indicated a relationship between hearing loss and consanguineous marriages (Chen et al., 2011; Zakzouk, 2002). In Saudi Arabia, two surveys conducted ten years apart found that the prevalence rate of hereditary sensorineural hearing loss was 66.07% and 36.6% in the first and second surveys respectively (Zakzouk, 2002). Chen et al. (2011) reported similar findings. Among 815 Chinese students surveyed, 35 were from consanguineous families and had prelingual severe to profound hearing loss. In the Namibian context, certain tribes within the Otjiherero, Ovaherero, Ovahimba and Owambo practise consanguineous marriage (Edwards-Jauch, 2009). Approximately 50% of the population in Namibia is made up of Owambo and 7% of Herero people (Hanns Seidel Foundation Namibia, 2010). Unpublished data from the NSA (2013) indicate that 3.9% and 16.6% of miners are Herero and Oshiwambo, which suggest that this may be a risk factor for hearing loss in this particular mining community.

3. METHODOLOGY

The following section presents the research design, setting, participants, ethical considerations, instrumentation, data collection procedure, data analysis methods, validity and reliability.

3.1. Research design

Like many other developing countries, there are limited or no studies regarding the possible causes or factors associated with hearing loss or its prevalence in Namibia (Mathers, Smith, & Concha, 2001). A descriptive and quantitative cross-sectional design was, therefore, deemed appropriate for the purpose of this study since the aim was to describe those factors associated with hearing loss, and thereby also describe its point prevalence within the mining sector in the country.

Descriptive studies such as the current study can be hypotheses generating and can develop ideas about the cause of a particular health outcome (Grimes & Schulz, 2002). Within the Namibian context, a descriptive research design was considered a necessary first step as literature regarding hearing loss in the mining sector is limited. Within the context of this study, a health outcome refers to the presence or absence of hearing loss as a result of exposure to risk factors (Donabedian, 1980 as cited in Jee & Or, 1999, p. 6). The exposure, as defined by Cameiro & Howard (2011), refers to the act of being exposed to various risk or protective factors and in the current study, the exposure was the various intrinsic and extrinsic factors experienced by the mine workers.

Furthermore, cross-sectional studies look at the relationship between an exposure and a health outcome at a specific point in time (Webb & Bain, 2011). The advantages of using a cross sectional research design were that data related to the respondents' health status and possible hearing loss were readily available in their medical files (Grimes & Schulz, 2002) and allowed the primary investigator the opportunity to access data without prolonging interruption to the routine or function of the mines. Moreover, the retrospective file review allowed the primary investigator to collect the available assessment data which is used by the mine to identify potential hearing loss and was cost-saving as research did not have to acquire the audiometric equipment as the study was self-funded. Data acquired from the questionnaire, retrospective file review and most recent audiogram were analysed quantitatively.

3.2. Setting

The current study took place in Namibia, a country where the mining sector is one of the three major contributors to the economy of the country. Most major mining and exploration activities carried out in the country are registered and represented by the Chamber of Mines (Chamber of Mines, 2008). Class A mines are managed by companies that make a "significant contribution (financial and technical capacity, employment, output and strategic considerations) to long term sustainability and/or development of the mining sector" (Chamber of Mines, 2008, pp. 5–6).The other classes are defined by the activity (mining and/or exploration) as well as related criteria determined by the chamber. The members of the Chamber of Mines are classified into seven categories, which include the representatives of the Class A to D mines, Associate member/s, Honorary member/s and Honorary life member/s. Based on the definition of Class A mines, it is expected that these institutions will be able to address health and safety issues adequately.

In 2013 there were 59 members affiliated to the Chamber of Mines (Appendix A) and the minerals mined for in the various mines include diamonds, uranium, zinc and copper. In 2011, the mining sector employed 11,240 people (Namibian Statistics Agency, 2012) and contributed 9.3% to the National gross product in 2013 (Chamber of Mines, 2014). Data collection took place at five Class A mines, of which three were based in the western part of Namibia, while the other two were based in the southern part of the country (Figure 1).

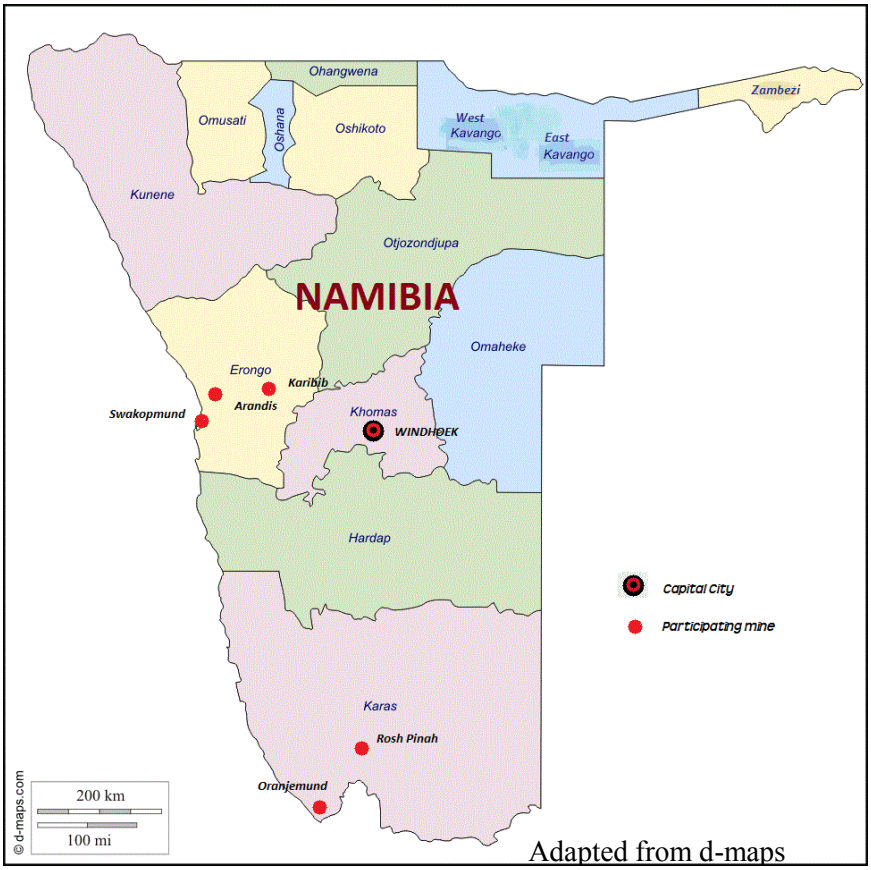

Figure 1: Participating mines in relation to the nearest Namibian towns

The questionnaires were administered in locations specified by the mine personnel and included three on-site training rooms, one off-site office and one off-site training room, while data from the retrospective file review took place at one on-site health facility and four off-site health facilities (Appendix B).

3.2.1. The Mining companies

In Namibia all major mining companies as well as their activities are registered and represented by an institution known as the Chamber of Mines. The Chamber of Mines was approached (Appendix C) to obtain permission to carry out this study involving the mines as well as to encourage the companies to participate. An endorsement letter was obtained from the Chamber of Mines (Appendix D). For selection purposes, a list of all mines affiliated with the Chamber of Mines as well as their contact details (Appendix A) was requested from the Director of the Uranium Institute, Dr. W. Swiegers, who is also an advisor to the Chamber of Mines pertaining

to occupational health and safety issues within the mines. He advised the Primary Investigator (PI) to contact the mines that were classified as Class A & Class B and facilitated discussion within the Chamber of Mines and mining companies regarding this study.

3.2.1.1. Sampling method and selection procedure for the selection of participating mines

The Chamber of Mines endorsed the study and 18 Class A/Class B mining companies were identified as possible sites. Due to time limitations and cost constraints as well as the distance between the mines, it was decided that only five (5) randomly selected mines out of the total of 18 mining companies indicated on the list be selected to participate in the study. The mining companies were initially contacted telephonically to determine whether the mines were candidates as candidacy was based on the pre-determined selection criteria as described below. Seven out of the 18 mines were telephonically contacted and reported to meet the criteria 1-4. Although a simple random sampling method was initially proposed for the selection of the five mines, the process could not be carried out as only five met all required criteria, which included the provision of written consent.

3.2.1.2. Selection criteria for mining companies

With the approval of the Chamber of Mines and for selection purposes, the managers of the occupational health departments of affiliated mines were initially contacted telephonically. Only mining companies that complied with the following criteria were included:

1. Audiometric or hearing evaluations of their employees were conducted at or on behalf of the companies. This was done to objectively assess and/or confirm the presence of hearing loss in the form of methodological triangulation (Bryman, 2003).
2. Personal medical records and, more specifically, hearing evaluations of the employees were available.
3. The health professional, who conducted the hearing assessments was appropriately trained in hearing evaluation protocol (Health & Safety Authority, 2007).
4. The management was willing to provide written consent to participate. A letter was written to the management of each mine to formally request permission to participate in the study (Appendix E).

3.2.1.3. Description of mining companies

Five open-pit mines in Namibia agreed to participate in this study. Three mines were based in the western part of Namibia where the main minerals mined included gold and Uranium, while the other two mines were based in the southern part of the country where zinc and diamonds are commonly mined.

3.3. Participants

The participants of this study comprised of the mining employees, who were the respondents. The selection of respondents in this study was a three phase process and will be described subsequently.

3.3.1. The respondents

The respondents were selected from the mines that met all selection criteria previously described. Prior to the arrival of the PI at each mine it was expected that the management of the mining companies would provide the PI with a list of employees from which the random selection of respondents could take place.

3.3.1.1. Sampling method and procedure for the selection of respondents

Non-probability sampling and more specifically convenience sampling or participation on the basis of availability (Kelly, 1999), was utilised for the purpose of this study. The reason for selecting this method was based on the safety concerns of the mine management. The respondents were chosen at the discretion of their foremen so that the respondents' work stations were not left hazardously unattended and safety in the workplace was constantly ensured. Therefore, the time and resources allocated to engage with respondents and capture data within a specific work shift at each mine was limited. This study was, therefore, carried out based on the availability of respondents and whether they met the selection criteria (Velasco, 2010). The disadvantage of utilising non-probability sampling in this study was that the health worker effect could have affected the reliability of the results. Respondents who were absent for various reasons were excluded from this study (Webb & Bain, 2011). This

could have included employees who present with hearing loss and were, as a result, not represented in this study.

In 2010, the total number of employees working in 14 registered mining companies was 11,355 (Chamber of Mines, 2010). Based on this amount, the ideal number of participants for this study was calculated to be 372 employees. However, again due to time constraints and cost limitations as well as the distance among mines, it was not possible to sample these many participants. Moreover, each mine followed different work time schedules and making prior arrangements with the respondents proved challenging. The targeted sample size was 150 participants; 30 participants from each of the five mines. This number was based on logistic measures that is that the average work shift is 8 hours per day (Government of the Republic of Namibia, 1992). Therefore, at least two (2) employees could be released every hour without compromising the safety and productivity at their respective workplaces.

3.3.1.2. Selection criteria for respondents

Respondents were included in the study, if the employee:

- Worked in a designated noise zone or area where the noise level was classified as ≥85 dB (A) (MoL, 1997). This was in line with the aim of determining whether factors other than noise were associated with hearing loss.
- Was willing to provide written informed consent or did not refuse to participate in the study (Boslaugh & McNutt, 2008),
- Was at least 18 years old. This complies with Namibian legislation, which prohibits and restricts child labour underground and in mines (MoL, 2007).
- Had a medical file, which included his/her most recent hearing evaluation/ screening audiogram.
- Was not absent from work on the day of data collection.

3.3.1.3. Description of respondents

All the respondents were employed in noisy environments, also known as noise areas or noise zones in mines (Table 1). The sample comprised of 132 respondents, of which 115 (87%) were male and 17 (13%) were female. The age range of respondents was 23 years to 63 years, with a mean age of 37 years. Although the respondents came from various regions around the country, they were based at the respective mines for employment purposes and included boilermakers, mining engineers, fitters, drillers and drivers of heavy-duty vehicles. The respondents' home languages included Oshiwambo or Oshiwambo dialect (37.88%), Afrikaans (24.24%), Damara/Nama (15.91%), Otjiherero (7.58%), English (3.79%), Rukwangali or Rukavango (2.28%) and Silozi (1.52%). Other local languages included Nyemba and Setswana, which had one person (0.76%) each. Seven (5.3%) persons did not report their home language.

In terms of the respondents' level of Education, the majority of respondents (78 or 59.09%) obtained a secondary (Grades 8-Grade 12) level of education, 19 (14.39%) obtained a tertiary education (Diploma or Degree), while 17 (12.88%) had a post-Grade 12 certificate and eight (6.06%) had primary level (Grade 0- Grade7) of education. Ten respondents did not specify their educational level (Appendix F).

Table 1: Summary of respondents' profiles

Gender	***Percentage of respondents (%)***
Male	87
Female	13
Age	
Miniumum	23
Maximum	63
Average	37
Home language	
Oshiwambo	37.88
Afrikaans	24.24
Damara.name	15.91
Otjiherero	7.58
English	3.79
Rukavango/Rukwangala	2.28
Silozi	1.52
Nyemba	0.76
Setsewana	0.76
NR	5.3
Level of education	
Secondary Education (Grades 8-12)	59.09
Tertiary education Diploma/Degree)	14.39
Post-Grade 12	12.88
Primary Education	6.06
NR	7.58

3.4. Instrumentation

The tools utilised to capture the data for this study comprised of a questionnaire in English and Afrikaans, a retrospective file review of respondents' medical history using the same questionnaire as the data collection tool and also their most recent audiograms.

3.4.1. The Questionnaire

The Worker's Hearing Health Questionnaire (WHHQ) was designed by the PI (Appendix G1). A questionnaire was selected over individual interviews as it was considered to be more structured, less time-consuming and less disruptive to the routine of the mines. More respondents were able to complete their questionnaires simultaneously. Moreover, the questionnaire elicited responses to sensitive questions such as health issues, which an interview could have inhibited if appropriate rapport was not established. As Afrikaans is one of the major languages spoken in various institutions in Namibia (Jansen, 1995), the questionnaire and information leaflet were translated into Afrikaans (Appendix G2). Afrikaans is the lingua franca, which promotes inter-cultural communication within communities (Fourie, 1995) and is used in businesses like the mines where it is often considered the official language. This was done with the assistance of the Stellenbosch Writing Lab. An interpreter was available for assistance if the respondent was not proficient in these two languages.

3.4.2. Development of the questionnaire

The questionnaire utilised in the study was designed by the PI as described below:

Step 1: An extensive literature review of the prevalence of hearing loss as well as factors that have been known to be associated with hearing loss was undertaken. This was done to conceptualise variables included in the study (Tucker, 2010).

Step 2: The sample for the study was pre-determined by the selection criteria for the current study.

Step 3: The questionnaire was produced in written format.

Step 4: The questionnaire was reviewed by one staff member of the Department of Speech-Language and Hearing Therapy as well as one staff member from the Baromedicine and Occupational Health Facility, Stellenbosch University. This was done to obtain an expert opinion and to review which questions should be included in the questionnaire (Mayland, Williams, & Ellershaw, 2011).

Step 5: The questionnaire was translated into Afrikaans by the Stellenbosch Writing lab.

Step 6: The questionnaire was piloted at a laundry service at a health facility in Windhoek to determine whether the language and content was suitable for the target respondents. The employees of the laundry services were selected as target respondents as they are also employed in areas classified as "noise zones" and would be familiar with the content addressed in the questionnaire.

Step 7: The questionnaire with the study protocol was forwarded to the Director of the Uranium Institute and selected occupational health co-ordinators for further comment. This was done to encourage the face and content validity of the questionnaire (Mayland, Williams, & Ellershaw, 2011).

No modifications were recommended.

3.4.3. Structure of Questionnaire:

The Questionnaire comprised of nine sections and 64 questions. Only 62 of the questions were used for analysis purposes and two pertaining to Educational level and Home language were included for descriptive purposes. Out of the 62 questions utilised for the purpose of this study, four (4) were open-format, seven (7) were numeric open-format, sixteen (16) were limited choice format questions, and thirty (30) were closed format questions. Moreover, five (5) questions were compound questions or "questions that contain a number of related but separate questions as a group using a shared list" (IBM, 2013).

- Questions 11, 15, 18 & 19 were open format questions

- Questions 1, 20, 22, 24, 32, 35 & 51 were numeric open questions.
- Questions 3, 4, 8, 12, 13, 23, 27, 31, 33, 36, 48, 49, 52, 57, 59 & 61 were limited choice questions.
- Questions 2, 9, 10, 14, 16, 21, 25 & 26, 28-30, 34, 37-47, 50, 53-56, 58 & 60 were closed-format questions.
- Questions 5, 6, 7, 17 & 62 were compound questions. Question 5 comprised of a combination of 11 closed-format questions as well as three (3) open format questions for each item selected. Questions 6 & 7 included one closed format question and one (1) open question for the closed format item selected as a follow up question. Question 17 was made up of 5 closed format questions as well as one (1) open format question for each item selected. Question 62 was made up of two (2) open format questions.

3.4.4. Components of the questionnaire

The questionnaire provided data about the respondents' demographic profiles, medical history, work history, family history and leisure activities. The nine sections (A-I) of the questionnaire are:

A. PARTICIPANT'S DETAILS

This section was included for descriptive purposes and included three components, namely Research number, Education level and Home language.

B. DEMOGRAPHIC INFORMATION

This section comprised of three questions related to three variables, namely Age, gender and population group

1. Age: This factor was included as literature (Fransen et al., 2008) states that as an individual grows older hearing deteriorates due to the death of cells in the cochlea.While hearing loss due to age is often prevalent in the elderly or individuals

aged 60 years and above, it can occur in individuals older than 40 and 50 years too (Dobie, 2008)

2. Gender: Several studies have indicated that males are more prone to hearing loss than females (Bauer, Körpert, Neuberger, Raber, & Schwetz, 1991; Helzner et al., 2005; Kim et al., 2010; Pratt et al., 2009). This is because males tend to engage in activities that put them more at risk for acquiring hearing loss. Mining is predominantly a male profession and can be more prevalent within the population as a result of this dynamic.

3. Population group: Although the information was collected, it was not utilised as the respondents were relatively homogenous in respect of population group.

C. MEDICAL HISTORY

This section included variables related to the respondents' health and which could then be associated with hearing loss. The variables which were included will be discussed below.

4. Annual medical check-up: Employees should have undergone a medical check-up at least once annually (CDC, 2009). This allows for early identification, assessment and monitoring of medical conditions that have been associated with hearing loss. Moreover, annual check-ups can identify employees who work in noisy environments and who present with hearing loss and, thereby, (OSHA, 2002) implement measures to protect hearing levels from deterioration.

5. Medical conditions: These variables were included for reasons mentioned in the literature review. Three questions related to each medical condition were included namely: when the medical condition was diagnosed/identified, how long the condition was treated and whether it was controlled/uncontrolled. These questions were included primarily for descriptive purposes and were only discussed if a medical condition was found to be significant. Controlled was defined as taking treatment/medication currently to treat the condition.

6. Smoking: Several studies had reported an association of smoking with hearing loss (Cruickshanks et al., 1998; Nakanishi et al., 2000). Due to the taxing job of working in the mines, employees smoke as a form of relieving stress (Cheyip et al., 2007)

7. Drinking: While some studies have indicated that drinking can elevate hearing thresholds in individuals (Murata et al., 2001; Upile et al., 2007), others have reported that moderate alcohol consumption can be a protective factor (Itoh et al., 2001; Popelka et al., 2000). Drinking is a common past time among miners (Lightfoot et al., 2009). Therefore, this factor was also included in the current study.

8. Record keeping: This was one of the components of a WHLPP (CDC, 2011).This question was included to determine whether respondents were aware of where to obtain their medical information if they needed to access it.

D. HEARING AND BALANCE

The hearing and balance section were initially added for descriptive purposes. However, the majority of the questions were not part of the primary aims of the study and were excluded during analysis. The questions excluded were 9, 11, 12, 14-17. Only questions 10 and 13 were considered in this study.

10. Self-reported hearing loss: This question was included as a form of triangulation. The use of more than one approach in the investigation of a research question to enhance confidence in the resulting findings is known as triangulation (Bryman, 2003). Responses were compared with the hearing loss identified in the respondents' most recent audiograms in order to verify this (Ahmed et al., 2004).

13. Annual hearing evaluations: This question was included in order to gather information regarding the screening practices of the mine. Responses were compared to the dates on the audiograms as a form of data triangulation.

E. WORK HISTORY

This section included eight questions and will be described subsequently.

18. Number of years employed in whole life: This question was linked to Question 25, which describes the presence of pre-existing hearing loss prior to the current job as research indicates that hearing loss may initially have been noted after 10 years of exposure (Palmer et al., 2002; Taylor et al., 1965).

19. Current job: This question was included for analysis purposes and to orient the respondents to the next question (20).

20. Number of years employed in current job: This question was included as prolonged exposure to noise could cause permanent damage to hearing (OSHA, 2002). (Nelson, Nelson, Concha-Barrientos & Fingerhut, 2005).

21. Shouting in work environment due to noise: This question was excluded as it is not a factor but rather an indication that the workers are exposed to loud noise. It was not relevant to the current study as all the respondents were supposed to be working in noise zones.

22. Number of hours exposed to noise per day: Ordinary workers usually worked for an average 8 hours per day (MoL, 2007). Miners worked continuous shifts that varied between 8 to 12 hours. This was included as exposure time had been found to be a contributing factor to NIHL (Bauer et al., 1991)

23. Working with noisy equipment: Items listed were taken from the Employee Noise Exposure Questionnaire (Brookhaven National Laboratory, 2009). This question was added to confirm that respondents work with equipment that emit and expose them to noise.

24. Number of hours working with noisy equipment: This question was linked to question 22 and 23. This question was included as the duration of noise exposure placed the individual at risk for acquiring hearing loss (Bauer et al., 1991).

25. Pre-existing hearing loss: This variable was included for descriptive purposes only.

F. WORK PLACE HEARING LOSS PREVENTION PROGRAMME

A WHLPP comprises of the components training and education, supervisory involvement, noise measurement, engineering and administration control, assessment monitoring and record keeping and the use of hearing and protective clothing. As this concept contains several components, the following questions aimed to describe the worker's perception regarding the existence of these components:

26. The availability of a WHLPP: Some industries still need to address the issue of implementing hearing conservation programmes (Dekker et al., 2013). This question was included to describe whether respondents were aware of the programme in their particular mines.

27. Annual training in hearing loss prevention: According to the CDC (2009) employees should receive training at least once a year. However, there is no indication whether training should be formal or informal. This question was added to determine whether mines are implementing the training component in their respective workplaces.

28. Formal training received: Formal training has a learning package, takes place in an institution with a designated teacher or trainer and has a form of credit or qualification at the end of the training (Eraut, 2004). On the other hand, informal training can be associated with tacit knowledge and often occurs in a social context. This question was included to determine whether formal training occurs within the setting.

29. Provision of hearing protection devices (HPDs): The MoL (1992) states that an institution should provide HPDs free of charge to employees who work in noise zones. This question was included to determine whether mining companies complied with this regulation.

30. Use of HPDs: This question is related to question 29. While the MoL (1992) states that institutions should provide HPDs to employees, it also states that management should not permit employees to enter noise zones unless the HPDs are worn. Individuals instinctively 'know' when an action is appropriate (Eraut, 2004) and when to wear

HPDs. However, employees choose not to wear HPDs as they are uncomfortable and prevent them from hearing warning signals (Morata et al., 2005).

31. Type of HPD: This question was included solely for descriptive purposes.

32. Length of time wearing HPD daily: This question is related to question 22, which enquired how long employees are exposed to noise daily. The average daily shift that employees work is 8 hours. It was assumed that employees that work for this amount of time will also utilise their HPDs throughout.

33. Training on use of HPDs: This factor is linked to the WHLPP component of training and education. Individuals who are trained on hearing loss prevention strategies are more compliant in using the HPDs (OSHA, 2002). Hence, if individuals are not trained they may present with a higher risk for hearing loss.

34. Use of HPDs regularly and strictly monitored: The MoL (1992) states that employers should prohibit employees from entering noise zones without the use of HPDs. This question was included to determine whether the WHLPP component of supervisory involvement was incorporated.

35. Length of time the supervisor wears HPDs: This question is linked to question 24 and was included to determine whether the WHLPP component of supervisory involvement is incorporated in the work environment.

36. How often noise levels are tested/monitored: Although there are no regulations related to this, it is expected that companies where noise levels are regularly monitored will have less incidents of hearing loss.

37. Noise areas are clearly marked/labelled/visible: Areas where it is not possible to reduce noise levels that are >85dB (A) are required to be demarcated and clearly visible for all employees (MoL, 1992). This component is linked with the training and education component, whereby employees should be aware of the signs, what they mean and take the necessary precautions to reduce hearing loss.

Questions 38-44 are Engineering and Administration controls that should be implemented to assist in reducing noise-levels in the occupational environment (University of Toronto, 2012). These questions were initially included to determine whether mining companies have these preventative measures. However, these questions were excluded as the data indicated that respondents did not answer the questions reliably. This could be because respondents did not know whether these measures were in place or being implemented.

G. EXPOSURE TO TOXIC CHEMICALS

45. Exposure to toxic chemicals. Research has indicated that exposure to toxic chemicals can be associated with hearing loss (Mäkitie et al., 2003; Morata, Dunn, Kretschmer, Lemasters, & Keith, 1993; Sliwińska-Kowalska, 2008). This component was included to determine whether there is an association between toxic chemical exposure and hearing loss.

Questions 46, 47, 50, 52-56 were similar to the previous questions regarding the WHLPP and its components. Since exposure to noise and toxic chemicals shared similarities in being potentially hazardous to employees' health, the same questions were asked to determine whether the components of training and education, supervisory involvement, assessment, monitoring and record keeping, measurement, engineering and administrative controls and use of protective clothing were included.

48. Type of protective clothing used: This question was included for descriptive purposes. The 10th draft of the Mining Safety and Health Regulations (n.d) requires that employees working in mines are required to wear full coverage clothing to protect them from hazardous substances like toxic chemicals (Ministry of Mines and Energy, n.d.).

49. Training on the use of Protective clothing: Like question 18, this question is linked to the component of Training and Education. Individuals who receive training on the use of protective clothing are more likely to utilise their protective clothing.

57. Workplace assistance of the employee with hearing difficulty: This question was initially included strictly for descriptive purposes, but was excluded as it did not address any of the aims of the study,

H. FAMILY HISTORY

58. Hereditary hearing loss: Al-Gazali (1998) found that 86% of deaf children had a positive family history of hearing loss. This question was, therefore, included to identify any hereditary factors which may affect hearing.

59. Family members with hearing loss: This question is linked to the previous question 58 and was included strictly for descriptive purposes. However, due to the scope of this study, this question was excluded.

60. Consanguineous marriage: The practice of consanguineous marriages in many Asian, African and South American populations (Chen et al., 2011; Zakzouk, 2002) was found to be associated with hearing loss. This practice also occurs within specific populations in Namibia (Edwards-Jauch, 2009) who are also employed within the mining sector. This question was added to determine whether there is such an association between consanguineous marriage and hearing loss in Namibia.

61. Relationship of parents in consanguineous marriage: This question was related to question 60 and was included for descriptive purposes. The respondents, who ticked Yes in question 60, were requested to specify the relationship in this question.

I. LEISURE ACTIVITIES

62. Leisure activities: Responses to this question indicated that respondents were exposed in at least one activity that had excessive loud sound. Several studies have reported an association between engaging in activities that expose the individual to loud sound and hearing loss (Levey et al., 2011; McBride et al., 1992; Schmuziger et al., 2006; Stewart et al., 2009).

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3.4.5. The retrospective file review:

A retrospective file review is a research method where data collected for purposes other than research are utilised and analysed (Gearing, Mian, Barber, & Ickowicz, 2006). In this study the data was health information obtained from the respondent's medical file. This information had been collected by a trained occupational nurse, hired by the mining company, to assess and monitor the employees' health status. The PI was granted access to the medical files and could review this secondary data in order to note factors that could be associated with hearing loss. This method is a relatively inexpensive method of gathering readily available data (Worster & Haines, 2004) and allowed for acquiring data which would not have been recorded by respondents in the questionnaire. Moreover, data collected have been examined by an occupational health practitioner, which increases reliability of responses. On the other hand, health professionals can utilise jargon which may not be easily comprehended by a researcher. The data obtained from medical files are originally not recorded for research purposes (Worster & Haines, 2004). As a result the data captured can lack in quality and quantity or essential information can be neglected or omitted during data collection (Gearing et al., 2006).

Respondents' medical files were accessed from the appointed Occupational Health Manager(s) (OHMs) at the health department or from the centre storing the medical records. This was done with the approval of the management of each participating mine as well as the written consent of each respondent. The retrospective file review form comprised of the same questions utilised on the questionnaire previously discussed. This was included as a means of methodological triangulation or using two or more methods to gather data regarding the research question (Bryman, 2003). This serves as a means of cross-checking the findings utilising two different methods and thereby increasing validity.

3.4.6. Recent audiogram

Audiometric testing is the gold standard for measuring hearing loss and is OSHA's foundation for surveillance (May, 2000). A full audiological test battery should comprise of air and bone conduction audiometry, speech audiometry, immittance results and reflex results (Hall &

Mueller, 1997). In Namibia, however, the availability of diagnostic audiometric data is limited. Most hearing assessments were conducted by Audiometricians or nurses trained in audiometric hearing screening, which only included air conduction threshold measurement in both ears (Director of Uranium Institute, personal communication). Few audiograms were carried out by registered Audiologists and as with screening, did not include full diagnostic results. As clinical files were used to obtain the audiometric information for this study, the data comprised of air conduction thresholds only, as these are typically used in the industry for surveillance purposes.

In order to maintain anonymity and confidentiality, only the research number was used as the sole means to identify the respondent's audiograms. The most recent audiograms were scrutinised and analysed for thepresence/absence of potential hearing loss. Four (4) respondents were last tested two years prior to the study, while the rest (128) were tested within one year of the study. Ninety-three (93) respondents' most recent audiograms were carried out within one year of last calibration date and three (3) within two years. The last calibration date for 36 respondents could not be verified as this data were missing. This might have compromised the reliability and validity of the data and therefore, caution should be applied when interpreting the data.

The following data was captured on a form (Appendix H):

- The air-conduction thresholds at 0.25, 0.5, 1, 2, 3, 4, 6 & 8 kHz in both Left (L) and Right (R) ears. The auditory thresholds at the mentioned frequencies were collected in order to calculate each respondent's pure tone average (PTA) and thereby establish the presence of a potential hearing loss.

- Date on which hearing was last assessed. This was included as a measurement of reliability as outdated results could affect the reliability as changes in hearing status may have occurred over time.

- Other data recorded in this form included the model of the audiometer, the last recorded calibration date and the tester position. These components were included to determine the reliability and validity of the audiogram. Audiometers should have certain specifications and should have complied with international

standards in order to provide reliable assessment results (Franks, 1998). Moreover, the audiometer should have been calibrated annually and the tester should be a qualified or trained individual in hearing evaluation in the occupational setting (Franks, Stephenson, & Merry, 1996).

3.5. Ethical Considerations

Ethics deals with "principled sensitivity to the rights of others" and limits the choices made in the pursuit of the truth (Bulmer & Ocloo, 2010). (p.377). Prior to commencing this study, the proposal was presented and subjected to the approval of the following entities:

The Health Research Ethics Committee (HREC) at the Faculty of Medicine and Health Sciences, Stellenbosch University, R.S.A.

The Biomedical Research Ethics Committee (BREC) and Research Management Committee (RMC) at the Ministry of Health and Social Services (MoHSS) in Namibia.

3.5.1. The Health Research Ethics Committee (HREC)

This study adhered to the ethical regulations of Stellenbosch University and was submitted to the Health Research Ethics Committee (HREC) of the Faculty of Health Sciences for approval. The proposal was initially returned as for further clarification of the issues of anonymity and confidentiality and 'Race' (Appendix I). The proposal was re-submitted to HREC and was approved (Appendix J). This was done to ensure that the study adheres to the ethical principles of:

- **Non-maleficence**, which is the duty to avoid, prevent and minimise harm to the research respondents. This principle seeks to uphold the rights and dignity of a respondent and, in so doing, form the foundation for other ethical principles such as the respect for human dignity, informed consent, respect for privacy and confidentiality. Any identifiable information of each participating mine as well as respondent, such as their names, was removed. A research number was allocated to respondents, which was used instead of their names throughout the study. The research number comprised of an abbreviation of their employer's pseudonym and a random number. Each research number was linked to a database and was stored on the PI's password protected laptop. Only the PI had access to the list of research numbers indicating respondents' names.

This was done in order to safeguard the anonymity and confidentiality of the mining companies and respondents' data. (Boslaugh & McNutt, 2008).

Autonomy, which acknowledges the right of an individual respondent to have control over or have a say in what will happen to them. Prior to collecting data, respondents were required to sign the informed consent form. This form states that the respondents were familiar with the aims and purpose as well as the method of the study, were freely and willingly participating and were at liberty to discontinue participation at any point in time during the study.

Justice, which deals with the ethical obligation to treat each respondent in a manner that is considered to be fair and morally right. The PI was not involved in the selection of respondents. Instead, respondents were allowed to participate at the convenience of the management. Moreover, a copy of the final report will be made available to the Chamber of Mines, Ministry of Health and Social Services, the director of the Uranium Institute as well as all participating mines in order to inform them of the findings of the study and thereby inform them of areas in the mining sector that can potentially enhance safety in the workplace. This is known as distributive justice or the "fair, just or equitable distribution of benefits and burdens" (Konow, 2003).

Beneficence, which imposes a duty to ensure that the study will benefit other individuals. Although there were no material or financial benefits to the respondents, this study could create more awareness of hearing loss, its causes, effects and prevention, and motivate companies to expand, enhance and reinvigorate their employees' wellness programmes, with particular regard to the prevention of hearing loss.

3.5.2. The Biomedical Research Ethics Committee & Research Management Committee

Approval to conduct this study in Namibia was sought (Appendix K1) and was also obtained from the Biomedical Research Ethics Committee (BREC) and Research Management Committee of the Ministry of Health and Social Services (MoHSS) in Namibia (Appendix K2).

The BREC and RMC were informed in order for the PI to obtain permission to do research within the country.

3.6. Data Collection Procedure & Data Analysis Methods

Data collection procedure and data analysis methods comprised of eight (8) phases (Figure 2). The Data collection procedure included Phases 1-4 and the data analysis methods included Phases 5-8. Phases 1-3 took place at venues allocated by the individual mines, while Phase 4 was carried out at the respective health facilities where medical records, including the most recent audiogram, were stored.

3.6.1. Data Collection Procedure

Data collection was conducted in the following four phases:

Phase 1*:* As was prescribed by the Health Research Ethics Committee (2009) respondents were informed of the purpose and aims of the study, how they were selected to take part, the procedures and protocols, the responsibilities of the PI, the voluntary nature of the study and that the respondent reserved the right to withdraw at any point in time during the study. This was done in the form of a short PowerPoint presentation. They were also informed that the use of any medical records would be treated as confidential.

Phase 2*:* The information leaflet and informed consent form were made available for respondents in English (Appendix L1) and Afrikaans (Appendix L2). The informed consent forms were signed.

Phase 3*:* The PI went through the questions one at a time using a PowerPoint presentation while respondents simultaneously completed the questionnaire. Respondents were encouraged to mark the questions which required further clarification during the session. This was done to reduce measurement error and reduce No Response (NR) rates (Kasprzyk, 2005). After going through the questions, respondents were able to consult with or seek clarity from the PI in either English or Afrikaans. In the event that respondents could not adequately communicate in either language, the assistance of a translator was requested. Illiterate respondents were assisted in

completing the questionnaire. Both were techniques to reduce selection bias in the study (Webb & Bain, 2011).

Phase 4: As the primary aim of this study was to determine the prevalence of hearing loss in the mining sector, data from the file review including the most recent audiogram were recorded (Appendix H). The PI scrutinised the records on-site and was not allowed to remove or misplace any information from the respondent's files. This was done so that any personal or confidential information would not be accessed by other unauthorised persons.

3.6.1.1. The air-conduction thresholds at 0.25, 0.5, 1, 2, 3, 4, 6 & 8 kHz in both Left (L) and Right (R) ears.

There are several definitions of the term/concept hearing loss. Bokmeyer et al. (1998), for example, define hearing loss as at least 10 dB at two or more consecutive frequencies, or at least 20 dB at one isolated frequency in air conduction in either ear; while Ahmed, Dennis and Ballal (2004) define hearing loss when the pure tone average (PTA) at the frequencies 0.5, 1, 2, 4 and 8 kHz is >25 decibels (dB) hearing level (HL). Several studies (Popelka, Cruickshanks, Tweed, Klein, Klein, & Nondahl, 2000; Cruickshanks, Klein, Klein, Wiley, Nondahl, & Tweed, 1998; Curhan, Eavey, Shargorodsky, & Curhan, 2010) utilise the World Health Organisation (WHO)'s definition of hearing loss, which is when the PTA of the thresholds at 0.5, 1, 2 and 4 kHz is > 25 dBHL in either ear (Mathers, Smith, & Concha, 2000). For the purpose of the study the results were reported in terms of potential hearing loss as the data used were obtained by means of screening procedures and not diagnostic procedures. This study used the following criteria to differentiate between three types of potential hearing losses namely:

- Low frequency hearing loss (LFHL), which was defined as the PTA or auditory thresholds at 0.5, 1 & 2 kHz >25 dBHL.
- High frequency hearing loss (HFHL), which was the PTA at 4 & 8 kHz>25dBHL.

- All major frequencies hearing loss (AFHL), which was the PTA at 0.5, 1, 2 & 4 kHz (WHO, 2009).

Potential hearing loss was indicated where the PTA of the three types of hearing losses > 25dBHL in either or both ears. This was done to increase the sensitivity. or the probability that an individual with hearing loss will be identified (Webb & Bain, 2011) throughout the different frequencies. While the thresholds at 3 & 6 kHz were recorded, this data were excluded as these frequencies were not included in the types of hearing loss defined above. Cognisance was taken of the fact that these frequencies are used for the purpose of hearing surveillance (International Standards Organisation (ISO), 1990). However, the purpose of this study was not to specifically identify NIHL but rather to identify potential hearing loss.

3.6.2. Data Analysis Methods

Data were coded into binary variables for analysis purposes and re-classified into Intrinsic factors, Extrinsic medical, Extrinsic social and Extrinsic occupational factors described in the current study.

All data pertaining to this study were analysed in consultation with the Centre for Statistical Consultation (CSC) of Stellenbosch University. The data were collected in and primarily analysed in Excel. Special statistical analyses were calculated utilising Stata version 2012. The multiple logistic regression model was analysed using the SAS software package. All missing data such as 'I don't know', Misresponses, No Responses (NR) and Not Applicable (N/A) responses were excluded from the data set during the analysis using the procedure called pair-wise deletion.

In order to determine the prevalence of potential hearing loss and to describe the related risk factors, data collected from the most recent audiogram were described in terms of the frequency counts and percentages. These factors were analysed in three phases.

Phase 5*:* All data was initially analysed using descriptive statistics. All categorical variables utilised frequency counts and percentages. Continuous (numerical open-set) variables were

described using frequency counts and percentages as well as the mean, minimum and maximum values.

Phase 6*:* All categorical variables that contained more than two categories as well as continuous data were grouped or recoded into binary variables described above. This was done to calculate the chi square (χ^2) and odds ratio (OR). In instances where the number of respondents in a group was too small, the Fisher's exact two-tailed test was utilised to calculate significance. While it is possible to calculate the chi-square for variables that have more than two categories in the variable, it is not possible to calculate the odds ratio. Generally a significant level of 5% was used in all analyses. Only factors found to be significant were discussed at greater length.

Phase 7: Factors found to be significant in Phase 6 were then analysed in a multiple logistic regression model in their original unit of measurement depicted on the questionnaire. This was done to determine which factors were considered to be significant risk factors in the presence of the other factors. For all analyses a 5% significance level was applied.

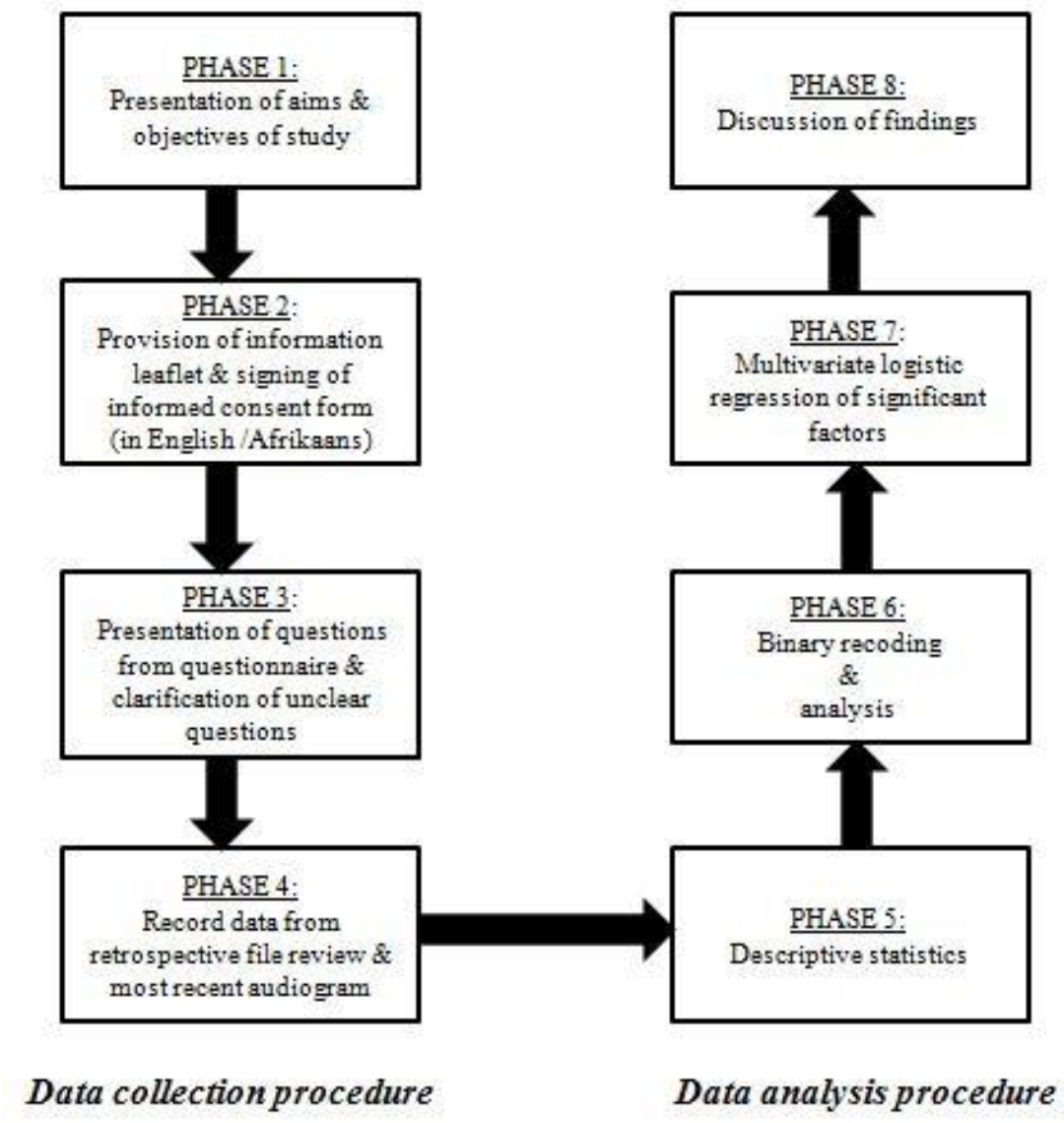

Figure 2: Flowchart of data collection and analysis procedure

3.7. Reliability and validity

Reliability refers to the extent to which the same results are yielded on repeated trials while validity is defined as the "degree to which a measure does what it is intended to do" (Durrheim, 1999, p.83).

One of the measures that was undertaken to improve reliability was the inclusion of the following two of the selection criteria for participating mining companies:

a) the hearing equipment should be calibrated and
b) the health worker conducting the hearing assessment should have appropriate training in protocol to conduct hearing assessments.

This was implemented to ensure that the respondents' results for the most recent screening audiograms were as reliable and accurate as possible. These two criteria were confirmed via the telephonic interview with the OHM at each respective mine.

Methodological triangulation was utilised in this study (Bryman, 2003) as many of the responses on the respondent questionnaire could be compared to and validated by the information collected during the medical file review. This measure enhanced the validity and reliability of the data obtained. The presentation of individual questions in the WHHQ as well as the medical record reviews were completed by the PI, thereby ensuring consistency in the manner in which the data were collected. Moreover, the PI was solely responsible for entering the data obtained throughout the study into the Excel spreadsheet. No third person was involved in capturing data, which reduced the margin for error and enhanced data reliability.

In order to enhance the validity of the questionnaire, the draft questionnaire was presented and discussed with two staff members of Stellenbosch University, one from the Speech-Language and Hearing Therapy Division and another one from the Barotrauma and Occupational Health facility in order to obtain a consensus about thequestions to included (Mayland, Williams, & Ellershaw, 2011).

Permission was sought and obtained from the senior management and management of the laundry services at a hospital in Windhoek (Appendix M1). A pilot study was conducted on six selected employees to determine the clarity of the instructions and questions, the administration time, the layout, the coding of questionnaires and the data input (MacLeod, n.d.) as cited in Kanjee (1999, p.298). In addition, the pilot study was conducted to determine

whether the explanation of the purpose of research was clear and acceptable to the respondents, and the method of data collection was adequate and effective (Appendix M2). The PI handed the questionnaire to the respondents to answer on their own in order to determine the time required to complete it. It was discovered that respondents left many questions unanswered. Upon reflection it was decided that the data collection procedure be modified. Thus, the questionnaire was presented in a PowerPoint presentation whereby each question was presented individually and the respondents had to indicate their response on the questionnaire, immediately after the presentation of that particular question. This allowed respondents to ask questions for clarification before they answered the subsequent question. The respondents were encouraged to mark questions that they felt could not be answered in front of their colleagues and these were addressed after the presentation. This improved the internal validity of the study as it determined whether respondents understood the questions.

The questionnaire with the proposed study protocol was submitted to the Director of the Uranium Institute and other occupational health co-ordinators employed in the mining sector to be reviewed. This additional review process enhanced the face and content validity of the questionnaire (Mayland, Williams, & Ellershaw, 2011). The suitability of the questionnaire and the acceptability of the study were communicated telephonically.

4. RESULTS & DISCUSSION

The aim of this chapter is to describe the findings in the research and review them with reference to the current body of literature. It is necessary to understand the background of individual factors that have been associated with hearing loss as was discussed extensively in the literature review.

The overall aim of the study was to describe factors associated with potential hearing loss in the mining sector in Namibia. The objectives were to: (i) determine the prevalence of potential hearing loss, as well as (ii) describe the extrinsic factors and (iii) intrinsic risk factors associated with potential hearing loss in the mining sector in Namibia. Extrinsic factors included occupational, social and medical factors. Extrinsic occupational factors included various variables related to noise and chemical exposure at the work, as well as the availability of a WHLPP. Extrinsic social factors included substance use, including smoking and alcohol consumption, as well as engaging in leisure activities that exposed the individual to loud sounds. Extrinsic medical factors included medical conditions such as chronic ear infection, head trauma/injury, Cholesterol, Hypertension and Diabetes, as well as potential ototoxic treatment for TB, HIV/AIDS, Cancer and Malaria. The intrinsic factors included Age, hereditary hearing loss and consanguineous marriage.

Statistical analyses included Odds Ratios (ORs), chi-square and, where necessary, Fisher's exact tests. All statistical analyses applied a 5% significance level.

4.1. Prevalence of potential hearing loss

The first objective was to determine the prevalence of potential hearing loss in the Namibian mining sector. The results are based on the data obtained from the miners' most recent audiograms, as well as the responses obtained during the completion of the questionnaire.

In this study one in three minerswere identified with potential hearing loss. According to the C.D.C. (2012), one in every four miners presents with hearing loss in the U.S.A. The results, therefore, suggested that there may be more miners affected in Namibian mines than in American mines.

Figure 3 displays the results of potential hearing loss as obtained from the most recent audiogram. According to these findings, the overall prevalence of potential hearing loss in this population was 27%, (36 out of 132 respondents) which is more than the reported cases of Deafness (6.4%) and hearing difficulties (9.6%) in the country (NPC, 2012a). This prevalence was also more than the global estimate of hearing impairment which is 1.4%, (Stevens et al., 2011). Despite this high prevalence as calculated from the most recent audiograms, only seven miners (5.98%) indicated to have hearing difficulties on the questionnaire (Table 22 in Appendix N). This suggested that the number of self-reported hearing loss was under-reported by 21.6%. A possible reason for the under-reporting of hearing loss is that people working in environments where there are noise zones, like the mines, stand within close proximity to each other in order to communicate (Fransen et al., 2008). Hence, respondents may not be aware that they have a hearing loss. A further reason for the discrepancy may be that the results are based on screening procedures and therefore indicate potential hearing loss. The use of diagnostic assessments may result in a lower prevalence than found in the study.

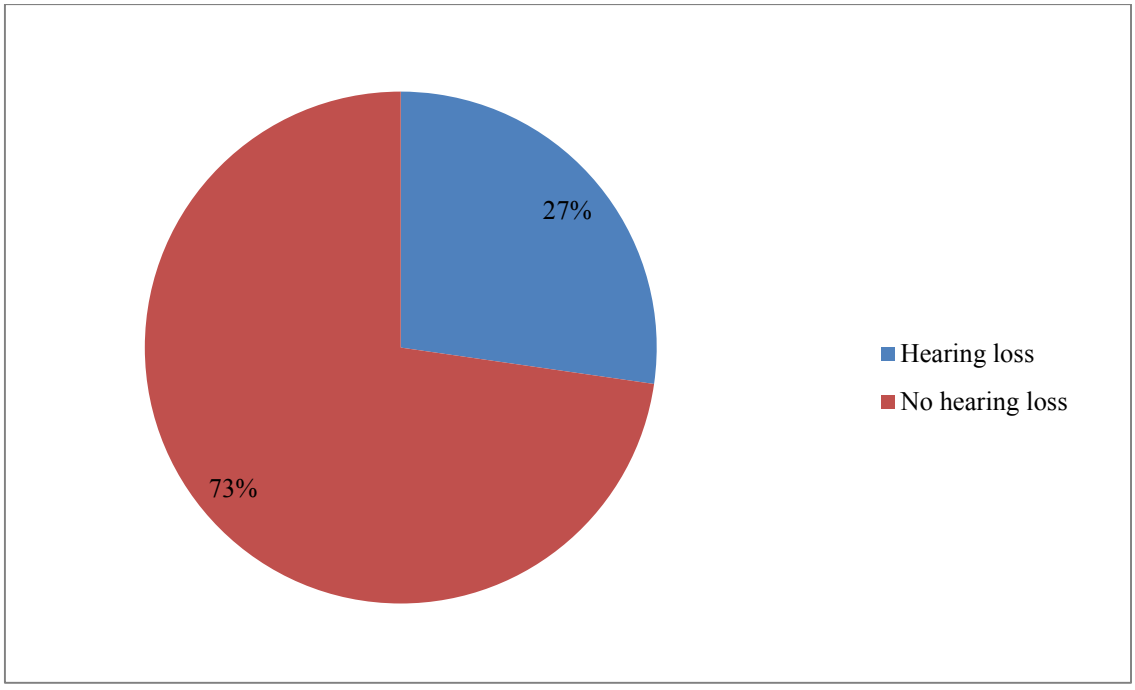

Figure 3: Prevalence of potential hearing loss (n=132)

Three categories of potential hearing loss were identified among the 36 respondents who were identified with potential hearing loss. These categories were: All major frequency hearing loss

(AFHL), High Frequency Hearing Loss (HFHL) and Low Frequency Hearing Loss (LFHL). Potential hearing loss was discussed relative to the number of ears (n=64) not the number of respondents. The type of potential hearing loss also included whether it occurred in one ear (Unilateral) or in both ears (Bilateral). As displayed in Figure 4, the majority of respondents presented with HFHL (84.38%), followed by AFHL (12.5%). Only 3.13% presented with LFHL. These results are expected as HFHL is typically associated with hearing loss acquired while working in noisy environments as in the mines (Amedofu, 2002; Rabinowitz, 2000; Strauss et al., 2012).

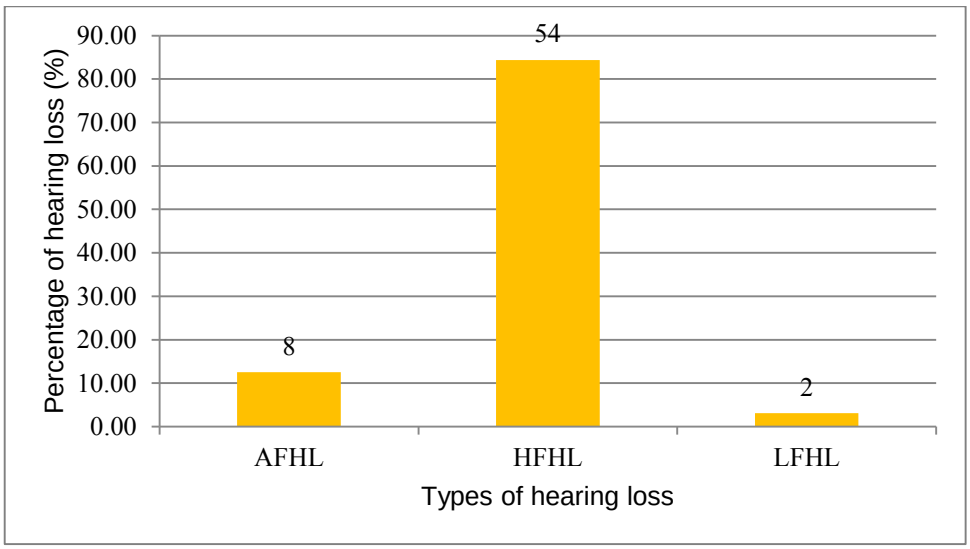

Figure 4: Percentage of individual hearing losses in relation to category of potential hearing loss (n=36)

Figure 5 displays the results obtained from the audiogram related to the laterality and severity of the potential hearing loss. Among the 18 respondents that presented with unilateral hearing loss, 17 (94.44%) presented with a mild hearing loss and one (5.56%) presented with a moderate hearing loss. Out of the 18 respondents who had a bilateral hearing loss, the majority (14 or 77.78%) presented with mild hearing loss, while results indicated that three (16.67%) presented with a moderate hearing loss and one (5.56%) presented with a severe hearing loss. No respondents presented with either profound unilateral or bilateral hearing loss (Figure 5). Mild hearing loss can be categorised as a slight impairment or where individuals are "able to hear and respond to words in normal voice within one metre" and have negligible disability weighting (Mathers, Smith, & Concha, 2001, p. 2). As a result, employees may not be aware

that they may have a hearing problem and the number of self-reported hearing loss is under-reported.

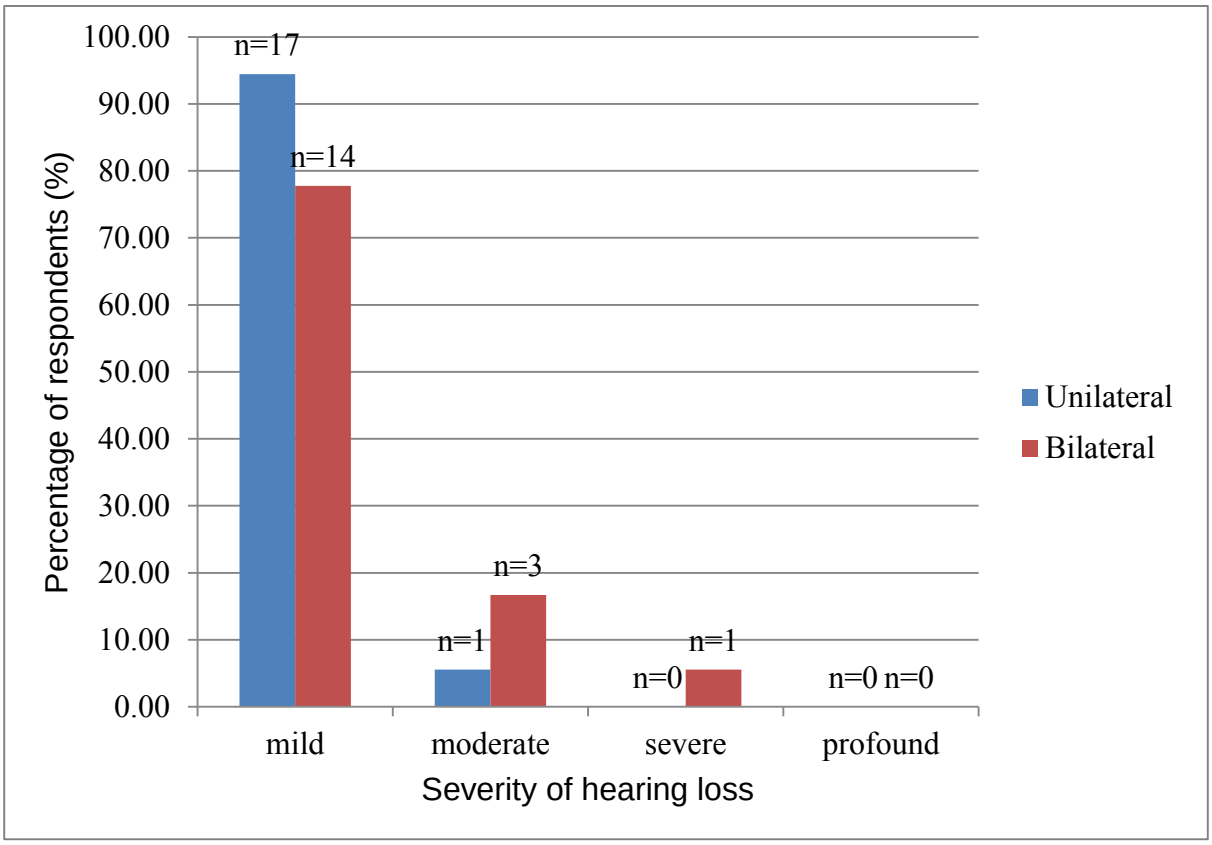

Figure 5: Prevalence of potential hearing loss according to the severity (n-36)

In the current study it was found that out of the 132 respondents 13.6% presented with a potential unilateral hearing loss while another 13.6% presented with a potential bilateral hearing loss. In other words, out of the 36 respondents that presented with potential hearing loss, half presented with a potential unilateral hearing loss (18 or 50%), while the other half presented with a potential bilateral hearing loss (18 or 50%) (Figure 6). This finding is unusual; particularly since the number of potential unilateral hearing loss in comparison to potential bilateral hearing loss is high for any population. One study conducted in the U.S.A found that out of 29 million Americans, 7.3% presented with a bilateral hearing loss while 8.9% presented with a unilateral hearing loss (Agrawal et al., 2008). Therefore, the prevalence of both losses in the current study is more in comparison to that found in the U.S.A. This suggests that the respondents are at greater risk for hearing loss than the general population (Agrawal et al., 2008; NPC, 2012b), because they work in conditions which are known risk factors for hearing loss (Pyykko, Toppila, Zou, & Kentala, 2007). Industries in developed countries like the

U.S.A. have more WHLPP that can reduce the likelihood of acquired hearing loss than developing countries like Namibia (Stevens et al., 2011).

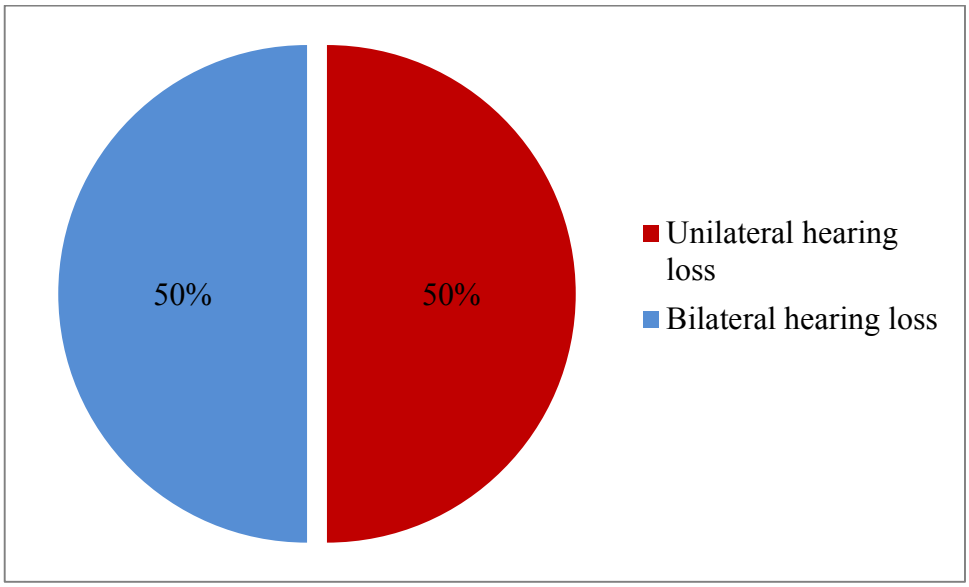

Figure 6: Prevalence of potential unilateral versus potential bilateral hearing lossin percentage (n=36)

Figure 7 displays the prevalence of potential unilateral hearing loss in the mining population. Out of the 18 respondents that presented with a potential unilateral hearing loss, there were a total of 20 individual types of hearing loss. Of these, 18 presented with a unilateral HFHL (UHFHL) of which ten (10 or 55.56 %) were on the left ear and eight (8 or 33.33 %) were on the right ear. Two (or 11%) respondents presented with AFHL (PTA 0.5, 1, 2 & 4 kHz) as well as HFHL (PTA 4 & 8 kHz) on the right ear. No other combinations were noted. This could be because occupational hearing loss typically commences in the higher frequencies and gradually affects the other frequencies such as the all major frequencies (Rabinowitz, 2000).

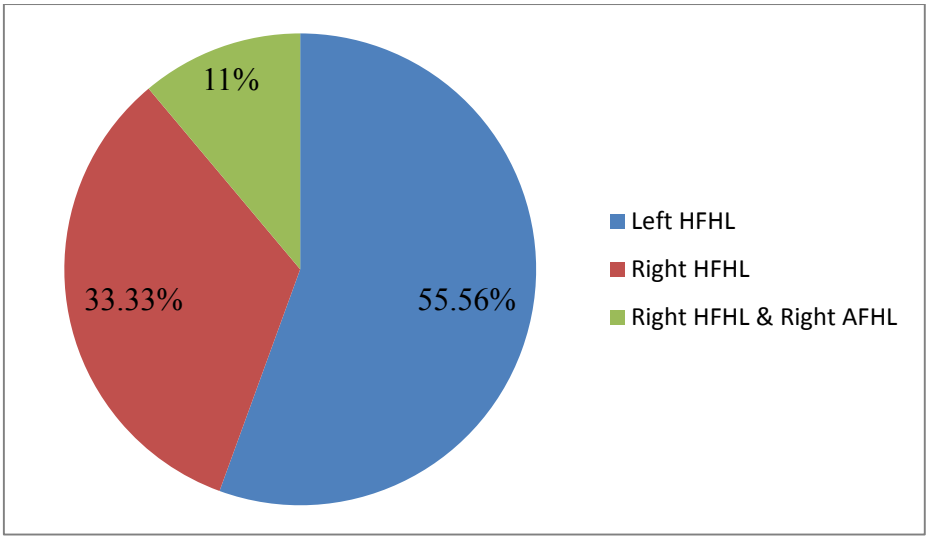

Figure 7: Percentage of respondents withindividual types of potential unilateral hearing loss (n=18)

Figure 8 refers to the prevalence of respondents with individual potential bilateral hearing loss. Among the 18 respondents whose screening assessments indicated a potential bilateral hearing loss, the majority or 12 (66.67%) presented with a Bilateral High Frequency Hearing Loss (BHFHL). Three (16.67%) of the respondents presented with AFHL (PTA 0.5, 1, 2 & 4 kHz) and HFHL (PTA 4 & 8 kHz) on the left ear as well as a HFHL on the right ear. Two (11.11%) respondents had an AFHL (PTA 0.5, 1, 2 & 4 kHz), HFHL (PTA 4 & 8 kHz) and LFHL (PTA 0.5, 1 & 2 kHz) on the right ear as well as HFHL on the left ear. Only one respondent (5.56%) presented with a combination of an AFHL and HFHL in the right ear as well as HFHL in the left ear. Hearing loss due to noise exposure commences in the high frequencies and gradually deteriorates among the other frequencies (Amedofu, 2002; Rabinowitz, 2000).

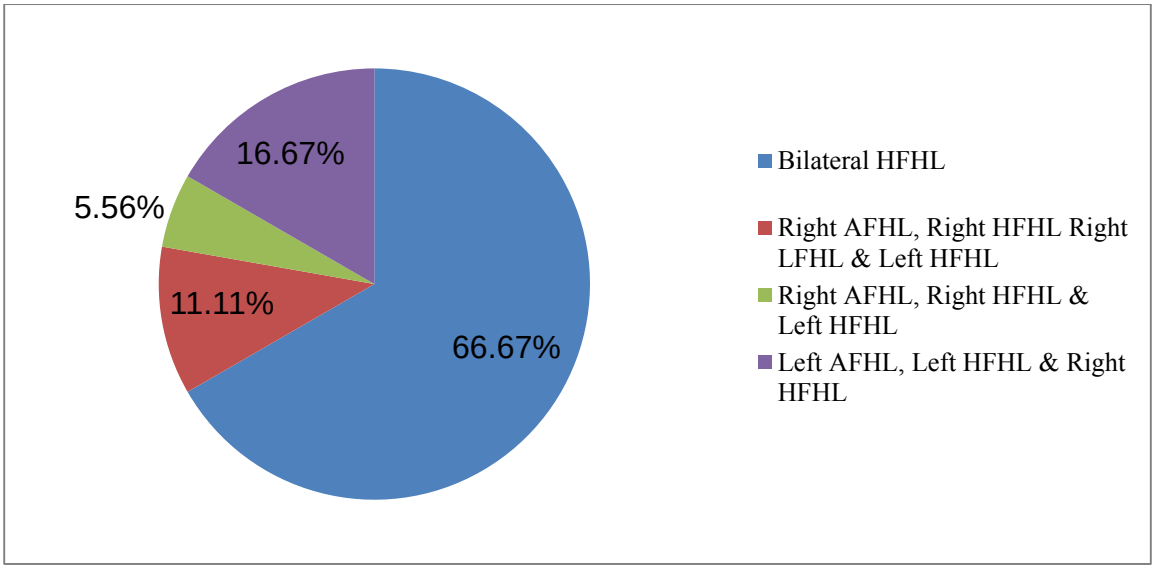

Figure 8: Prevelence of respondents with individual potential bilateral hearing loss (n=18)

However, high frequency hearing loss has often also been associated with Age, occupational noise and chemical exposure as well as ototoxic medical treatments. However, studies that focused on NIHL in the mining sector associated HFHL with excessive exposure to loud noise (Chadambuka, Mususa, & Muteti, 2000; Kim & Kwon, 2012; Strauss et al., 2012).

It can be argued that the population under-investigation are exposed to hazardous levels of noise (McBride, 2004) and therefore, at risk for acquiring hearing loss as a result of their working conditions. However, the effect of other risk variables should be considered.

4.2. Associated factors

The second and third objectives of the study were to describe the factors associated with potential hearing loss. Table 2 displays both extrinsic and intrinsic factors which were found to be significant.

Table 2: Summary of variables found to be significant and associated with potential hearing loss in the Namibian mining sector

Variable(n=valid responses)	Total number of respondents with variable N (%)	Total number of respondents with potential hearing loss & variable	df	Chi square statistic χ^2	p value	OR (95% CI)
EXTRINSIC FACTORS						
Occupational						
Number of years employed in whole life ≥10 years (n=131)	83 (63.36)	29 (22.14)	1	6.32	0.012	3.1 (1.3 - 7.9)
Number of years in current job ≥10 (n=128)	38 (29.69)	18 (14.06)	1	10.9	0.001	3.9 (1.7 - 8.8)
No formal training in HL prevention provided (n=125)	43 (34.4)	6 (4.8)	1	5.23	0.022	0.3 (0.1. – 0.9)
Medical						
History of Diabetes (n=132)	8 (6.06)	5 (3.79)	-	-	0.035*	5 (1.1 - 22.1)
INTRINSIC FACTORS						
Age ≥ 40 years (n-131)	45 (34.35)	20 (15.27)	1	9.9	0.002	3.5 (1.6 - 7.8)
Age ≥ 50 years (n=131)	18 (13.74)	11 (8.4)	1	11.84	0.001*	5.5 (1.9 - 15.8)
* Calculated utilising Stata version 12.1						

4.2.1. Extrinsic factors

The second objective of the current study was to investigate whether extrinsic factors, specifically occupational, social and medical factors are associated with hearing loss in the Namibian mining sector.

Associated factors

Only extrinsic occupational and medical factors were found to be significant.

4.2.1.1. Occupational factors

Two extrinsic occupational variables found to be associated with hearing loss were the number of years an individual had been employed in his whole life and the number of years the individual had been employed in his/her current job.

a) Number of years employed in whole life

As reflected in Table 2, one of the variables that were found to be significantly associated with potential hearing loss is the number of years the respondents have been employed in their whole lives. This factor is thought to be related with Age. It is expected that older individuals have been employed for longer periods than their younger counterparts. This is evident when looking at the trend of the number of years employed and comparing it to the demographic age groups (Namibia Statistics Agency, 2013). In this study, the majority of respondents were employed between 10-19 years, followed by the group employed 1-9 years, the group employed 20-29 years and the group employed 30-39 years. Only one individual worked for <1 year while another one for >40 years (Figure 9). According to the results contained in (Table 2) respondents that were employed for > 10 years were 3.1 times more likely to be identified with potential hearing loss than individuals that were employed for < 10 years (OR = 3.1; CI 1.3-7.9). This is consistent with a longitudinal study that found that NIHL is evident after 10-15 years of exposure (Taylor et al., 1965). The minimum amount of years employed in whole life was <1 year, while the maximum amount of years was 40 years. The average amount of years employed in whole life was 13.8 years. The majority (54 out of 131 or 40.91%) of respondents were employed between 10-19 years. Forty-seven (35.61%) were employed between 1-9 years,

16 (12.12%) were employed between 20-29 years and 12 (9.09%) were employed between 30-39 years. One respondent (0.76%) was employed for less than one year while another one (0.76%) was employed for more than 40 years. One respondent (0.76%) was excluded as this question was not answered.

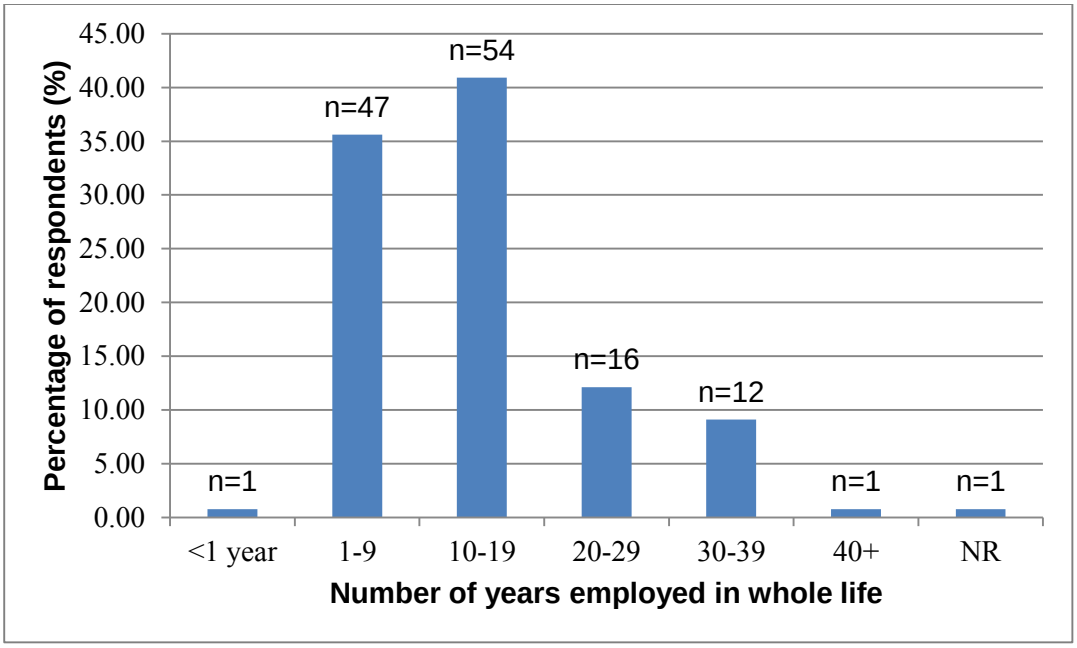

Figure 9: Age of respondents employed in whole life (n=131)

For analysis purposes, the data was grouped into two categories, namely individuals who were employed for less than 10 years and those employed for more than 10 years. Table 3 depicts the results obtained when the number of years employed were considered relative to hearing status. Out of the 83 respondents that had been employed for more than 10 years, 29 (22.14%) were identified with potential hearing loss, while 54 (41.22%) did not present with hearing loss. Of the 48 respondents (36.64%) who were employed for less than 10 years, seven (5.34%) were identified with potential hearing loss while 41 (31.3%) did not present with any hearing loss. As reflected in Table 2, the percentage of respondents identified with potential hearing loss who had been employed for more than 10 years were significantly different to the percentage of respondents identified with potential hearing loss who had been employed for less than 10 years ($p = 0.012$). According to the findings of the current study, the odds of being identified with potential hearing loss was 3.1 times greater in respondents who had been employed for more than 10 years as compared to respondents who had been employed for less than 10 years (OR= 3.9; CI: 1.3-7.9). This supported the literature which reported that occupational noise exposure is evident in individuals who have been exposed for 10-15 years

(Taylor et al., 1965). Moreover, as one becomes older hearing deteriorates due to hair cell degeneration in the cochlea (Fransen et al., 2008).

Table 3: Frequency table indicating number of respondents employed in whole life≥10 years in relation to hearing status

	Hearing status		
	Potential Hearing loss N (%)	No hearing loss N (%)	**Total N (%)**
Worked≥10 years (whole life)	29 (22.14)	54 (41.22)	**83 (63.36)**
Worked<10 years (whole life)	7(5.34)	41 (31.3)	**48 (36.64)**
Total	**36 (27.48)**	**95 (72.52)**	**131 (100)**

b) Number of years employed in current job

Figure 10 displays the results of the number of years an employee has been working in his/her current job. The minimum and maximum amount of years employed in the current position was <1 year and 35 years respectively. The average amount of years employed in the current job was 8.66 years. Almost two thirds (63.64%) of the respondents had been employed in their current job between one and nine years. Twenty-two (16.67%) respondents had been employed in their current jobs between 10-19 years, while 13 (9.85%) were employed between 20-29 years. Six (4.55%) held their current position for less than a year. Only three (2.27%) respondents had worked in their current jobs for more than 30 years. A total of four (3.03%) respondents data were excluded as one (0.76%) did not answer the question appropriately and another three respondents (2.27%) did not answer this question.

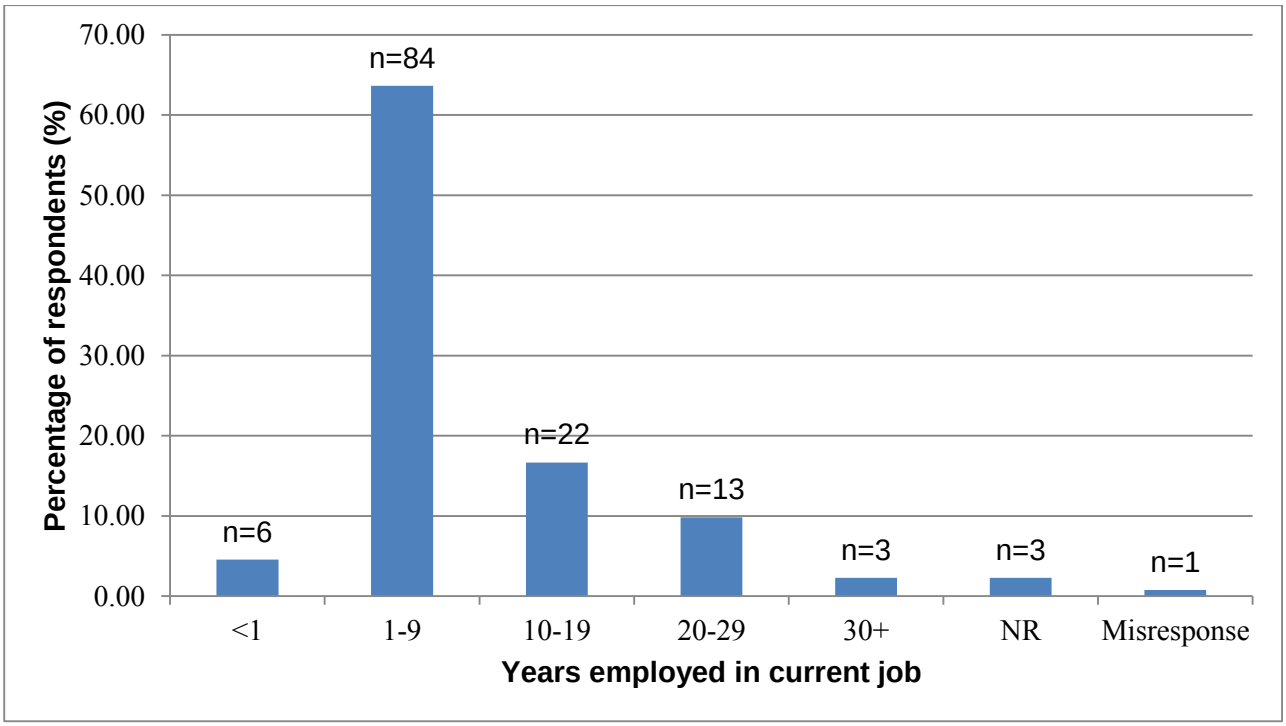

Figure 10: Percentage of respondents employed in current job in relation to the number of years employed (n=132)

For analysis purposes, the data was grouped into two categories, namely individuals who were employed for less than 10 years and those employed for more than 10 years. Table 4 is a summary of the results obtained for the number of respondents employed for more than as well as less than 10 years in their current job. Out of the 128 valid responses obtained, 38 (28.79%) were employed for more than 10 years in their current job and 90 (68. 18%) were employed for less than 10 years. A total of four (3.03%) were excluded for reasons mentioned in the previous paragraph. There were 128 valid responses, which included 18 (14.06%) respondents with hearing loss and 20 (15.63%) without hearing loss. Ninety respondents (70.31%) were employed for less than 10 years and included 17 (13.28%) respondents with hearing loss while 73 (57.03%) did not have hearing loss.

Table 4: Frequency table indicating number of respondents employed in current job for ≥10 years in relation to hearing status

	Hearing status		
	Hearing loss N (%)	No Hearing Loss N (%)	**Total N (%)**
Worked in current job≥10years	18 (14.06)	20 (15.63)	**38 (29.69)**
Worked in current job<10years	17 (13.28)	73 (57.03)	**90 (70.31)**
Total	**35 (27.34)**	**93 (72.66)**	**128 (100)**

Similar to the previous variable of number of years employed in whole life, the number of years employed in current job was also found to be associated with potential hearing loss.

As reflected in Table 2 the variable of respondents being employed > 10 years in their current job was found to be significant ($p = 0.001$). According to the findings of the current study, the odds of being identified with having a potential hearing loss was 3.9 times greater in respondents who had been employed in their current position for more than 10 years as compared to respondents who were in their current job for less than 10 years (CI: 1.7-8.8). This finding is supported by literature that suggests that exposure to occupational noise levels for periods 10-15 years can result in hearing loss (Taylor et al., 1965). Moreover, employees who have been working for several years in the same job may become complacent and miss out on some of the WHLPP measures such as going for regular hearing evaluations (Centers for Disease Control and Prevention, 2011) (CDC, 2011) and regular use of protective clothing including HPDs (Morata et al., 2005; Zungu, 2012). Finally, these findings could be the result of cochlear hair cell degeneration as the individual ages (Fransen et al., 2008).

c) No formal training in hearing loss prevention

Table 5 displays the results related to whether formal training in the prevention of hearing loss was received. Forty-three (34.4%) out of 125 respondents indicated that they did not receive formal training in the prevention of hearing loss while 82 (65.6%) indicated receiving formal training. Seven (5.3%) out of 132 respondents were excluded as they did not answer this question). Data from the audiograms indicated that out of those respondents that indicated that they had not received formal training, 37 (29.6%) were identified as not having hearing loss

while 6 (4.8%) were identified with potential hearing loss. Of those 82 (65.6%) individuals that reported having received formal training in hearing loss prevention, 55 (44%) respondents did not have a hearing loss while 27 (21.6%) respondents were identified with potential hearing loss. As can be seen in Table 2 the percentage of respondents with potential hearing loss who had received formal training was significantly different from the percentage of respondents with potential hearing loss who had not received formal training ($p = 0.02$). The Odds Ratio for the respondents who did not receive training was 0.3 (CI: 0.1-0.9).

Table 5: Frequency table indicatin the number ofrespondents with no formal training in relation to hearing status

	Hearing status		
	Potential hearing loss N (%)	No Hearing Loss N (%)	**Total N (%)**
No formal training	6 (4.8)	37 (29.6)	**43 (34.4)**
Formal training	27 (21.6)	55 (44)	**82 (65.6)**
Total	**33 (26.4)**	**92 (73.6)**	**125 (100)**

In this study, therefore individuals who did not receive formal training were 0.3 times more likely to be identified with with hearing loss than individuals who received formal training in hearing loss prevention (CI 0.1-0.9). This suggests that not receiving formal training is a protective factor rather than a risk factor. This is an unexpected result as it contradicts literature that reports that training reduces the incidence of hearing loss in noisy environments (Daniell, Swan, et al., 2002; Davies, Marion, & Teschke, 2008). A possible reason for this finding is that the respondents may have misinterpreted the term "formal training". Formal training as defined by Eraut (2004) should be an organized event with a prescribed framework, an allocated trainer as well as a form of accreditation. This term was described during the PowerPoint presentation of the questions during the data collection procedure. However, respondents' idea of formal training may have differed from what was explained. Moreover, the majority of the other questions that addressed the Training and Education component were appropriately answered and were found to be insignificant risk factors (Refer to Training and Education Section in Table 19 in Appendix N).

4.2.1.2. Medical factors

Diabetes

Table 6 displays the number of respondents with Diabetes in relation to their hearing status. The prevalence of Diabetes among the respondents was 6.06%. (8 out of 132 respondents). Therefore, 124 of the respondents (93.94%) did not indicate a history of Diabetes. Of the eight Diabetic respondents, five (3.79%) were identified with potential hearing loss and three (2.27%) did not have hearing loss. Out of the group that indicated that they did not have a history of Diabetes, 31 respondents (23.48%) were identified with potential hearing loss while 93 (70.45%) did not present with hearing loss. As can be seen in Table 2 the percentage of respondents identified with potential hearing loss who had Diabetes was significantly different from the percentage of respondents identified with potential hearing loss and did not have Diabetes ($p = 0.0035$). The findings indicate that the odds of being identified with potential hearing loss is 5 times greater for the respondents who have Diabetes than for those who do not have Diabetes (OR=5; CI =1.1 -22.1).

Table 6: Frequency table indicating Diabetes in relation to Hearing status

	Hearing status		
	Potential hearing loss N (%)	No hearing loss N (%)	**Total N (%)**
Diabetes	5(3.79)	3(2.27)	**8 (6.06)**
No Diabetes	31(23.48)	93(70.45)	**124(93.94)**
Total N (%)	**36(27.27)**	**96(72.73)**	**132 (100)**

The prevalence of Diabetes for this study (6.06%), is more than the estimated global prevalence of 2.8% in 2000 and the estimated global prevalence of 4.8% for 2030 (Wild et al., 2004). These results correlate with the findings of several studies that have indicated a significant relationship between these two conditions (Bainbridge, Hoffman & Cowie, 2011; Ishii, Talbott, Findlay, Antonio, & Kuller, 1992; Kakarlapudi, Sawyer, & Staecker, 2003; Mozaffari et al., 2010). Ishii et al (1992) reported that out of 146 men with non-insulin dependent diabetes mellitus (NIDDM) 16.4% presented with severe NIHL, where the pure tone average was

≥65dBHL. That particular study further reported that individuals with Diabetes were 3.9 times more likely to present with hearing loss than individuals without hearing loss (CI 1.2-11.9). The current study found that individuals with Diabetes were 5 times more likely to be identified with potential hearing loss than individuals who were non-diabetic with the true effect of the population ranging between 1.1 and 22.1. A significant relationship was found despite the small sample of respondents. However, the confidence interval suggests that the sample size should be increased to establish the true association. The clinical relevance of these results are important as the findings are in agreement with many other studies (Bainbridge et al., 2011; Chalmers & Neill, 2012; Dalton et al., 1998). These recommended that the surveillance and monitoring of hearing levels in individuals with this medical condition be conducted more frequently to avoid deterioration in their hearing levels.

One study conducted in the mining industry in Australia reported that miners are more at risk for Diabetes due to pre-existing conditions of obesity and hypertension (Chalmers & Neill, 2012). Although obesity was not included as a variable for investigation in this study, seven (5.3%) of the respondents indicated obesity in "Other medical conditions" in Question 5 of the questionnaire. A further variable which should be considered when contemplating the impact of Diabetes is Age. Age has been found to be associated with several medical conditions including Diabetes (Bainbridge, Hoffman & Cowie, 2011; Mozaffari, Tajik, Ariaei, Ali-Ehyaii, & Behnam, 2010).

4.2.2. Intrinsic factor

The third objective of this study was to investigate whether intrinsic variables such as age, gender, hereditary hearing loss or consanguineous marriage were associated with hearing loss in the Namibian mining sector. Among these variables, only Age was found to be significant.

Age

As can be seen in Figure 11 below, 53 (40.15%) respondents were classified into the Age group (in years) 30- 39. This group was followed by the Age groups 20-29 with 33 (25%), 40-49 with 27 (20.45%) and 50-59 with 16 (12.12%) respondents respectively. The Age group 60+ presented with the least, with only 2 (1.52%) respondents. One respondent (0.76%) was

excluded as this question was not answered. The minimum and maximum ages were 23 and 63 years old with a mean age of 37 years. The same trend is found among employees in the general Namibian mining population (Unpublished data from the NSA, 2013). It was noted that the percentage of respondents in this study decreased for every ten year increase in Age i.e. there is a tendency of mining employees to leave as they grow older. This is expected as the taxing nature of working within the mining sector is a recognized fact (Cheyip et al., 2007).

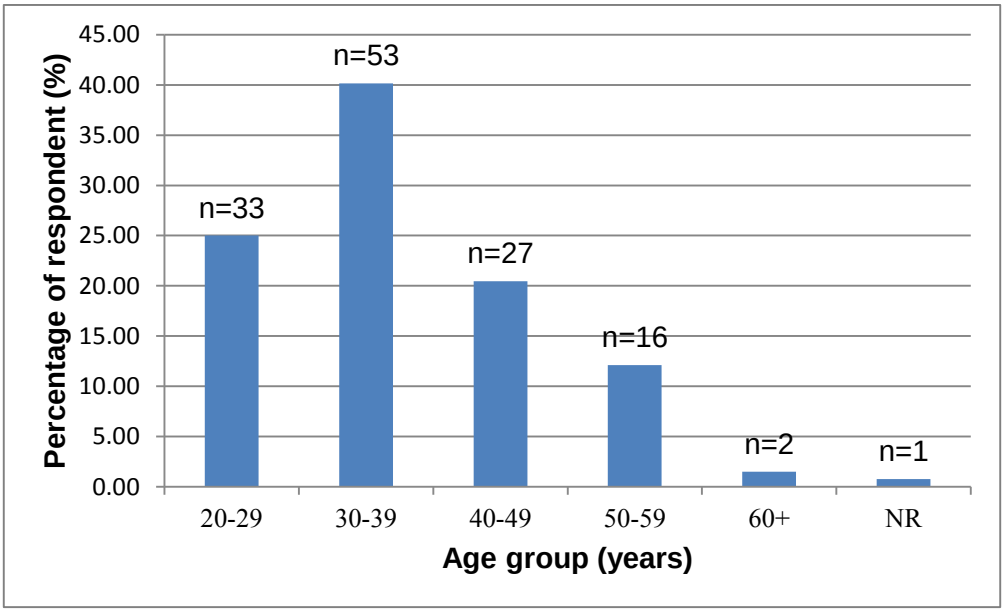

Figure 11: Demographics of respondents according to age group in percentage (n=132)

For the purpose of analysis, the Age groups were reduced to two groups, namely respondents older than 40 years and those less than 40 years. One (0.76%) respondent out of 132 was excluded as he did not answer the question. Out of 131 valid responses, 45 (34.35%) were aged more than 40 years old and included 20 (15.27%) with potential hearing loss and 25 (19.08%) without hearing loss. Eighty-six respondents (65.65%) were younger than 40 years old and included 16 (12.21%) respondents with potential hearing loss and 70 (50.4%) respondents without hearing loss (Table 7). As reflected in Table 2, the percentage of respondents with hearing loss who were aged >40 years old were significantly different to the percentage of respondents <40 years old (p = 0.02). The findings of the current study suggest that the odds of being identified with potential hearing loss was 3.5 times more likely in respondents who were aged more than 40 years old in comparison to respondents who were aged less than 40 years old (OR=3.5; CI 1.6-7.8).

Table 7 Frequency table of Age group (≥40 years) in relation to Hearing status

	Hearing status		
	Potential Hearing loss N (%)	No hearing loss N (%)	**Total N (%)**
Age≥40 years	20 (15.27)	25 (19.08)	**45(34.35)**
Age<40 years old	16(12.21)	70 (53.44)	**86(65.65)**
Total	**36 (27.48.)**	**95 (72.52)**	**131 (100)**

The results depicted in Table 8 shows that out of 131 valid responses, 18 (13.74%) were older than 50 years and included 11 (8.4%) with potential hearing loss and 7 (5.34%) without hearing loss. Hence, 113 respondents (86.26%) were aged less than 50 years old and included 25 (19.08%) respondents with potential hearing loss and 88 (67.18%) respondents without hearing loss. One respondent (0.76%) out of 132 was excluded as he/she did not answer this question. As indicated in Table 2 the variable of being aged more than 50 years old was found to be significant (p = 0.01). According to the findings of the current study, the odds of being identified with potential hearing loss was 5.5 times greater in respondents who were aged more than 50 years old as compared to respondents who were aged less than 50 years old (CI 1.9-15.8).

Table 8: Frequency table of respondent's agegroup (years>50) in relation to hearing status

	Hearing status		
	Potential hearing loss N (%)	No Hearing loss N (%)	**Total N (%)**
Age≥50years	11(8.4)	7 (53.4)	**18(13.74)**
Age<50 years	25 (19.08)	88(67.18)	**113(86.26)**
Total	**36(27.48)**	**95(72.52)**	**131(100)**

Studies have suggested that Age is a factor that plays the most significant and inevitable role in acquiring hearing loss (Ahmed, Dennis, & Ballal, 2004; Daniel, 2007). Age is a non-modifiable and unavoidable risk factor associated with hearing loss (Daniel, 2007). The current study found a significant relationship between hearing loss and being older than 40 year (p=0.02) and being older than 50 years (p=0.01). The hearing loss associated with being older than 50 years was expected as the literature affirms that hearing loss related to Age is often more evident from the age of 50 years old and above (Dobie, 2008). The results indicated that respondents who were older than 40 years were 3.5 times more likely to be identified with potential hearing loss than individuals who are younger than 40 years old (CI=1.6-7.8). Furthermore, respondents who were older than 50 years old were found to be 5.5 times more likely to be identified with potential hearing loss than individuals that were younger than 50 years old (CI 1.9-15.8). This increase in odds ratio between the two age groups suggests that an increase in age, increased the likelihood of an individual being identified with potential hearing loss for individuals working in the mines. These findings correlated with existing literature as one study found that with an increase in age (five year interval), the number of individuals with normal hearing levels decreased, while the total number of individuals with hearing loss increased for every additional five year interval (Strauss et al., 2012). The findings of the current study is further supported by the results of a longitudinal study that found that for every 10 years an individual ages, the presence of hearing loss increased (Pearson et al., 1995). Amedofu (2002) reported similar findings. Therefore, while respondents are employed in noisy environments, Age cannot be ruled out as a contributing risk factor in the development of hearing loss. These results highlight the need for more stringent surveillance and monitoring of hearing in these groups.

4.2.3. Among the five significant factors, which has the most impact?

The final logistic regression model only included the five significant variables described in the previous section in their original unit of measurement in the questionnaire. These included (1) Age in years, (2) history of Diabetes, (3) number of years employed in whole life, (4) number of years employed in current job (5) whether they did not receive formal training (Table 9):

Table 9: Multiple logistic regression model to predict the likelihood of potential hearing loss

Variable	df	β	SE β	Wald χ^2	P	Adjusted Odds Ratio (AOR) (95%CI)
Age	1	0.0613	0.0465	1.7349	0.1878	1.06 (0.97 -1.16)
Diabetes	1	-0.6975	0.9183	0.5768	0.4476	0.49 (0.08 - 3.01)
Number of years employed-whole life (years)	1	-0.0327	0.0542	0.3644	0.5461	0.96 (0.870 -1.076)
Number of years employed - current job	1	0.0937	0.0498	3.5417	0.0598	1.09 (0.99 -1.21)
No formal training received	1	1.1864	0.5677	4.3673	0.0366	0.305 0.1-0.928
Intercept	1	-3.9077	1.6182	5.8314	0.0157	

Among the five significant variables that were found to be associated with potential hearing loss, only No formal training was found to be associated in the presence of the other variables (p=0.03; OR=0.305, 95%CI 0.1-0.92). This suggests that individuals who do not receive formal training are 0.305 times more likely to be identified with potential hearing loss than individuals that receive formal training and is therefore a protective factor. As was previously mentioned this was an unexpected result as it contradicts literature that advocates for training and education as a means to reduce hearing loss (Davies et al., 2008; Verbeek, Kateman, Morata, Dreschler, & Sorgdrager, 2009). This anomaly could be attributed to respondents not understanding the term "formal" training as it was defined in this study.

However, caution should be practiced when interpreting this finding as the purpose of this study was strictly descriptive and not to determine a causal relationship between these factors.

There is collinearity among the variables of employment in whole life, employment in current job, Diabetes and Age that suggested the remaining four significant factors are interrelated and cannot be separated in order to determine the impact of each in the acquisition of hearing loss. For example, Age can be correlated with the number of years the employee worked in his whole

life as well as the number of years they worked in the current job. As an individual gets older, the number of years he/she is employed either in his/her whole life or current job where he/she is exposed to noise also increases (Amedofu, 2002; Pyykkö, Ilmari, Toppila, Esko, Zou, Jing & Kentala, 2007; Toppila et al., 2001). Age has also been found to be related to condition, Diabetes (Kesavadev, Short, & Nair, 2003).

4.3. Non-associated factors

The variables which were found not to have a significant relationship with potential hearing loss are reflected in Tables 10-13. A brief discussion of these results follows each section.

4.3.1. Extrinsic occupational factors

Table 10: Summary of non-significant extrinsic occupational factors

Variables (n=valid responses)	Number (%) of respondents with variable	Number (%) of respondents with variable and potential hearing loss	OR (95% CI)	p value
Exposed to toxic chemicals Yes (n=117)	64 (54.7)	20 (17.09)	2 (0.8 - 4.7)	0.127
WHLPP available Yes (n=108)	71 (65.74)	19 (17.59)	1 (0.4 - 2.4)	0.976

May (2000) states that exposure to ototoxic substances; including heavy metals such as mercury, lead, arsenic and cobalt as well as organic compounds such as toluene, styrene could compromise the auditory function. These substances are often found in the mining industry and therefore place individuals at risk for hearing loss (Donoghue, 2004). Several studies have found significant relationships between toxic chemical exposure and hearing loss (Fransen et al., 2008; Kim & Kwon, 2012; Mäkitie et al., 2003; Sliwinska-Kowalska et al., 2004). In the current study while exposure to chemicals was found to be insignificant (p=0.127), individuals that reported being exposed to chemicals were twice as likely to be identified with potential hearing loss than individuals without such a history with the true effect of the population ranging between 0.8 to 4.7 (OR=2; CI 0.8-4.7) (Table 10)

As can be seen in Table 10, 37 out of 108 respondents (34.26%) reported that there were no WHLPP available. Although 10 (9.26%) of these respondents were identified with a potential hearing loss, no association could be established between the availability of a WHLPP and potential hearing loss (OR=1, CI 0.4 to 2.4). A possible reason for the results is that many of the respondents were not certain of the definition of a WHLPP as shown by the fact that 24 respondents were excluded, of which 19 did not know how to answer the question and 5 did not answer this question. Individual variables within components of the WHLPP were explored. A detailed summary of all variables can be found in Appendix N.

4.3.2. Extrinsic social factors

Despite much literature that reported the association of hearing loss with smoking (Nakanishi et al., 2000; Palmer et al., 2004; Pouryaghoub et al., 2007), alcohol consumption (Fransen et al., 2008; Popelka et al., 2000; Upile et al., 2007) and engaging in leisure activities that expose the individual to loud sound (Clark, 1991; Levey et al., 2011; Ramma et al., 2011), the current study found these variables to be insignificant (p=0.084), (p=0.131) and (p=0.595). This is summarized in Table 11.

Table 11: Summary of extrinsic social factors

Variable (n=total number of valid responses)	Number (%) of respondents with variable	Number (%) of respondents with variable and potential hearing loss	OR (95% CI)	p value
Smoking Yes (n=129)	36 (27.91)	14 (10.85)	2.1 (0.9 - 4.7)	0.084
Drinking Yes(n=130)	91 (70)	21 (16.15)	0.5 (0.2 - 1.2)	0.131
Engage in at least one leisure activity that exposes him/her to loud sound Yes (n=126)	72 (57.14)	17 (13.49)	0.8 (0.4 - 1.8)	0.595

4.3.3. Extrinsic medical factors

Table 12 summarises the relationship between hearing loss and the individual medical conditions of chronic ear infection (p=0.705), head trauma/injury (p=0.392), cholesterol (p=0.34) and hypertension (p=0.077). It also summarises the relationship between potential hearing loss and possible ototoxic treatment for conditions like TB (p=1), HIV/AIDS (p=1), Cancer (p=0.473), Malaria (p=0.189) and Chronic pain (p=0.285). All these conditions were also found to be insignificant, despite the literature indicating significant relationships between individual variables.

Table 12: Summary of insignificant extrinsic medical factors

Variable (n=total number of valid responses)	Number (%) of respondents with variable	Number (%) of respondents with variable and potential hearing loss	OR (95% CI)	p value
Chronic ear infection Yes(n=132)	13 (9.85)	4 (3.03)	1.2 (0.3 - 4.2)	0.705*
Head injury/trauma Yes (n=132)	7 (5.3)	3 (2.27)	2.1 (0.4 - 9.8)	0.392*
Cholesterol Yes (n=132)	13 (9.85)	5 (3.79)	1.8 (0.5 - 5.8)	0.34*
Hypertension Yes(n=132)	17 (12.88)	8 (6.06)	2.8 (1 - 7.8)	0.077*
Tuberculosis (TB) Yes (n=132)	8 (6.06)	2 (1.52)	0.9 (0.2 - 4.6)	1*
HIV/AIDS Yes (n=132)	7 (5.3)	2 (1.52)	1.1 (0.2 - 5.8)	1*
Cancer Yes (n=132)	2 (1.52)	1 (0.76)	2.7 (0.2 - 44.6)	0.473*
Malaria Yes(n=132)	7 (5.3)	0 (0)	0.2 (0 - 5.6)$	0.189*
Chronic pain Yes (n=132)	10 (7.58)	1 (0.76)	0.3 (0 - 2.3)	0.285*

* Calculated utilising Stata version 12.1

4.3.4. Intrinsic factors

The relationship between the individual factors of gender, heredity and consanguinity and potential hearing loss were found to be insignificant (p=0.153), (p=0.153), (0.890) and (p=1). This was found to be the case in the current study, despite literature indicating a positive relationship between hearing loss and male gender (Bauer et al., 1991; Kim & Kwon, 2012), family history of hearing loss (Li & Friedman, 2002) as well as consanguinity (G. Chen et al., 2011; Zakzouk, 2002). These findings are displayed in Table 13.

Table 13: Summary of insignificant Intrinsic risk factors

Variable (n=total valid responses)	**Total number of respondents with variable (%)**	**Total number of respondents with variable and potential hearing loss (%)**	**OR (95% CI)**	**p value**
Gender				
Male (n=132)	115 (87.12)	34 (25.76)	3.1 (0.7 - 14.5)	0.153*
Female (n=132)	17(12.88)	2(1.52)	0.3 (0.1-1.5)	0.153*
Family history of hearing loss Yes(n=114)	27 (23.68)	8 (7.02)	0.9 (0.4 - 2.4)	0.890
Consanguinity Yes(n=108)	10 (9.26)	3 (2.78)	1.2 (0.3 - 4.9)	1*
* Calculated utilising Stata version 12.1				

The confidence intervals among the insignificant factors tend to be wide and span over the value of one. This suggested that a bigger sample would be required to determine the true effect or association of individual factors with hearing loss (Webb & Bain, 2011).

5. CONCLUSION, CRITIQUE & RESEARCH IMPLICATIONS

5.1.Conclusion

Potential hearing loss is common among mining employees in Namibia and was found to be prevalent in 27% of respondents. However, caution must be exercised when utilizing these data as the sample was small and not representative of the general population of mine workers as this sample was take from Class A mines only. Among the various extrinsic and intrinsic factors investigated in this study five factors were found to be associated with hearing loss. The extrinsic occupational factors included whether the individual received formal training in the prevention of hearing loss, the number of years employed in whole life as well as the number of years employed in his/her current job. The latter two were particularly found to be associated if the individual was employed in their whole life as well as their current job for more than 10 years. Among the extrinsic medical conditions, only Diabetes was found to be significant. The only intrinsic factor found to be associated with hearing loss was Age, particularly if were individuals were aged >40 and >50 years old.

This study demonstrated that the surveillance of data in the mines is useful in describing relationships and identifying risk factors for hearing loss. Although limited in its scope it also demonstrated that some effort is being made in order to promote health and prevent hearing loss among category A mining companies in Namibia.

5.2.Critique and research implications

The availability of data pertaining to health related issues such as occupational hearing loss in developing countries is under-reported due to no or limited data available (Smith, 1998). This study addressed this issue by investigating the prevalence of potential hearing loss and describing factors that were found to be associated with it (hearing loss) among mine workers in Namibia.

When drawing conclusions about the results of this study, caution should be exercised as the data is based on screening audiograms rather than diagnostic data for the presence of hearing loss. Information regarding the noise levels in the environment or measures carried out to control the levels of noise in the environment during hearing assessment were not recorded. Hence, the prevalence of potential hearing loss may have been over-estimated.

Moreover, the sample size was small. This was demonstrated by the wide confidence intervals among all the factors investigated in the study regardless of whether they were found to be significant or insignificant. In this study convenience sampling was utilized as respondents were selected at the convenience of their foremen so as to ensure the safety of their work stations. However, researcher bias was avoided in this manner as the PI was not involved in the selection of the respondents during the data capturing phase. On the other hand, by utilizing this sampling method, the sample was not representative of all employees at a particular mine (Webb & Bain, 2011). Moreover, the sample included individuals who were present at work at the time of data collection. This could exclude employees who potentially could present with hearing loss, but who were absent and could not participate in this study. This is known as the healthy worker effect. It is recommended that future studies utilise stratified sampling as a technique in order to make the sample more representative of the population at each mine and the mining industry at large (Grimes & Schulz, 2002). For example, mines that employ a bigger number of employees should have comprised a larger proportion of the sample investigated.

At the initial phase of the study, an attempt was made to utilise stratified sampling to make the sample more representative. Prior to commencing research, the PI contacted various mines to gather information pertaining to occupational health related issues including the factors associated with hearing loss in mines. However, mines were reluctant to answer questions regarding occupational issues without prior endorsement of the Chamber of Mines. At one mine, for example, access to medical records were initially restricted to only the hearing

evaluation and the PI would have not been able to carry out a review of other risk factors that could contribute to hearing loss in this study. This demonstrates mines' reluctance to release such information, possibly to protect employees' confidential records. Moreover, as contact with mines was limited prior to data capturing the PI was initially not familiar with the different setup and setting of each mine. Each mine had their own filing system and it was challenging to plan the reviewing of medical records in advance.

The disadvantages and difficulties with retrospective file reviews should also be contemplated. One disadvantage is that during data collection, biological assessment results included medical jargon which may not have been easily comprehended by the PI and could have resulted in essential information being omitted (Worster & Haines, 2004). Another disadvantage of retrospective file reviews is that it was not possible to verify conflicting data as some data in the questionnaire was not reflected in the file review. However, this methodology has its advantage in that information that was omitted in the questionnaire was reflected in the file. This could also be seen as a method of triangulation, which can increase reliability (Bryman, 2003). Moreover, it is an inexpensive method of gathering data regarding the respondents' health (Gearing et al., 2006).

It is noteworthy that surveillance and monitoring efforts are being carried out particularly among the Class A mines. The availability of hearing evaluations demonstrates this and results indicated that most respondents were assessed at least once a year. On the other hand, some mines that had hearing assessment results did not indicate when last the equipment was calibrated, which queries the internal reliability of the test results. As this current study included only Class A mines, further research should be conducted to describe the prevalence of hearing loss as well as associated risk factors in non-Class A mines to generate a more comprehensive perspective of the Namibian mining industry and thereby reduce selection bias.

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…

APPENDICES

APPENDIX A:

List of mining companies registered with the Chamber of Mines

Class A Founder Members

Namdeb Diamond Corporation (Pty) Ltd	O. N. Shikongo	R. Burger
Rossing Uranium Ltd	C. Salisbury	

Class A Members

Okorusu Fluorspar (Pty) Ltd.	M. T Dawe	P. Mawoyo
AngloGold Ashanti	J. Coetzee	
Skorpion Zinc Mining	S. Kumar	
Rosh Pinah Zinc Corporation (Pty) Ltd.	C. Aspeling	H. Fourie
Langer Heinrich Uranium (Pty) Ltd.	W. Duvenhage	M. Tjipita
AREVA Resources Namibia	A. L'Hour	H. Mbako
Extract Resources / Swakop Uranium	G. Marais	
Eco (Atlantic) Oil & Gas Ltd	G Holzman	A Friedman
Chariot Oil & Gas	R Mwanachilenga	
Petrobras Oil & Gas B.V.	R Maueler	

Class B Members

Salt & Chemicals (Pty) Ltd.	R. E. Stanton	S. Anderson
Sakawe Mining Corporation	K. Kapwanga	E. Nefussy
Weatherly Mining Namibia Ltd.	C. Thomas	A. Thomson
Bannerman Mining Resources Namibia	L. Jubber	W. Ewald
Valencia Uranium (Pty) Ltd.	D. Kullmann	M. Hilmer
OHORONGO Cement (Pty) Ltd	H-W Schutte	Dr. J. Hilger

Class C Members

Diamond Fields (Namibia) Ltd.	W. Joubert	
Salt Company (Pty) Ltd	J. Klein Jnr.	J. Klein Snr.
Purity Manganese (Pty) Ltd.	A. Eretz	B. Bannai
African Bounty cc	F.T. Kuys	F.C. De Beer
Peralin (Pty) Ltd.	M. Rattay	J. Rattay

Otjozondu Mining (Pty)Ltd	A. Jones	D Shimwino

Class D Members

Ambase Prospecting (Namibia) (Pty) Ltd.	G Viviers	
B2Gold Corp	B Lytle	V. Petzel
Bafex Exploration	C Mackenzie	
Mount Burgess Gold	N. Forrester	J Moore
Onganja Mining Company (Pty) Ltd.	R. G. Carr	E. A. Barbour
PE Minerals	C. Wium	E. Mbeeli
Rio Tinto Namibia (Pty) Ltd.	K. M. Sims	N. Selibas
Teck Cominco (Namibia) Ltd	N. Ceyhan	
Hallie Investment No.14 (Pty) Ltd	S. V Bromfield	A. Ghigini
West Africa Gold Exploration	J Joubert	J Andrew
Minemakers (Namibia) (Pty) Ltd.	Amb. T Itenge-Emvula	H. Scheepers
Namibia Rare Earths (Pty) Ltd.	F. Bizouerne	K. Woodman
Reptile Uranium Namibia (Pty) Ltd.	G Cochran	P Christians
Marenica Energy Limited	M Hill	
Zhonghe Resources (Namibia) Develop.	Z Zheng	D. Ma
Nutam (Pty) Ltd.	B. De Decker	P. Looijen
Craton Mining & Exploration (Pty) Ltd.	K. Hartmann	K. Maiden
Gecko Mining (Pty) Ltd.	P. Ellis	O. Krappmann
SADC Minerals & Energy Holdings Ltd.	B. Aarninkhof	Dr. H.W. Runz
SWA Uranium Mines (Pty) Ltd.	V. Osiyuk	A.P. Osipenko
Kuiseb Mining & Processing (Pty) Ltd.	T. Smalley	
Cheetah Minerals Exploration	B. Corner	D. Verran
Namibian Copper Limited	B. Timmins	A. Marlow
Sabre Resources Namibia (Pty) Ltd.	J. Ashipala	
African Huaxia Mining (Pty) Ltd.	V. Yang	
AVONLEA Minerals Limited	K. Kaura	D. Riekie

Lodestone Namibia (Pty) Ltd.	J. Joubert	J. Grobler
Namibian Marine Phosphate (Pty) Ltd.	Amb. T Itenge-Emvula	H. Scheepers
Afri-Can Marine Minerals Corporation	B. J. Tourillon	J. Akwenye
Pitchstone Exploration Namibia (Pty) Ltd.	S.J. Blower	E A.G. Trueman
Kunene Resource Holdings (Pty) Ltd.	B. Munro	M. Yeo
China Africa Resources Namibia	E. Pekema	C. Thomas
NABIRM Energy Services (Pty) Ltd	O.O Arowolo	R.N Misika
Petuna Investment Three (Pty) Ltd	E Repina	S Paraketsov
Namibia East China Non-ferrous Investment (Pty) Ltd	L Ming	

APPENDIX B
Summary of time spent at each mine and decryption of venue

Table 14: Data collection period and venue at respective mines

Mine	**Venue**		**Number of days at each mine (days)**
	Questionnaire	***Retrospective File Review***	
Mine 1: Green Leopard (GreLeo)	On-site Training Room		3
		Onsite Health Facility	
Mine 2: * Blue Lion (BluLio)	Off-site Office	Off-site Health Facility	3
Mine 3: Orange Rhino	On-site Training Room		3

(OraRhi)		Off-site Health Facility	
Mine 4: Red Elephant (RedEle)	Off-site Training Room		2.5
		Off-site Health Facility	
Mine 5: Yellow Buffalo (YelBuf)	On-site Training Room		2.5
		Off-site Health Facility	
Total number of days	**14**		

APPENDIX C

Letter to the Chamber of Mines

P. O. Box 50157
Bachbrecht
Windhoek
NAMIBIA

TO: Mr XXXXXXX
General Manager: Chamber of Mines of Namibia
P. O. Box 2895
Windhoek

THROUGH: Dr W. Swiegers
Director: Chamber of Mines Uranium Institute

Date:

Dear Sir

REQUEST FOR PERMISSION TO CONDUCT A STUDY ON THE RISK FACTORS ASSOCIATED WITH HEARING LOSS IN THE MINING SECTOR IN NAMIBIA

The purpose of this letter is to seek permission from the Chamber of Mines to conduct the above-mentioned study and, for selection purposes, to request a contact list of mining and exploration companies that are members of your institution. In addition, may I request that your institution encourage registered mining and exploration companies to participate in the study? The criteria for participating mines include the following:

1. The company should be willing to provide written consent.
2. They should have conducted first entry and regular hearing evaluations of their employees and have kept their results in their personal medical records.
3. They should have calibrated hearing assessment equipment.
4. They should have, in their employment, health workers with appropriate training in hearing evaluation protocol to conduct hearing assessments.

I am the Audiologist employed at the Ministry of Health & Social Services, Speech Therapy & Audiology Department (Ear, Nose & Throat Clinic) at the Windhoek Central Hospital. I am registered as a Master's in Audiology student at Stellenbosch University (R.S.A.): Interdisciplinary Health Division, Speech & Hearing Department.

In my work, I regularly identify, assess and manage patients who present with ear problems such as hearing loss. Hearing loss can compromise the individual's ability to communicate and function appropriately at work, home and socially and thereby adversely impact on his/her quality of life.

I have dealt with several patients who presented with hearing loss and who also reported a history of working in environments that are potentially hazardous to their health. Such environments include being exposed to excessive sound/noise and/or toxic chemicals. Research indicates that exposure to excessive levels of sound/noise and/or toxic chemicals places individuals at risk for acquiring hearing loss. Upon further enquiry, these patients reported that as employees they were not always provided with adequate protective clothing

and devices, while others reported not being aware of the need for such precautions. This made me query whether employers in Namibia are knowledgeable about these practices and are aware that preventative measures can be implemented to reduce the risk of acquiring this occupational disorder.

On the other hand, other research indicates that some individuals do not present with symptoms of hearing loss despite working in similar environments. This suggests that there can be other factors that can affect the individual's susceptibility to acquiring hearing loss, and which is the title and purpose of my research.

The number of employees that will participate in this will depend on the number of mines that meet the above-mentioned criteria. Please refer to the table below:

Number of participating companies	**Number of participants exposed to noisy environments/per company**	**Total number of participants**
5	30	150
4	40	160
3	50	150
2	80	160
1	150	150

The target is to encourage five (5) mining companies to participate, thereby allowing 30 employees (mine-workers) at each mine to take part.

There are limited studies regarding hearing loss in Namibia and more specifically hearing loss in the occupational environment within the country. Conducting this study will address this need and will allow for establishing a general baseline of mining employees' hearing levels in Namibia. Moreover, it will identify possible areas for further research in order to prevent future hearing loss, which will improve the employee's ability to communicate effectively in the work, home and social environments.

This study complies with the ethical requirements of the Human Research Ethics Committee (HREC) at Stellenbosch University, R.S.A. as well as the Biomedical Ethics Research Committee & Research Management Committees of the Ministry of Health and Social Services, Namibia. This study will be registered with the Ministry of Health & Social Services pending your approval.

Please find attached the following documents:

- Certified copy ethics approval from the HREC, Stellenbosch University;
- My application to register the study at the Ministry of Health & Social Services;
- My research proposal;
- The Questionnaire I will use as a tool for data capturing;

- My Curriculum Vitae (CV) and
- Certified copies of my credentials.

Taking all of the above into account, I hope you will consider my request favourably by granting me permission to conduct this study, providing a contact list of mining/exploration companies that are members of your institution, and encouraging mines that meet the selection criteria above to participate.

Yours faithfully

.....
(Ms) Irene M. Barrion

APPENDIX D
Endorsement letter from Chamber of Mines

THE CHAMBER OF MINES OF NAMIBIA

14 August, 2013

TO WHOM IT MAY CONCERN

PERMISSION TO CONDUCT A STUDY ON THE RISK FACTORS ASSOCIATED WITH HEARING LOSS IN THE MINING SECTOR IN NAMIBIA

This letter serves to inform you that Ms. Irene M. Barrion is the Audiologist employed at the Ministry of Health & Social Services, Speech Therapy & Audiology Department (Ear, Nose & Throat Clinic) at the Windhoek Central Hospital. She is also registered for a Master's degree program in Audiology at Stellenbosch University (R.S.A.): Interdisciplinary Health Division, Speech & Hearing Department.

She would like to conduct a study with regards to the above-mentioned topic, and is inviting mining companies to participate. She has obtained ethical clearance to conduct this study from both Stellenbosch University as well as the Ministry of Health and Social Services in Namibia. The Chamber of Mines is aware of her study and also endorses it. This matter was discussed at the last USC meeting on August 8, 2013 at the Uranium Institute.

Please render her the assistance and co-operation she would require.

Yours sincerely,

.....

Veston Malango
Chief Executive Officer

3 Schutzen Street
Windhoek Central
P.O. Box 2895
WINDHOEK
NAMIBIA

Telephone +264 61 [illegible]
Telefax +264 61 222635
E-mail: vmalango@chamberofmines.org.na
Website: www.chamberofmines.org.na

APPENDIX E
Letter to management of mining companies

P. O. Box 50157

Bachbrecht
Windhoek
NAMIBIA
imbarrion@gmail.com

TO: Mr/Ms XXXXXXX
Manager: of XXXXXX Mine
P. O. Box XXXX
Windhoek

CC: Mr./Ms. XXXXXX
Occupational Health Manager
XXXXX Mine

Date:

Dear Sir/Madam

INVITATION TO YOUR COMPANY TO PARTICIPATE IN A STUDY ON THE RISK FACTORS ASSOCIATED WITH HEARING LOSS IN THE MINING SECTOR IN NAMIBIA

I am writing this letter to you as the head of ..... *(Name of mining company)* for the above-mentioned purpose. Your company was initially approached because it is a member of the Chamber of Mines, which represents the interests of all the major mining and exploration companies in the country. Your company was selected for invitation to participate because I was informed that:

1. Hearing evaluations are conducted on your employees and kept in medical records.
2. The equipment used to assess hearing is calibrated.
3. The health workers conducting hearing assessments have appropriate training in hearing evaluation protocol.

Currently, I am the State Audiologist employed at the Ministry of Health & Social Services, Speech Therapy & Audiology Department (Ear, Nose & Throat Clinic) at the Windhoek Central Hospital. I am also registered as a Master's in Audiology student at Stellenbosch University (R.S.A.): Interdisciplinary Health Division, Speech & Hearing Department.

In my work, I regularly identify, assess and manage patients who present with ear problems such as hearing loss. Hearing loss can compromise the individual's ability to communicate and function appropriately at work, home and socially and thereby adversely impact on his/her quality of life.

I have dealt with several patients who presented with hearing loss and who also reported a history of working in environments that are potentially hazardous to their health. Such environments include being exposed to excessive sound/noise and/or toxic chemicals. Research indicates that exposure to excessive sound/noise levels and/or toxic chemicals places

individuals at risk for acquiring hearing loss, while other research indicates that some individuals do not present with symptoms of hearing loss despite working in similar environments. This suggests that there can be other factors that can affect the individual's susceptibility to acquiring hearing loss, and which is the title and purpose of my research.

If you should cordially accept this invitation, then as a participating mining/exploration company, may I request the following:

1. Provide written permission to participate in this study,
2. Provide a list of employees (mine-workers) who are known to be working in noise areas/zones,
3. Allow the principal investigator (PI) access to the premises to collect data from approximately 30 randomly selected employees. The number of participants may change depending on the number of mines that decide to participate. Please refer to the table below:

Number of participating companies	**Number of participants exposed to noisy environments/per company**	**Total number of participants**
5	30	150
4	40	160
3	50	150
2	80	160
1	150	150

4. Allow the selected employees to participate in this study for two hours *(To be verified in a pilot study)*. During this period, employees will be required to listen to and view a presentation regarding the study, sign an informed consent form and answer the Worker's Hearing Health Questionnaire (WHHQ).
5. Provide a suitably private venue that can accommodate the selected employees for approximately two (2) hours.

The aims, goals, procedures, protocol and methodology of the study will be explained during the presentation. It will also be stated that the study is of a voluntary nature. Participants' confidentiality will be maintained, and should they have any questions or concerns regarding the study, the PI will be available to address them at any given time during the research session at your company.

As the PI, I will:

1. Respect the rules and regulations of the mining/exploration company,
2. Behave in a professional manner that will not compromise the integrity of the mining/exploration company,
3. Liaise with the management in co-ordinating an appropriate schedule and venue for data collection so as not to disrupt the overall function of the mining/exploration company.

4. Maintain the confidentiality of the participating mining/exploration company and its employees,
5. Be available to answer any questions regarding this study and
6. Inform participating mines and employees of the findings.

There are limited studies regarding hearing loss in Namibia and more specifically hearing loss in the occupational environment within the country. Conducting this study will address this need and will allow for establishing a general baseline of mining employees' hearing levels in Namibia. Moreover, it will identify possible areas for further research in order to prevent future hearing loss, which will improve the employee's ability to communicate effectively in the work, home and social environments.

This study complies with the ethical requirements of the Human Research Ethics Committee (HREC) at Stellenbosch University, R.S.A. as well as the Biomedical Ethics Research Committee & Research Management Committees of the Ministry of Health and Social Services, Namibia. This study is registered with the Ministry of Health & Social Services with the approval of the Chamber of Mines.

Please find attached the following documents:

- Certified copy ethics approval from the HREC, Stellenbosch University (R.S.A.);
- Certified copy of the letter stating that the study is registered at the Ministry of Health & Social Services;
- My research proposal;
- The Questionnaire I will use as a tool for data capturing;
- My Curriculum Vitae (CV) and
- Certified copies of my credentials.

Taking all of the above into account, I hope you will consider my request favourably by providing written consent to participate in this study, provide a list of employees working in noise areas/zones and grant permission to selected employees to take part.

I look forward to hearing from you.

Yours faithfully

.....
(Ms) Irene M. Barrion

APPENDIX F
Summary profile for participants

Summary table of respondent profile

Mine	Date	Language used in Question-naira	Research number	Education level	Home language	Age	Gender	Population group	Hearing Loss present	Literacy assisted
Green Leopard	27/08/2013	ENG	GreLeo001	Grade 7	Damara/ Nama	47	Male	Black	No	
	27/08/2013	AFR	GreLeo002	Grade 12	Afrikaans	43	Male	Other	Yes	
	27/08/2013	ENG	GreLeo003	Grade 12	Afrikaans	33	Male	Coloured	Yes	
	27/08/2013	AFR	GreLeo004	Misresponse	Damara/ Nama	53	Male	Black	No	
	27/08/2013	ENG	GreLeo005	NR	Afrikaans	48	Male	Coloured	Yes	
	27/08/2013	ENG	GreLeo006	Diploma	Afrikaans	36	Male	Coloured	Unknown	
	ND	ENG	GreLeo007	Grade 12	Afrikaans	30	Male	Coloured	No	
	28/08/2013	ENG	GreLeo008	Grade 10	Afrikaans	41	Male	Black	Unknown	
	28/08/2013	ENG	GreLeo009	Grade 5	English	48	Male	Black	No	Literacy assisted
	28/08/2013	ENG	GreLeo010	Grade 10	Afrikaans	44	Male	Black	No	
	28/08/2013	ENG	GreLeo011	Adv Certificate	Khoi/Khoi	45	Male	Black	Unknown	

	28/08/2013	ENG	GreLeo012	Post Grade 12	Afrikaans	34	Male	Black	No	
	28/08/2013	AFR	GreLeo013	Grade 12	Damara/ Nama	35	Male	Black	No	
	28/08/2013	ENG	GreLeo014	Post Grade 12	Afrikaans	42	Male	Coloured	No	
	28/08/2013	AFR	GreLeo015	Grade 12	Oshikwanyama	38	Male	Black	No	
	28/08/2013	AFR	GreLeo016	Misresponse	NR	47	Male	NR	No	
	28/08/2013	ENG	GreLeo017	Grade 12	Otjiherero	32	Male	Black	No	
	28/08/2013	AFR	GreLeo018	Grade 3	Oshiwambo	63	Male	Black	No	Literacy assisted
	28/08/2013	AFR	GreLeo019	Grade 7	Afrikaans	28	Male	Coloured	No	
	28/08/2013	ENG	GreLeo020	Grade 12	Damara/ Nama	39	Male	Black	No	
	28/08/2013	AFR	GreLeo021	NR	NR	57	Male	Coloured	Yes	
	29/08/2013	ENG	GreLeo022	Grade 12	Afrikaans	28	Male	Coloured	No	
	28/08/2013	AFR	GreLeo023	Grade 12	Afrikaans	34	Male	Coloured	No	
	29/08/2013	ENG	GreLeo024	Grade 12	Damara/ Nama	39	Female	Black	No	
	28/08/2013	ENG	GreLeo025	Grade 12	Otjiherero	32	Male	Black	Yes	
	28/08/2013	AFR	GreLeo026	Grade 11	Damara/ Nama	48	Male	Black	Yes	
	29/08/2013	ENG	GreLeo027	Grade 12	Afrikaans	30	Female	Coloured	No	
	29/08/2013	ENG	GreLeo028	Grade 12	Afrikaans	39	Male	Black	Yes	
Blue Lion	30/08/2013	ENG	BluLio001	Grade 10	Silozi	22	Male	Black	Unknown	
	30/08/2013	ENG	BluLio002	Grade 12	Oshikwanyama	24	Male	Black	No	
	30/08/2013	ENG	BluLio003	Grade 12	Afrikaans	29	Female	Black	No	

	30/08/2013	ENG	BluLio004	Grade 10	Damara/ Nama	52	Male	Black	No	Literacy assisted
	30/08/2013	ENG	BluLio005	Grade 12	Otjiherero	29	Male	Black	No	
	30/08/2013	AFR	BluLio006	Grade 5	Damara/ Nama	60	Male	Black	Yes	Literacy assisted
	30/08/2013	AFR	BluLio007	NR	Afrikaans	45	Male	Coloured	No	
	30/08/2013	ENG	BluLio008	Degree	Oshiwambo	30	Female	Black	No	
	30/08/2013	ENG	BluLio009	Grade 12	Damara/ Nama	52	Male	Black	Yes	
	30/08/2013	ENG	BluLio010	Grade 12	Rukavango	26	Male	Black	Yes	
	30/08/2013	ENG	BluLio011	Degree	Oshiwambo	25	Male	Black	No	
	30/08/2013	ENG	BluLio012	Grade 12	Afrikaans	25	Male	White	No	
	30/08/2013	AFR	BluLio013	N3 Certificate	Afrikaans	51	Male	NR	Yes	
	30/08/2013	ENG	BluLio014	Grade 12	Otjiherero	29	Female	Black	No	
	02/09/2013	ENG	BluLio015	Grade 10	Damara/ Nama	32	Male	Black	No	
	02/09/2013	ENG	BluLio016	Grade 12	Afrikaans	35	Male	Coloured	No	
	02/09/2013	ENG	BluLio017	N3 Certificate	Oshindonga	26	Male	Black	No	
	03/09/2013	ENG	BluLio018	Grade 10	Otjiherero	50	Male	Black	No	
	03/09/2013	ENG	BluLio019	N3 Certificate	Afrikaans	23	Male	Coloured	No	
	03/09/2013	ENG	BluLio020	NR	Oshiwambo	23	Male	Black	No	
	03/09/2013	ENG	BluLio021	Grade 12	Silozi	42	Male	Black	Yes	
	03/09/2013	AFR	BluLio022	Grade 6	Oshiwambo	53	Male	Black	No	

Orange Rhino	04/09/2013	ENG	OraRhi001	Diploma	NR	46	Male	Black	No	
	04/09/2013	ENG	OraRhi002	Post Gr12 Certificate	Oshiwambo	NR	Male	Black	No	
	04/09/2013	ENG	OraRhi003	Post Gr12 Certificate	Damara/ Nama	51	Male	Black	No	
	04/09/2013	ENG	OraRhi004	Post Gr12 Certificate	Otjiherero	36	Male	Black	No	
	04/09/2013	ENG	OraRhi005	Grade 12	Nyemba	30	Male	Black	Yes	
	04/09/2013	ENG	OraRhi006	Grade 12	Afrikaans	23	Male	Coloured	No	
	04/09/2013	ENG	OraRhi007	Grade 12	Otjiherero	24	Male	Black	No	
	04/09/2013	ENG	OraRhi008	Grade 8	NR	39	Male	Black	No	
	04/09/2013	ENG	OraRhi009	Grade 8	Oshiwambo	39	Male	Black	No	
	04/09/2013	ENG	OraRhi010	N3 Certificate	Oshiwambo	32	Male	Black	No	
	04/09/2013	ENG	OraRhi011	NR	Oshiwambo	41	Male	Black	No	
	04/09/2013	ENG	OraRhi012	Misresponse	Oshiwambo	NR	Male	Black	Unknown	
	04/09/2013	ENG	OraRhi013	Degree	English	35	Male	Black	No	
	04/09/2013	ENG	OraRhi014	Grade 9	Oshiwambo	26	Male	Black	Yes	
	04/09/2013	ENG	OraRhi015	Grade 10	Damara/ Nama	28	Male	Black	No	
	04/09/2013	ENG	OraRhi016	Grade 12	Oshiwambo	33	Male	Black	Yes	
	04/09/2013	ENG	OraRhi017						Unknown	
	04/09/2013	ENG	OraRhi018	Grade 9	Oshiwambo	35	Male	Black	No	

			OraRhi019						Unknown	
	04/09/2013	ENG	OraRhi020	NR	NR	32	Male	Black	Yes	
	04/09/2013	ENG	OraRhi021	N3 Certificate	Oshiwambo	28	Male	Black	No	
	04/09/2013	ENG	OraRhi022	Higher Education Certificate	Oshiwambo	35	Male	Black	No	
	04/09/2013	ENG	OraRhi023	N3 Certificate	Damara/ Nama	30	Male	Black	No	
	04/09/2013	ENG	OraRhi024	N3 Certificate	Oshindonga	31	Male	Black	Yes	
	04/09/2013	ENG	OraRhi025	N3 Certificate	Afrikaans	31	Male	Coloured	Yes	
			OraRhi026						Unknown	
	04/09/2013	ENG	OraRhi027	Diploma	Afrikaans	25	Male	Coloured	No	
	04/09/2013	ENG	OraRhi028	Grade 12	Afrikaans	31	Female	Coloured	No	
	04/09/2013	ENG	OraRhi029	Degree	Oshindonga	28	Female	Black	No	
	04/09/2013	ENG	OraRhi030	Degree	NR	28	Male	Black	No	
	04/09/2013	ENG	OraRhi031	Diploma	Otjiherero	31	Male	Black	No	
	04/09/3013	ENG	OraRhi032	Degree	Oshiwambo	33	Female	Black	No	
	04/09/2013	ENG	OraRhi033	Grade 12	Afrikaans	46	Male	Coloured	Yes	
	05/09/2013	ENG	OraRhi034	Grade 12	Oshiwambo	48	Male	Black	No	
			OraRhi035						Unknown	
	05/09/2013	ENG	OraRhi036	Diploma	Afrikaans	29	Female	Coloured	No	
			OraRhi037						Unknown	
	05/09/2013	ENG	OraRhi038	Diploma	Damara/ Nama	27	Female	Black	No	

	05/09/2013	ENG	OraRhi039	Diploma	Afrikaans	35	Male	Coloured	No	
	05/09/2013	ENG	OraRhi040	Grade 10	Oshindonga	38	Male	Black	No	
	05/09/2013	ENG	BluLio23						Unknown	
	05/09/2013	ENG	BluLio24	Grade 9	Damara/ Nama	34	Male	Black	No	
	05/09/2013	ENG	BluLio25	Grade 12	Damara/ Nama	41	Male	Black	Yes	
	05/09/2013	AFR	BluLio26	Grade 10	Damara/ Nama	42	Male	Black	No	
	05/09/2013	AFR	BluLio27	Grade 7	Oshiwambo	42	Male	Black	Yes	Literacy assisted
	05/09/2013	ENG	BluLio28	Grade 12	Damara/ Nama	27	Male	Black	No	
Red Elephant	09/09/2013	ENG	RedEle001	Grade 12	Otjiherero	32	Male	Black	No	
	09/09/2013	ENG	RedEle002	Grade 12	Afrikaans	29	Male	Coloured	No	
	09/09/2013	ENG	RedEle003	Diploma	Afrikaans	34	Male	White	No	
	09/09/2013	ENG	RedEle004	Grade 8	Oshiwambo	57	Male	Black	Yes	
	09/09/2013	ENG	RedEle005	Grade 10	Afrikaans	36	Male	Coloured	Yes	
	09/09/2013	ENG	RedEle006	Grade 10	Oshiwambo	40	Female	Black	Yes	
	09/09/2013	AFR	RedEle007	Grade 12	Oshindonga	39	Male	Black	No	
	09/09/2013	ENG	RedEle008	Grade 7	Oshiwambo	58	Male	Black	Yes	Literacy assisted & translator present
	09/09/2013	ENG	RedEle009	Grade 10	Oshiwambo	57	Male	Black	Yes	

	10/09/2013	ENG	RedEle010	Grade 12	Oshiwambo	37	Male	Black	No	
	10/09/2013	ENG	RedEle011	Grade 12	Oshiwambo	28	Female	Black	Yes	
	10/09/2013	ENG	RedEle012	Grade 10	Oshiwambo	42	Male	Black	No	
	09/09/2013	AFR	RedEle014	NR	Afrikaans	52	Male	White	Yes	
	09/09/2013	ENG	RedEle015	Grade 10	Oshiwambo	44	Female	Black	No	
	10/09/2013	ENG	RedEle016	N2 Certificate	Oshiwambo	40	Male	Black	No	
	10/09/2013	ENG	RedEle017	Grade 12	Oshiwambo	40	Female	Black	No	
	10/09/2013	ENG	RedEle018	Grade 8	Oshiwambo	59	Male	Black	Yes	Literacy assisted in Afrikaans
	10/09/2013	ENG	RedEle019	Grade 10	Oshiwambo	54	Male	Black	No	
	10/09/2013	ENG	RedEle020	Grade 9	Oshiwambo	43	Male	Black	Yes	
	10/09/2013	AFR	RedEle021	Grade 10	Oshiwambo	54	Male	Black	No	
	10/09/2013	ENG	RedEle022	Grade 10	Oshiwambo	41	Female	Black	No	
	10/09/2013	ENG	RedEle023	Diploma	English	41	Male	White	No	
	10/09/2013	ENG	RedEle024	Grade 12	Setswana	37	Male	Black	No	
Yellow Buffalo	12/09/2013	ENG	YelBuf001	Diploma	Silozi	28	Male	Black	No	
	12/09/2013	ENG	YelBuf002	Post Gr12 Certificate	Afrikaans	26	Male	Coloured	No	
	12/09/2013	ENG	YelBuf003	Grade 12	Damara/ Nama	26	Male	Black	No	
	12/09/2013	ENG	YelBuf004	Grade 12	Oshiwambo	36	Male	Black	No	

	12/09/2013	ENG	YelBuf005	Diploma	Damara/ Nama	28	Female	Black	No	
	12/09/2013	ENG	YelBuf006	Grade 12	Oshikwanyama	25	Male	Black	No	
	12/09/2013	ENG	YelBuf007	Grade 12	Oshindonga	32	Male	Black	No	
	12/09/2013	ENG	YelBuf008	Grade 12	Oshiwambo	26	Male	Black	No	
	12/09/2013	ENG	YelBuf009	Grade 12	Oshiwambo	30	Male	Black	No	
	12/09/2013	ENG	YelBuf010	Diploma	Oshiwambo	25	Female	Black	No	
	12/09/2013	ENG	YelBuf011	Diploma	Afrikaans	34	Male	Black	Yes	
			YelBuf012						Unknown	
	12/09/2013	ENG	YelBuf013	Diploma	Otjiherero	57	Male	Black	Yes	
	13/09/2013	ENG	YelBuf014	Grade 12	Damara/ Nama	38	Male	Black	No	
	13/09/2013	AFR	YelBuf015	Grade 12	Afrikaans	33	Male	Black	No	
	13/09/2013	ENG	YelBuf016	N3 Certificate	Oshiwambo	34	Male	Black	No	
	13/09/2013	ENG	YelBuf017	Grade 9	Oshiwambo	34	Male	Black	No	
	ND	ENG	YelBuf018	NR	NR	39	Male	NR	Yes	
	13/09/2013	ENG	YelBuf019	Grade 10	Thimbukushu	38	Male	Black	No	
	13/09/2013	ENG	YelBuf020	Grade 12	English	42	Male	Other	No	
	13/09/2013	ENG	YelBuf021	Grade 12	Afrikaans	24	Male	Coloured	Unknown	
	13/09/2013	ENG	YelBuf022	Grade 10	English	36	Male	Coloured	Yes	
	13/09/2013	ENG	YelBuf023	Grade 10	Oshiwambo	36	Male	Black	Yes	
	13/09/2013	ENG	YelBuf024	Grade 12	Oshiwambo	36	Male	Black	No	
	13/09/2013	ENG	YelBuf025	Grade 10	Oshiwambo	36	Male	Black	No	
	13/09/2013	ENG	YelBuf026	Grade 12	Damara/ Nama	34	Male	Black	No	

	13/09/2013	ENG	YelBuf027	Grade 12	Rukwangali	43	Male	Black	No	
COLOUR SCHEME										
	Participant excluded from the study									

APPENDIX G1:

English Questionnaire

WORKER'S HEARING HEALTH QUESTIONNAIRE (WHHQ)

Current date: _____

A. PARTICIPANT DETAILS

Research number: ____XXXXX **Education level:**

(customised & allocated)_____ _____

Home language(s):

_____

B. DEMOGRAPHIC INFORMATION

1. **What is your age?** _____years old.

2. **What is your Gender?**

☐ A. Male ☐ B. Female

3. **What is your Population Group?**

☐ A. Black ☐ B. Coloured ☐ C. White (Caucasian) ☐ D. Asian

☐ E. Other : (Please specify)

_____

C. MEDICAL HISTORY

4. How often do you go for medical check-ups?

☐ A. Every 3 months ☐ B. Every 6 months ☐ C. Every year ☐ D. Every 2 years ☐ E. I don't know

☐ F. Other: (Please specify)

_____

_____

5. Please mark *ALL* the conditions for which you have been treated AND fill in the relevant information that may apply to you.

Medical condition	***a) When was it diagnosed/ identified?***	***b) How long were you treated for this condition?***	***c) Is it controlled or not controlled?***
☐ A. Constant ear infection			
☐ B. Head trauma/injury			
☐ C. Cholesterol			
☐ D. Hypertension (high blood pressure)			
☐ E. Diabetes (Sugar)			
☐ F. Tuberculosis (TB)			
☐ G. HIV/AIDS			
☐ H. Cancer			

☐ I. Malaria			
☐ J. Constant pain			
☐ K. Other: (Please specify)			

6. **Please choose the statement that best describes your smoking habits <u>AND answer the relevant question if applicable.</u>**

☐ A. I currently smoke.

a) **Approximately how many cigarettes do you smoke per day?**

I smoke _____cigarettes per day.

☐ B. I smoke sometimes e.g. when I'm with my friends

b) **Approximately how many cigarettes do you smoke in a month?**

I smoke _____cigarettes per month.

☐ C. I used to smoke.

c) **Approximately how many cigarettes did you smoke per day?**

I smoked _____cigarettes per day.

☐ D. I have never smoked.

7. Please choose the statement that best describes your drinking habits

☐ A. I currently drink.

a) Approximately how many bottles of beer/glasses of wine do you drink per day?

I drink _____bottles of beer/glasses of wine *(Please circle one)* per day

☐ B. I drink sometimes e.g. when I'm with my friends.

b) Approximately how many bottles of beer/glasses of wine do you drink in a month?

I drink _____bottles of beer/glasses of wine *(Please circle one)* per month.

☐ C. I used to drink.

c) Approximately how many bottles of beer/glasses of wine did you drink per day?

I drank _____bottles of beer/glasses of wine *(Please circle one)* per day.

☐ D. I never drink.

8. Who has copies/records of your medical conditions? (Please tick ALL that may apply to you).

☐ A. Supervisor

☐ B. Human Resource Department (HR)

☐ C. Occupational Health Manager

☐ D. Doctor

☐ E. Audiologist

☐ F. Nurse

☐ G. I don't know

☐ H. Other: (Please specify)

_____

_____

_____

D. HEARING & BALANCE HISTORY

9. Please select only ONE statement that best applies to you. 'Other people like my colleagues, friends and families constantly complain that they have to speak louder and/or repeat themselves when talking to me'.

- ☐ A. Strongly agree
- ☐ B. Agree
- ☐ C. Disagree
- ☐ D. Strongly disagree.

10. Do you have difficulties hearing?

- ☐ A. Yes, I have difficulty hearing. *(Please go to Question 11)*
- ☐ B. No, I have no difficulty hearing. *(Please go to Question 13)*
- ☐ C. I don't know *(Please go to Question 13).*

11. When did the problem start?

It started _____years/months/weeks/days *(Please circle one)* ago.

12. Was the onset of the hearing loss

- ☐ A. Gradual/Slow?
- ☐ B. Sudden/Quick?
- ☐ C. Fluctuating (Sometimes better or sometimes worse)?
- ☐ D. Other (please specify):

_____

_____

13. How often do you have your hearing tested?

☐ A. Never ☐ B. Every 6 months ☐ C. Annually ☐ D. Every 2 years

☐ E. Other: (Please specify)

_____

14. Do you hear any ringing sounds or noise in your ear/s?

☐ A. Yes, I hear ringing sounds or noise in my ear/s. *(Please go to Question 15)*

☐ B. No, I don't hear ringing sounds or noise in my ear/s. *(Please go to Question 17)*

☐ C. I don't know.*(Please go to Question 17)*

15. When did the ringing sounds or noise start?

_____ years/months/weeks/days *(Please circle one)* ago.

16. In which ear do you hear the ringing sounds or noise in your ear/s?

☐ A. Right (R) ear ☐ B. Left (L) ear ☐ C. Both ears ☐ D. I don't know

17. Please mark which of the following you experience at least once a month for most months of the year AND answer the relevant question. (If there are none that apply to you, please leave this section blank)

Medical experience	***When did it start?***
☐ A. Nausea	a)_____ years/months/weeks/days *(Please circle one)*
☐ B. Double-vision	b)_____

	years/months/weeks/days *(Please circle one)*
☐ C. Vomiting	c)_____ years/months/weeks/days *(Please circle one)*
☐ D. Dizziness	d) _____ years/months/weeks/days *(Please circle one)*
☐ E. Fullness or stuffiness in the ears	e)_____ years/months/weeks/days *(Please circle one)*

E. WORK HISTORY

18. Approximately how many years have you worked in your life?

_____ (years/months/weeks)

19. What is your current job?

_____

20. Approximately how long have you worked at your current job?

_____ (years/months/weeks)

21. Do you have to shout for others to hear you because of noise at work?

☐ A. Yes

☐ B. No

☐ C. I don't know.

22. Approximately how many hours are you exposed to loud noise every day?

_____hours.

23. Which of these tools do you utilise (make use of) daily in your job? (Please tick <u>ALL</u> that may apply to you)

☐ A. Grinder (e.g. angle grinder)

☐ B. Compacting equipment (steer & terrain loaders, rammers)

☐ C. Grass cutters/trimmers

☐ D. Compressor (e.g. air driven)

☐ E. Impact equipment (e.g. an impact driver, air wrench)

☐ F. Earth moving equipment (e.g. a grader)

☐ G. Explosives

☐ H. High pressure discharges (used for lamps or pumps)

☐ I. Communications equipment

☐ J. Drills

☐ K. Electric saw (e.g. Chain saw/Band saw)

☐ L. Generator

☐ M. Metal working machines (e.g. alligator shear/lever shear)

☐ N. Woodwork tools (e.g. sander or joiners)

☐ O. Hammering tools

☐ P. I don't know

☐ Q. Other: (Please specify)

_____

_____

24. If you marked any of the tools in the previous question (i.e. Question 23) please indicate for each item how long you use it on average per day.

Grinder (e.g. angle grinder) a)_____hours/minutes per day *(Please circle one)*	Compacting equipment (steer & terrain loaders, rammers) b)_____hours/minutes per day *(Please circle one)*
Grass cutters/trimmers c)_____hours/minutes per day *(Please circle one)*	Compressor (e.g. air driven) d)_____hours/minutes per day *(Please circle one)*
Impact equipment (e.g. an impact driver, air wrench) e)_____hours/minutes per day *(Please circle one)*	Earth moving equipment (e.g. a grader) f)_____hours/minutes per day *(Please circle one)*
Explosives g)_____hours/minutes per day *(Please circle one)*	High pressure discharges (used for lamps or pumps). h)_____hours/minutes per day *(Please circle one)*

Communications equipment i)_____hours/minutes per day *(Please circle one)*	Drills j)_____hours/minutes per day *(Please circle one)*
Electric saw (e.g. Chain saw/Band saw) k)_____hours/minutes per day *(Please circle one)*	Generator l)_____hours/minutes per day *(Please circle one)*
Metal working machines (e.g. alligator shear/lever shear) m)_____hours/minutes per day *(Please circle one)*	Woodwork tools (e.g. sander or joiners) n)_____hours/minutes per day *(Please circle one)*
o) Hammering tools _____hours/minutes per day *(Please circle one)*	

25. Was your hearing affected at your previous job?

☐ A. Yes ☐ B. No ☐ C. I don't know. ☐ D. I did not have a job.

F. WORKPLACE HEARING LOSS PREVENTION PROGRAMME

26. Is there a Hearing Loss Prevention Programme at your current workplace?

☐ A. Yes, there is a Hearing Loss Prevention Programme.

☐ B. No, there is no Hearing Loss Prevention Programme.

☐ C. I don't know

27. Approximately, how often do you receive formal training regarding the prevention of hearing loss at work?

☐ A. I never receive training

☐ B. Every 6 months

☐ C. Every year

☐ D. Every 2 years

☐ E. I don't know

☐ F. Other (Please specify)

_____

_____

28. Did you receive formal training regarding the prevention of hearing loss? (Please tick ALL that may apply to you)

☐ A. Yes, at my current workplace.

☐ B. Yes, at my previous workplace.

☐ C. Yes, during my studies.

☐ D. Yes, through a health professional (i.e. a nurse, doctor, audiologist, hearing aid acoustician)

☐ E. Yes, through a colleague/ friend.

☐ F. No, I did not receive formal training about the prevention of hearing loss.

29. Does your workplace provide you with hearing protection devices?

☐ A. Yes

☐ B. No

☐ C. I don't know.

30. Do you use hearing protection devices while at work?

☐ A. Yes, I use hearing protection devices. *(Please go to Question 31)*

☐ B. No, I don't use hearing protection devices. *(Please go to Question 33)*

31. What kind of hearing protection devices do you use?

☐ A. Foam tip hearing protection devices 

☐ B. Ear mufflers 

☐ C. Custom-made (made for you) hearing protection devices. 

☐ D. I don't know.

☐ E. Other: (Please specify)

_____

_____

32. How long do you wear hearing protection devices every day? _____hours

33. Did you receive your training on the use of hearing protection devices? (Please tick <u>ALL</u> that may apply to you)

☐ A. Yes, at my current workplace.

☐ B. Yes, at my previous workplace.

☐ C. Yes, during my studies.

☐ D. Yes, through a health professional (i.e. a nurse, doctor, audiologist, hearing aid acoustician).

☐ E. Yes, through a colleague/ friend.

☐ F. No, I did not receive training regarding the use of hearing protection devices.

☐ G. Other (please specify)

_____

_____

34. Is the use of hearing protection devices regularly and strictly monitored?

☐ A. Yes, the use of hearing protection devices is monitored.

☐ B. No, the use of hearing protection devices is not monitored.

☐ C. I don't know.

35. **How long does your supervisor wear his/her hearing protection device every day?** _____hours

36. How often are the noise levels in your workplace tested/monitored?

☐ A. (Never) noise levels have never been measured.

☐ B. Every 6 months

☐ C. Every year

☐ D. Every 2 years

☐ E. I don't know

☐ F. Other (Please specify)

_____

37. Are noisy areas clearly marked/labelled/visible at work?

☐ A. Yes

☐ B. No

☐ C. I don't know.

38. **Are mufflers installed to reduce noise caused by machines/equipment? (Please mark <u>ONE</u> only)**

- ☐ A. Yes, there are mufflers installed on ALL machines
- ☐ B. Yes, there are mufflers installed on SOME machines.
- ☐ C. No, there are no mufflers installed.
- ☐ D. I don't know.

39. Are there any walls or buildings enclosure around the machines/equipment that help to reduce the noise made by machines/equipment?

- ☐ A. Yes, there are walls or buildings around the machines/equipment
- ☐ B. No, there are no walls or buildings around the machine/equipment.
- ☐ C. I don't know.

40. Are there any sound-absorbing materials covering the walls that help to reduce the noise?

- ☐ A. Yes, there are sound-absorbing materials on the walls.
- ☐ B. No, there are no sound-absorbing materials on the walls.
- ☐ C. I don't know.

41. Are there any devices installed to reduce or prevent a machine/equipment from shaking (vibrating) excessively? (Please mark ONE only)

- ☐ A. Yes, there are devices installed on ALL machines/equipment.
- ☐ B. Yes, there are devices installed on SOME machines/equipment.
- ☐ C. No, there are no devices installed.
- ☐ D. I don't know.

42. Are the machines/equipment serviced & maintained regularly?

- ☐ A. Yes, machines/equipment is serviced & maintained regularly.
- ☐ B. No, machines/equipment is not serviced & maintained regularly.

☐ C. I don't know.

43. Is your work schedule arranged in a way so that you are not always exposed to noisy areas?

☐ A. Yes, my work scheduled helps reduce the time I am exposed to noise.

☐ B. No, my work schedule does not reduce the time I am exposed to noise.

☐ C. I don't know.

44. Does your workplace restrict the number of employees exposed to noisy environments?

☐ A. Yes, the number of employees exposed to noisy environments is restricted.

☐ B. No, the number of employees exposed to noisy environments is not restricted.

☐ C. I don't know.

G. EXPOSURE TO TOXIC CHEMICALS

45. Are you exposed to any toxic chemicals every week?

☐ A. Yes, I am exposed. *(Please go to Question 46)*

☐ B. No, I am not exposed. *(Please go to Question 49)*

☐ C. I don't know *(Please go to Question 49).*

46. Do you use protective clothing when you work with toxic chemicals?

☐ A. Yes, I use protective clothing. *(Please go to Question 47)*

☐ B. No, I don't use protective clothing. *(Please go to Question 49)*

47. Does your workplace provide you with protective clothing when you have to work with toxic chemicals?

☐ A. Yes, protective clothing is given. *(Please go to Question 48)*

☐ B. No, protective clothing is not given. *(Please go to Question 49)*

☐ C. I don't know.*(Please go to Question 49)*

48. What kind of protective clothing do you use? (Please tick <u>ALL</u> that may apply to you)

☐ A. Boots 

☐ B.Gloves 

☐ Chard hat 

☐ D. Goggles 

☐ E. Overalls 

☐ F. Masks 

☐ G. Other: (Please specify)

_____

_____

49. Were you trained on how to use protective clothing to prevent exposure to toxic chemical exposure? (Please tick <u>ALL</u> that may apply to you)

☐ A. Yes, at my current workplace.

☐ B. Yes, at my previous workplace.

☐ C. Yes, during my studies.

☐ D. Yes, through a health professional.

☐ E. Yes, through a colleague/ friend.

☐ F. No, I was not trained on the use of protective clothing.

☐ G. Other (please specify)

_____

_____

50. Is the use of other protective clothing regularly and strictly monitored?

☐ A. Yes, the use of protective clothing is monitored.

☐ B. No, the use of protective clothing is not monitored.

☐ C. I don't know.

51. How long does your supervisor wear his/her protective clothing? _____hours

52. How often are toxic, organic or chemical solvent levels in your workplace tested/monitored?

☐ A. (Never) Noise levels have never been measured

☐ B. Every 6 months

☐ C. Every year

☐ D. Every 2 years

☐ E. I don't know

☐ F. Other: (Please specify)

_____

_____

53. Are areas that have toxic chemicals areas clearly marked/labelled?

☐ A. Yes, areas with toxic chemicals are labelled.

☐ B. No, areas with toxic chemicals are not labelled.

☐ C. I don't know.

54. Are there any walls or buildings around the hazardous areas that help to reduce the exposure to toxic, organic or chemical solvents?

☐ A. Yes

☐ B. No

☐ C. I don't know.

55. Is your work schedule arranged in a way so that you are not always exposed to areas with toxic chemicals?

☐ A. Yes, my work schedule is arranged.

☐ B. No, my work schedule is not arranged.

☐ C. I don't know.

56. Does your workplace restrict the number of employees exposed to areas with toxic chemicals?

☐ A. Yes

☐ B. No

☐ C. I don't know.

57. How does your workplace help employees diagnosed with hearing loss?
(Please tick <u>ALL</u> that you think may apply to your workplace). The workplace:

☐ A. Refers the employee to the appropriate health professional (i.e. a doctor, audiologist, and hearing aid acoustician) for consultation.

☐ B. Gives the employee a less noisy job.

☐ C. Gives money to the employee.

☐ D. Gives money to buy (a) hearing aid/s.

☐ E. Gives money to attend listening therapy sessions after hearing aid(s) are fitted.

☐ F. Helps the employee to claim worker's compensation from government.

☐ G. Helps the employee to claim worker's compensation from the Social Security Commission.

☐ H. Nothing. My workplace does not help the worker with hearing loss.

☐ I. I don't know.

☐ J. Other (please specify):

_____

_____

H. FAMILY HISTORY

58. Does anyone in your family have hearing problem/s?

☐ A. Yes *(Please go to Question 59)*

☐ B. No *(Please go to Question 60)*

☐ C. I don't know *(Please go to Question 60)*

59. Who in your family has hearing problem/s? (Please tick ALL that may apply to you)

☐ A. Father	☐ B. Father's father (grandfather)	☐ C. Mother's father (grandfather)
☐ D. Mother	☐ E. Father's mother(grandmother)	☐ F. Mother's mother (grandmother)
☐ G. Brother	☐ H. Father's brother (uncle)	☐ I. Mother's brother (uncle)
☐ J. Sister	☐ K. Father's sister (aunty)	☐ L. Mother's sister (aunty)
☐ M. Other: (Please specify) _____ _____		

60. Are your father and your mother cousins?

☐ A. Yes *(Please go to Question 61)*

☐ B. No *(Please go to Question 62)*

☐ C. I don't know *(Please go to Question 62)*

61. Are your father and your mother _____.

☐ A. First cousins ☐ B. Second cousins ☐ C. Distant cousins

☐ D. Other: (Please specify)

_____

_____

I. LEISURE ACTIVITIES HISTORY

62. Please list any hobbies you currently do (or previously did) that may put you at risk for obtaining a hearing loss e.g. listening to loud music, working with power tools, contact sport etc.

Activity	**How long do you take part in these activities?**
A)	a) _____hours per day/ days per week *(Please circle one)*
B)	b)_____hours per day/ days per week *(Please circle one)*
C)	c)_____hours per day/ days per week *(Please circle one)*
D)	d)_____hours per day/ days per week *(Please circle one)*
E)	e)_____hours per day/ days per week *(Please circle one)*

THANK YOU FOR PARTICIPATING.

APPENDIX G2:

Afrikaans Questionnaire

WERKERSGEHOORGESONDHEID-VRAELYS (WGGV)

Huidige datum: _____

A. DEELNEMERSINLIGTING

Navorsingsnommer:

Opvoedingsvlak:

_____

Huistaal/Huistale: _____

_____

(Plaas asseblief plakker hier)

B. DEMOGRAFIESE INLIGTING

1. **Hoe oud is u?** _____jaar oud.

2. **Wat is u geslag?**

☐ C. Manlik. ☐ D. Vroulik.

3. Wat is u bevolkingsgroep?

☐ A. Swart. ☐ B. Kleuring. ☐ C. Wit. ☐ D. Asiaties.

☐ E. Ander. Spesifiseer asseblief:

_____

C. MEDIESE GESKIEDENIS

4. Hoe gereeld gaan u vir mediese ondersoeke?

☐ A. Elke 3 maande. ☐ B. Elke 6 maande. ☐ C. Jaarliks. ☐ D. Elke 2 jaar. ☐ E. Ek weet nie.

☐ F. Ander. Spesifiseer asseblief:

_____

_____

5. Merk asseblief ALLES waarvoor u al ooit behandel is EN gee die betrokke besonderhede wat op u van toepassing is.

Mediese toestand	***a) Wanneer is dit gediagnoseer/ geïdentifiseer?***	***b) Hoe lank is u behandel vir hierdie toestand.***	***c) Is dit onder beheer ? Onder beheer/ nie onder beheer nie***
☐ A. Konstante oorinfeksie.			
☐ B. Hoof- trauma/-besering.			

☐ C. Cholesterol.			
☐ D. Hipertensie (Hoë bloeddruk).			
☐ E. Suikersiekte.			
☐ F. Tuberkulose (TB).			
☐ G. MIV/vigs.			
☐ H. Kanker.			
☐ I. Malaria.			
☐ J. Konstante pyn.			
☐ K. Ander. Spesifiseer asseblief:			

6. Kies die antwoord wat u rookgewoontes die beste beskryf EN antwoord die betrokke vrae waar nodig.

☐ A. Ek rook tans.

d) Ongeveer hoeveel sigarette rook u per dag?

Ek rook _____sigarette per dag.

e) Hoeveel jaar rook u?

Ek rook _____ jaar.

☐ B. Ek rook soms, bv. saam met my vriende

a) Ongeveer hoeveel sigarette rook u in 'n maand?

Ek rook _____sigarette per maand.

b) Hoeveel jaar rook u?

Ek rook _____ jaar.

☐ C. Ek het voorheen gerook.

a) Ongeveer hoeveel sigarette het u per dag gerook?

Ek het _____sigarette per dag gerook.

b) Hoeveel jaar het u gerook?

Ek het _____jaar gerook.

☐ D. Ek het nog nooit gerook nie.

7. Kies die antwoord wat u drinkgewoontes die beste beskryf EN antwoord die betrokke vraag waar nodig.

☐ A. Ek drink tans.

d) Ongeveer hoeveel glase alkoholiese drankies drink u per dag?

Ek drink _____ glase alkohol per dag.

☐ B. Ek drink soms, bv. saam met my vriende.

e) Ongeveer hoeveel glase alkoholiese drankies drink u in 'n maand?

Ek drink _____ glase alkohol per maand.

☐ C. Ek het voorheen gedrink.

f) Ongeveer hoeveel glase alkoholiese drankies het u per dag gedrink?

Ek het_____ glase alkoholiese drankies per dag gedrink.

☐ D. Ek het nog nooit gedrink nie.

.

8. Wie hou kopieë/rekords van u mediese inligting? Merk ALLE antwoorde wat op u van toepassing is.

☐ A. Toesighouer.

☐ B. Menslikehulpbronne-afdeling.

☐ C. Arbeidsgesondheid-bestuurder.

☐ D. Dokter.

☐ E. Oudioloog.

☐ F. Verpleegkundige.

☐ G. Ek weet nie.

☐ H. Ander. Spesifiseer asseblief:

_____

_____

_____

D. GEHOOR- EN BALANSGESKIEDENIS

9. Kies slegs EEN van die volgende wat die beste by u pas. "Ander mense soos my kollegas, vriende en familie kla gedurig dat hulle harder moet praat en/of hulself moet herhaal as hulle met my praat".

☐ A. Ek stem sterk saam.

☐ B. Ek stem saam.

☐ C. Ek stem nie saam nie.

☐ D. Ek verskil sterk.

10. Sukkel u om te hoor?

☐ A. Ja, ek sukkel om te hoor. *(Gaan asseblief na vraag 11)*

☐ B. Nee, ek sukkel nie om te hoor nie. *(Gaan asseblief na vraag 13)*

☐ C. Ek weet nie. *(Gaan asseblief na vraag 13)*

11. Wanneer het die probleem begin?

Dit het .....jaar/maande/weke/dae gelede begin. *(Omkring asseblief net een)*

12. Was die aanvang van die gehoorverlies

☐ A. Geleidelik/stadig?

☐ B. Skielik/vinnig?

☐ C. Fluktuerend (soms beter, soms slegter)?

☐ D. Ander? Spesifiseer asseblief:

_____

_____

13. Hoe dikwels laat u u gehoor toets?

☐ A. Nooit. ☐ B. Elke 6 Maande. ☐ C. Jaarliks. ☐ D. Elke 2 Jaar.

☐ E. Ander. Spesifiseer asseblief:

_____

14. Hoor u enige getuit of geraas in u oor/ore?

☐ A. Ja, ek hoor ’n getuit of geraas in my oor/ore. *(Gaan asseblief na vraag 15)*

☐ B. Nee, ek hoor nie ’n getuit of geraas in my oor/ore nie.*(Gaan asseblief na vraag 17)*

☐ C. Ek weet nie. *(Gaan asseblief na vraag 17)*

15. Wanneer het die getuit of geraas begin?

Dit het_____ jaar/maande/weke/dae *(omkring asseblief net een)* gelede begin.

16. In watter oor hoor u die getuit of geraas?

☐ A. Regteroor (R) ☐ B. Linkeroor (L) ☐ C. Beide (albei ore) ☐ D. Ek weet nie.

17. Merk asseblief watter van die volgende ondervind u ten minste een maal 'n maand vir die meeste maande van die jaar EN antwoord die betrokke vraag. (As nie een van hulle betrekking op u het nie, los die spasie oop.)

Mediese simptome	***Wanneer het dit begin?***
☐ A. Naarheid.	a)_____ *Datum*
☐ B. Dubbelvisie.	b)_____ *Datum*
☐ C. Vomering (opgooi).	c)_____ *Datum*
☐ D. Lighoofdigheid.	d) _____ *Datum*
☐ E. 'n Gevoel van verstopte ore.	e)_____ *Datum*

E. WERKSGESKIEDENIS

18. Omtrent hoeveel jaar werk u al?

_____ jaar.

19. Wat is u huidige pos?

_____

20. Omtrent hoeveel jaar doen u al u huidige werk?

_____(jaar/maande/dae). *(Omkring asseblief net een)*

21. Do you have to shout for others to hear you because of the noise at work?

☐ A. Ja.

☐ B. Nee.

☐ C. Ek weet nie.

22. Omtrent hoeveel ure elke dag word u blootgestel aan harde geraas?

_____uur.

23. Watter van die volgende gereedskap gebruik u elke dag by die werk? Merk ALLES wat u gebruik.

☐ A. Slypers (bv. 'n hoekslyper).

☐ B. Kompakterende gereedskap (kompakte skepbakvraglaaiers en multiterrein-skepbakvraglaaiers, stampers).

☐ C. Grassnyers/grassnoeiers.

☐ D. Kompressors (bv. luggedrewe).

☐ E. Impaktoerusting (bv. 'n impakdrywer, lugmoersleutel).

☐ F. Aardverskuiwingstoerusting (bv. 'n padskraper).

☐ G. Plofstowwe.

☐ H. Hoëdrukafvoertoerusting (gebruik by lampe of pompe).

☐ I. Kommunikasie-toerusting.

☐ J. Bore.

☐ K. Elektriese sae (bv. kettingsaag/bandsaag).

☐ L. Kragopwekkers.

☐ M. Metaalwerkmasjinerie (bv. 'n krokodilsnyer/ hefboomsnyer).

☐ N. Houtwerkgereedskap (bv. skuurders of voeggereedskap).

☐ O. Hamergereedskap.

☐ P. Ek weet nie.

☐ Q. Ander. Spesifiseer asseblief:

_____

_____

24. As u enige van die gereedskap in die vorige vraag (vraag 23) gemerk het, dui asseblief aan by hierdie items hoeveel uur per dag u dit gebruik.

Slypers (bv. 'n hoekslyper) a)_____uur/minute per dag. *(Omkring asseblief net een)*	Kompakterende gereedskap (kompakte skepbakvraglaaiers en multiterrein-skepbakvraglaaiers, stampers) b)_____uur/minute per dag. *(Omkring asseblief net een)*
Grassnyers/grassnoeiers c)_____uur/minute per dag. *(Omkring asseblief net een)*	Kompressors (bv. luggedrewe) d)_____uur/minute per dag. *(Omkring asseblief net een)*
Impaktoerusting (bv. 'n impakdrywer, lugmoersleutel) e)_____uur/minute per dag. *(Omkring asseblief net een)*	Aardverskuiwingstoerusting (bv. 'n padskraper) f)_____uur/minute per dag. *(Omkring asseblief net een)*
Plofstowwe g)_____uur/minute per dag. *(Omkring asseblief net een)*	Hoëdrukafvoertoerusting (gebruik by lampe of pompe) h)_____uur/minute per dag. *(Omkring asseblief net een)*
Kommunikasietoerusting i)_____uur/minute per dag. *(Omkring asseblief net een)*	Bore j)_____uur/minute per dag. *(Omkring asseblief net een)*

Elektriese sae (bv. 'n kettingsaag/bandsaag) k)_____uur/minute per dag. *(Omkring asseblief net een)*	Kragopwekkers l)_____uur/minute per dag. *(Omkring asseblief net een)*
Metaalwerkmasjinerie (bv. 'n krokodilsnyer/ hefboomsnyer) m)_____uur/minute per dag. *(Omkring asseblief net een)*	Houtwerkgereedskap (bv. skuurders of voeggereedskap) n)_____uur/minute per dag. *(Omkring asseblief net een)*
o) Hamergereedskap _____uur/minute per dag. *(Omkring asseblief net een)*	

25. Is u gehoor aangetas by u vorige werk?

☐ A. Ja. ☐ B. Nee. ☐ C. Ek weet nie. ☐ D. Ek het nog nooit voor-heen gewerk nie.

F. WERKSPLEK-GEHOORVERLIES-VOORKOMINGSPROGRAM

26. Is daar 'n gehoorverliesprogram in u huidige werksplek?

☐ A. Ja, daar is 'n Gehoorverlies-voorkomingsprogram.

☐ B. Nee, daar is nie 'n Gehoorverlies-voorkomingsprogram nie.

☐ C. Ek weet nie.

27. Ongeveer hoe dikwels ontvang u formele opleiding oor die voorkoming van gehoorverlies by die werk?

☐ A. Ek ontvang nooit opleiding nie.

☐ B. Elke 6 maande.

☐ C. Elke jaar.

☐ F. Ander. Spesifiseer asseblief:

_____

28. Het u enige formele opleiding oor die voorkoming van gehoorverlies ontvang? Merk ALMAL wat op u betrekking het.

☐ A. Ja, in my huidige werksplek.

☐ B. Ja, waar ek voorheen gewerk het.

☐ C. Ja, gedurende my opleiding.

☐ D. Ja, by 'n gesondheidswerker (bv. 'n verpleegster, dokter, oudioloog, gehoortoestel-akoestikus).

☐ E. Ja, by 'n kollega/vriend.

☐ F. Nee, ek het nie formele opleiding ontvang nie.

☐ G. Ander. Spesifiseer asseblief:

_____

_____

29. Voorsien u werk u van gehoorbeskermers?

☐ A. Ja.

☐ B. Nee.

☐ C. Ek weet nie.

30. Gebruik u gehoorbeskermers terwyl u werk?

☐ A. Ja, ek gebruik gehoorbeskermers terwyl ek werk. *(Gaan asseblief na vraag 31).*

☐ B. Nee, ek gebruik nie gehoorbeskermers terwyl ek werk nie. *(Gaan asseblief na vraag 33)*

31. Watter tipe gehoorbeskermers gebruik u?

☐ A. Skuimrubber-oorpluisies. 

☐ B. Oorskutte. 

☐ C. Pasgemaakte (wat vir u gemaak is) gehoorbeskermers. 

☐ D. Ek weet nie.

☐ E. Ander. Spesifiseer asseblief:

_____

_____

32. Hoe lank dra u daagliks die gehoorbeskermers? _____uur.

33. Is u opgelei in die gebruik van gehoorbeskermers? Merk ALMAL wat op u betrekking het.

☐ A. Ja, in my huidige werksplek.

☐ B. Ja, waar ek voorheen gewerk het.

☐ C. Ja, gedurende my opleiding.

☐ D. Ja, by 'n gesondheidswerker (bv. 'n verpleegkundige, 'n dokter, 'n oudioloog, 'n gehoortoestel-akoestikus).

☐ E. Ja, by 'n kollega/vriend.

☐ F. Nee, ek het nie opleiding ontvang in die gebruik van gehoorbeskermers nie.

☐ G. Ander. Spesifiseer asseblief:

_____

_____

34. Word die gebruik van gehoorbeskermers gereeld en streng gemonitor?

☐ A. Ja, die gebruik van gehoorbeskermers word gemonitor.

☐ B. Nee, die gebruik van gehoorbeskermers word nie gemonitor nie.

☐ C. Ek weet nie.

35. **Hoe lank dra u toesighouer sy/haar gehoorbeskermers daagliks?** _____uur.

36. Hoe dikwels word die geraasvlakke in u werksplek getoets/gemonitor?

☐ A. Nooit – geraasvlak-ke is nog nooit gemeet nie.

☐ B. Elke 6 maande.

☐ C. Elke jaar.

☐ D. Elke tweede jaar.

☐ E. Ek weet nie.

☐ F. Ander. Spesifiseer asseblief:

_____

_____

37. Word areas waar daar geraas word duidelik aangedui/gemerk/sigbaar gemaak?

☐ A. Ja.

☐ B. Nee.

☐ C. Ek weet nie.

38. Is dempers geïnstalleer om masjinerie/toerusting se geraas te verminder? (Merk net een).

☐ A. Ja, dempers is op ALLE masjinerie/toerusting geïnstalleer.

☐ B. Ja, dempers is op SOMMIGE masjinerie/toerusting geïnstalleer.

☐ C. Nee, daar is geen dempers geïnstalleer nie.

☐ D. Ek weet nie.

39. Is daar enige mure of konstruksies rondom masjinerie/toerusting wat help om die masjinerie/toerusting se geraas te verminder?

☐ A. Ja, daar is mure of konstruksies rondom masjinerie.

☐ B. Nee, daar is nie mure of konstruksies rondom die masjinerie nie.

☐ C. Ek weet nie.

40. Is daar enige klankabsorberende materiaal teen die mure wat help om geraas te verminder?

☐ A. Ja, daar is klankabsorberende materiaal teen die mure.

☐ B. Nee, daar is nie klankabsorberende materiaal teen die mure nie.

☐ C. Ek weet nie.

41. Is daar enige toestelle geïnstalleer wat uitermatige masjienvibrasie/toerustingvibrasie verhoed of verminder? Merk slegs EEN asseblief.

☐ A. Ja, daar is toestelle op ALLE masjinerie geïnstalleer.

☐ B. Ja, daar is toestelle op SOMMIGE masjinerie geïnstalleer.

☐ C. Nee, daar is geen toestelle geïnstalleer nie.

☐ D. Ek weet nie.

42. Word die masjinerie/toerusting gereeld gediens en in stand gehou?

☐ A. Ja, masjinerie/toerusting word gereeld gediens en in stand gehou.

☐ B. Nee, masjinerie/toerusting word nie gereeld gediens en in stand gehou nie.

☐ C. Ek weet nie.

43. Is u werkskedule so beplan dat u nie altyd in die geraas werk nie?

☐ A. Ja, my werkskedule help om my blootstelling aan geraas te beperk.

☐ B. Nee, my werkskedule beperk nie my blootstelling aan geraas nie.

☐ C. Ek weet nie.

44. Beperk u werksplek die aantal werknemers wat aan geraas blootgestel word?

☐ A. Ja, die aantal werknemers wat aan geraas blootgestel word, word beperk.

☐ B. Nee, die aantal werknemers wat aan geraas blootgestel word, word nie beperk nie.

☐ C. Ek weet nie.

G. BLOOTSTELLING AAN GIFTIGE CHEMIKALIEË

45. Word u weekliks aan giftige chemikalieë blootgestel?

☐ A. Ja, ek word blootgestel. *(Gaan asseblief na vraag 46)*

☐ B. Nee, ek word nie blootgestel nie. *(Gaan asseblief na vraag 49)*

☐ C. Ek weet nie. *(Gaan asseblief na vraag 49)*

46. Gebruik u beskermende klere wanneer u met giftige chemikalieë werk?

☐ A. Ja, ek gebruik beskermende klere. *(Gaan asseblief na vraag 47)*

☐ B. Nee, ek gebruik nie beskermende klere nie. *(Gaan asseblief na vraag 49)*

47. Voorsien u werksplek u van beskermende klere wanneer u met giftige chemikalieë werk?

☐ A. Ja, beskermende klere word voorsien. *(Gaan asseblief na vraag 48)*

☐ B. Nee, beskermende klere word nie voorsien nie. *(Gaan asseblief na vraag 49)*

☐ C. Ek weet nie. *(Gaan asseblief na vraag 49)*

48. Watter tipe beskermende klere gebruik u? Merk almal wat op u van toepassing is.

☐ A. Stewels. 

☐ B. Handskoene. 

☐ C. Harde hoed. 

☐ D. Oogbeskerming. 

☐ E. Oorpak. 

☐ F. Masker. 

☐ G. Ander. Spesifiseer asseblief:

_____

_____

49. Is u opgelei hoe om beskermende klere te gebruik om blootstelling aan giftige chemikalieë te verhoed? Merk asseblief ALMAL wat op u betrekking kan hê.

☐ A. Ja, in my huidige werksplek.

☐ B. Ja, in my vorige werkplek.

☐ C. Ja, tydens my studies.

☐ D. Ja, deur 'n gesondheidswerker

☐ E. Ja, deur 'n kollega/vriend.

☐ F. Nee, ek is nie opgelei in die gebruik van beskermende klere nie.

☐ G. Ander. Spesifiseer asseblief:

_____

_____

50. Word die gebruik van ander beskermende klere gereeld en streng gemonitor?

☐ A. Ja, die gebruik van ander beskermende klere word gemonitor.

☐ B. Nee, die gebruik van ander beskermende klere word nie gemonitor nie.

☐ C. Ek weet nie.

51. Hoe lank dra u toesighouer sy/haar beskermende klere daagliks? _____uur

52. Hoe gereeld word giftige-, organiese- of chemiese-oplosmiddelvlakke getoets/gemonitor?

☐ A. Nooit – dit is nog nooit gemeet nie.

☐ B. Elke 6 maande.

☐ C. Elke jaar.

☐ D. Elke tweede jaar.

☐ E. Ek weet nie.

☐ F. Ander. Spesifiseer asseblief:

_____

_____

53. Word areas waar met giftige chemikalieë gewerk word duidelik aangedui/gemerk?

☐ A. Ja, areas met giftige chemikalieë is gemerk.

☐ B. Nee, areas met giftige chemikalieë is nie gemerk nie.

☐ C. Ek weet nie.

54. Is daar enige mure of konstruksie-afskortings rondom die gevaarlike areas wat help om die blootstelling aan giftige, organiese of chemiese oplosmiddels te verminder?

☐ A. Ja.

☐ B. Nee.

☐ C. Ek weet nie.

55. Is u werkskedule so aangepas dat u nie altyd aan areas met giftige chemikalieë blootgestel is nie?

☐ A. Ja, my werkskedule is aangepas.

☐ B. Nee, my werkskedule is nie aangepas nie.

☐ C. Ek weet nie.

56. Beperk u werksplek die aantal werknemers wat aan giftige chemikalieë blootgestel word?

☐ A. Ja.

☐ B. Nee.

☐ C. Ek weet nie.

57. Hoe help u werksplek werknemers wat met gehoorverlies gediagnoseer is? Merk asseblief ALLES wat u dink op u werksplek van toepassing mag wees.

Die werksplek:

☐ A. Verwys die werknemer na die toepaslike gesondheidswerker (bv. 'n dokter, oudioloog of gehoorapparaat-akoestikus) vir konsultasie.

☐ B. Plaas die werknemer in 'n werk wat minder geraas het.

☐ C. Vergoed die werknemer finansieel.

☐ D. Skenk geld vir ('n) gehoortoestel/le.

☐ E. Skenk geld om gehoorterapiesessies by te woon na ('n) gehoortoestel/le ingesit is.

☐ F. Help die werknemer met ongevalleverskeringseise (workers' compensation) by die regering.

☐ G. Help die werknemer met ongevalleversekeringseise (workers' compensation) by die Social Security Commission.

☐ H. Doen niks. My werksplek help glad nie 'n werker met gehoorverlies nie.

☐ I. Ek weet nie.

☐ J. Ander. Spesifiseer asseblief:

_____

_____

H. FAMILIEGESKIEDENIS

58. Het enigeen in u familie 'n gehoorprobleem?

☐ A. Ja. *(Gaan asseblief na vraag 59)*

☐ B. Nee. *(Gaan asseblief na vraag 60)*

☐ C. Ek weet nie. *(Gaan asseblief vraag 60)*

59. Wie in u familie het 'n gehoorprobleem/gehoorprobleme? Merk ALMAL wat op u van toepassing is.

☐ A. Pa	☐ B. Pa se pa (oupa)	☐ C. Ma se pa (oupa)
☐ D. Ma	☐ E. Pa se ma (ouma)	☐ F. Ma se ma (ouma)
☐ G. Broer	☐ H. Pa se broer (oom)	☐ I. Ma se broer (oom)
☐ J. Suster	☐ K. Pa se suster (tannie)	☐ L. Ma se suster (tannie)
☐ M. Ander. Spesifiseer asseblief: _____ _____		

60. Is u ma en pa niggie en neef?

☐ A. Ja. *(Gaan asseblief na vraag 61)*

☐ B. Nee. *(Gaan asseblief na vraag 62)*

☐ C. Ek weet nie. *(Gaan asseblief na vraag 62)*

61. Is u ma en pa _____.

☐ A. Volle niggie en neef.

☐ B. Kleinniggie en kleinneef.

☐ C. Verlangse niggie en neef.

☐ D. Ander. Spesifiseer asseblief:

_____

_____

I. GESKIEDENIS VAN ONTSPANNINGSAKTIWITEITE

62. Noem al u huidige of vorige stokperdjies wat 'n moontlike risiko vir gehoorverlies inhou of ingehou het, byvoorbeeld luister na harde musiek, werk met kraggereedskap, of kontaksport EN antwoord die betrokke vrae waar nodig.

AKTIWITEITE	***a) Hoeveel uur per dag neem u aan hierdie aktiwiteite deel?***	***b) Hoe gereeld neem u aan hierdie aktiwiteite deel?***
A)	_____uur per dag.	_____dag/dae per week.
B)	_____uur per dag.	_____dag/dae per week.
C)	_____uur per dag.	_____dag/dae per week.
D)	_____uur per dag.	_____dag/dae per week.
E)	_____uur per dag.	_____dag/dae per week.

DANKIE VIR U DEELNAME. □

APPENDIX H

AUDIOGRAM & PERCENTAGE LOSS OF HEARING FORM

Mining Company: ***(Please place sticker here)***	**Right (R) ear hearing threshold in decibels (dBHL)**								**Left (L) ear hearing threshold in decibels (dBHL)**							
Research number: ***(Please place sticker here)***	**250 Hz**	**500 Hz**	**1000 Hz**	**2000 Hz**	**3000 Hz**	**4000 Hz**	**6000 Hz**	**8000 Hz**	**250 Hz**	**500 Hz**	**1000 Hz**	**2000 Hz**	**3000 Hz**	**4000 Hz**	**6000 Hz**	**8000 Hz**
Most recent audiogram on date : (YY/MM/DD) _____ Audiometer model: _____ Calibration date (YY/MM/DD): _____																

Tester Position: _____ Training/Experience: _____																
First entry audiogram on date: (YY/MM/DD) _____ Audiometer model: _____ Calibration date (YY/MM/DD): _____ Tester Position: _____																

Training/Experience:																
Difference in threshold on date: (YY/MM/DD) _____ Difference noted (Y/N) _____																
Pure tone Average (PTA)	$APTA_{0.5,1,2,4}$:_____dBHL $HPTA_{4,8}$: _____dBHL $LPTA_{0.5,1,2}$: _____dBHL								$APTA_{0.5,1,2,4}$:_____dBHL $HPTA_{4,8}$: _____dBHL $LPTA_{0.5,1,2}$: _____dBHL								

PERCENTAGE LOSS OF HEARING (PLH) based on:	**500 Hz**	**1000 Hz**	**2000 Hz**	**3000 Hz**	**4000 Hz**	**TOTAL PLH**
Most recent audiogram						
First entry audiogram						
Difference in (PLH*) i.e.* ***Shift in PLH= Most recent audiogram – First entry audiogram*** Difference in PLH (Y/N): _____						

APPENDIX I:

HREC Request for modification

UNIVERSITEIT·STELLENBOSCH·UNIVERSITY
jou kennisvennoot · your knowledge partner

Request for Modifications
New Application

25-Mar-2013
BARRION, Irene Monica

Ethics Reference #: S13/02/025
Title: RISK FACTORS ASSOCIATED WITH HEARING LOSS IN THE MINING SECTOR IN NAMIBIA

Dear Miss Irene BARRION,

The New Application received on 13-Feb-2013, was reviewed by Health Research Ethics Committee 2 via Committee Review procedures on 20-Mar-2013.

Present Committee Members:
Davids, Mertrude MA
Fernandez, Pedro PW
Lochner, Christine C
Kruger, Mariana M
Rosenkranz, Bernd B
Botha, Philip PR
Barsdorf, Nicola
De Roubaix, Malcolm JAM
Moller, Marlo M
Engelbrecht, Susan S
Willett, David DWE
Verster, Gerrit GC
Edwards, C E
Rohland, Elvira EL
Botha, Matthys MH

In principle the Committee is in agreement with the project, but requested that you attend to the following matters before the project could be finally approved.The following modification(s) and/or additional information about the research or the application are requested:

1. The synopsis can be structured with sub headings to assist in reading.

2. Why are the participants between 18 and 60 years excluded? They should be included in the study population. Kindly adjust the inclusion criteria appropriately.

3. The anonymous/confidential handling of information should be expanded to demonstrate clearly how participants' medical history will remain confidential.

4. The informed consent should discuss in detail what medical information will be collected, especially the HIV status of the patients. Please discuss what will happen if the participant has hearing loss and indicate to whom the participant will be referred to for further management.

5. There is no discussion of any potential benefits to the participant. Please elaborate?

6. Kindly use the template of the participant informed consent form (PICF), available on the website: www.sun.ac.za/rds

7. Kindly indicate how you will anonymise this study.

8. You make reference to 'race', kindly indicate whether this is a research variable. If not you are kindly requested to omit it.

9. Kindly note that the worker's numbers should be substituted with research numbers.

10. You indicate that the workers will get together to complete the questionnaire. Kindly indicate whether there will be supervision available to assist the workers if they would require clarification, etc.

11. You are kindly requested to check the protocol for grammatical errors.

On receipt of the additional information / corrected document(s) the application will be reconsidered.

Please provide a letter of response to all the points raised IN ADDITION to HIGHLIGHTING or using TRACK CHANGES function indicate ALL corrections / amendments of ALL DOCUMENTATION, clearly in order to allow rapid scrutiny and appraisal.

The HREC has determined that your response to this Request for Modifications may be reviewed via Expedited review procedures. Based on your response the HREC has the prerogative and authority to ask further questions, seek additional information, require further modifications, or refer your response to the convened HREC.

Please note that the application for approval and registration of this project would be cancelled automatically if no feedback is received from you within 6 (six) months of the date of this letter.
Please note that you ***may not*** recruit subjects until you receive a ***written notice of HREC approval*** that will include the date-stamped informed consent document(s) to use when seeking consent from subjects.

For standard HREC forms and documents please visit: www.sun.ac.za/rds

If you have any questions or need further assistance, please contact the HREC office at 0219389207.

Sincerely,

Mertrude Davids
HREC Coordinator
Health Research Ethics Committee 2

APPENDIX J
Approved Health Research Ethics Committee Letter

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jou kennisvennoot · your knowledge partner

Approval Notice
Response to Modifications- (New Application)

06-Jun-2013
BARRION, Irene Monica

Ethics Reference #: S13/02/025
Title: RISK FACTORS ASSOCIATED WITH HEARING LOSS IN THE MINING SECTOR IN NAMIBIA

Dear Miss Irene BARRION,

The Response to Modifications - *(New Application)* received on 13-May-2013, was reviewed by members of Health Research Ethics Committee 2 via Expedited review procedures on 05-Jun-2013 and was approved.
Please note the following information about your approved research protocol:

Protocol Approval Period: 05-Jun-2013 -05-Jun-2014

Please remember to use your **protocol number** (S13/02/025) on any documents or correspondence with the HREC concerning your research protocol.

Please note that the HREC has the prerogative and authority to ask further questions, seek additional information, require further modifications, or monitor the conduct of your research and the consent process.

After Ethical Review:
Please note a template of the progress report is obtainable on www.sun.ac.za/rds and should be submitted to the Committee before the year has expired.
The Committee will then consider the continuation of the project for a further year (if necessary). Annually a number of projects may be selected randomly for an external audit.
Translation of the consent document to the language applicable to the study participants should be submitted.

Federal Wide Assurance Number: 00001372
Institutional Review Board (IRB) Number: IRB0005239

The Health Research Ethics Committee complies with the SA National Health Act No.61 2003 as it pertains to health research and the United States Code of Federal Regulations Title 45 Part 46. This committee abides by the ethical norms and principles for research, established by the Declaration of Helsinki, the South African Medical Research Council Guidelines as well as the Guidelines for Ethical Research: Principles Structures and Processes 2004 (Department of Health).

Provincial and City of Cape Town Approval

Please note that for research at a primary or secondary healthcare facility permission must still be obtained from the relevant authorities (Western Cape Department of Health and/or City Health) to conduct the research as stated in the protocol. Contact persons are Ms Claudette Abrahams at Western Cape Department of Health (healthres@pgwc.gov.za Tel: +27 21 483 9907) and Dr Helene Visser at City Health (Helene.Visser@capetown.gov.za Tel: +27 21 400 3981). Research that will be conducted at any tertiary academic institution requires approval from the relevant hospital manager. Ethics approval is required BEFORE approval can be obtained from these health authorities.

We wish you the best as you conduct your research.
For standard HREC forms and documents please visit: www.sun.ac.za/rds

If you have any questions or need further assistance, please contact the HREC office at 0219389207.

Included Documents:
Investigators declaration
Protocol
Supervisors declaration
Synopsis
Application Form
Checklist
cv Dawood
CV Irene
CV Meinjies
Supervisors declaration

APPENDIX K1:

Letter to the Permanent Secretary of the Ministry of Health & Social Services

P. O. Box 50157
Bachbrecht
Windhoek
NAMIBIA

TO: Mr. A. Ndishishi
The Permanent Secretary
Ministry of Health & Social Services
Private Bag 13198
Windhoek

ATTENTION: The Biomedical Research Committee &
Research Management Committee
Ministry of Health & Social Services

Date:

Dear Sir

REQUEST FOR PERMISSION TO CONDUCT A STUDY ON THE RISK FACTORS ASSOCIATED WITH HEARING LOSS IN THE MINING SECTOR IN NAMIBIA

The purpose of this letter is to seek permission from the Biomedical Research Committee and Research Management Committee to conduct the above-mentioned study. Currently, I am the Audiologist employed at the Ministry of Health & Social Services, Speech Therapy & Audiology Department (Ear, Nose & Throat Clinic) at the Windhoek Central Hospital. I am also registered as a Master's in Audiology student at Stellenbosch University (R.S.A.): Interdisciplinary Health Division, Speech & Hearing Department.

In my line of work, I often identify, assess and manage patients who present with ear problems such as hearing loss. Hearing loss can compromise the individual's ability to communicate and

function appropriately at work, home and socially and thereby adversely impact on his/her quality of life in the long run.

Several patients who presented with hearing loss also reported a history of working in environments that are potentially hazardous to their health. Such environments include being exposed to excessive sound/noise and/or toxic chemicals. Research indicates that exposure to excessive levels of sound/noise and/or toxic chemicals places individuals at risk for acquiring hearing loss. Upon further enquiry, these patients reported that as employees they were not always provided with adequate protective clothing and devices, while others reported not being aware of the need for such precautions. This made me query whether employers in Namibia are knowledgeable about these practices and are aware that preventative measures can be implemented to reduce the risk of acquiring this occupational disorder.

On the other hand, other research indicates that some individuals do not present with symptoms of hearing loss despite working in similar environments where they are exposed to excessive noise levels and/or toxic chemicals. This suggests that there can be other factors that can affect the individual's susceptibility to acquiring hearing loss, which is the title and purpose of my research.

Currently, there are limited studies regarding hearing loss in Namibia and more specifically hearing loss in the occupational environment within the country. Conducting this study would address this need and would allow for establishing a general baseline of mining employees' hearing levels in Namibia. Moreover, it would identify possible areas for further research in order to prevent future hearing loss, which would improve the employee's ability to communicate effectively in the work, home and social environments and thereby improve the individual's quality of life and reduce related financial and human capital costs to employers and the Government of Namibia.

This study complies with the ethical requirements of the Human Research Ethics Committee (HREC) at Stellenbosch University, R.S.A., and has been presented to the Chamber of Mines, Namibia. However, prior to commencing with my study, the HREC requires me to obtain formal written permission from the national ethics governing body in Namibia, i.e. The Biomedical Ethics Research Committee & Research Management Committee; hence my respectful request.

Please find attached the following documents:

- A copy of the ethics approval from the HREC, Stellenbosch University;
- My application to register the study at the Ministry of Health & Social Services;
- My research proposal;
- The questionnaire I will use as a tool for data capturing;
- My Curriculum Vitae (CV) and
- Certified copies of my credentials.

Taking all of the above into account, I hope you will consider my request favourably and grant me permission to conduct this study.

I look forward to hearing from you.

Yours faithfully

.....
(Ms) Irene M. Barrion

APPENDIX K2:

Biomedical Research Ethics Committee (BREC) &

Research Management Committee (RMC) Approval Letter

9 - 00001

REPUBLIC OF NAMIBIA

Ministry of Health and Social Services

Private Bag 13198 **Ministerial Building** **Tel: (061) 2032560**
Windhoek **Harvey Street** **Fax: (061) 222558**
Namibia **Windhoek** **E-mail:** tkakili@yahoo.com
Enquiries: Ms. T. Kakili **Ref:** 17/3/3 **Date:** 29 July 2013

OFFICE OF THE PERMANENT SECRETARY

Ms. L Barrion
P. O. Box 5157
Bachbrecht

Dear Ms Barrion

Re: A study on the risk factors associated with hearing loss in the mining sector in Namibia

1. Reference is made to your application to conduct the above-mentioned study.

2. The proposal has been evaluated and found to have merit.

3. **Kindly be informed that permission to conduct the study has been granted under the following conditions:**

3.1 The data to be collected must only be used for the completion of your Master's degree in Audiology;
3.2 No other data should be collected other than the data stated in the proposal;
3.3 A quarterly report to be submitted to the Ministry's Research Unit;
3.4 Preliminary findings to be submitted upon completion of the study;
3.5 Final report to be submitted upon completion of the study;
3.6 Separate permission should be sought from the Ministry for the publication of the findings.

Yours sincerely,

MR. ANDREW NDISHISHI
PERMANENT SECRETARY

"Health for All"

APPENDIX L1:

English information leaflet & informed consent form

PARTICIPANT INFORMATION LEAFLET & INFORMED CONSENT FORM

TITLE OF THE RESEARCH PROJECT:

Risk factors associated with hearing loss in the mining sector in Namibia

REFERENCE NUMBER: S13/02/025

PRINCIPAL INVESTIGATOR: Ms Irene M. Barrion

ADDRESS: Speech & Hearing Therapy Division

Interdisciplinary Health Department

Faculty of Health Sciences

Tygerberg Campus

CONTACT NUMBER: +264 (0)81 320 30 49(Cell phone)

+264 (0)61 203 31 45 (Work)

Dear Participant

You are being invited to take part in a research project. Please take some time to read the information presented here, which will explain the details of this project. Please ask the study staff any questions about any part of this project that you do not fully understand. It is very important that you are fully satisfied that you clearly understand what this research entails and how you could be involved. Also, your participation is **entirely voluntary** and you are free to

decline to participate. If you say no, this will not affect you negatively in any way whatsoever. You are also free to withdraw from the study at any point, even if you do agree to take part.

This study has been approved by the Health Research Ethics Committee at Stellenbosch University and will be conducted according to the ethical guidelines and principles of the international Declaration of Helsinki, South African Guidelines for Good Clinical Practice and the Medical Research Council (MRC) Ethical Guidelines for Research.

What is this research study all about?

The purpose of this study is to find out possible factors related to hearing loss of the miner's in Namibian mines.

By taking part in this study you will help by giving information about what your hearing is like among mine-workers. This research will look at what is being done by your employer and by you (the employee) in preventing hearing problems. Moreover, it will look at which medical condition such as recurrent ear infection, Head trauma/injury, Cholesterol, Hypertension (high-blood pressure), Diabetes, Tuberculosis, HIV/AIDs, Cancer, Malaria and Chronic pain, which have been associated with hearing loss in your workplace. This will help your company to improve their employee wellness programme even better in future to protect you and other workers.

A total of 150 mine-workers *(to be verified based on the participating mine selection criteria)* have been invited from five (5) different mines around Namibia to join this study. You are one of thirty mine-workers from your workplace.

As a mine-worker your name was selected in a manner described below:

Out of 13 mines in Namibia, the management of 5 mining/exploration companies were approached and agreed to join this study *(to be verified based on mine selection criteria)*. Your

mine was chosen because it has functioning and reliable equipment as well as appropriate health professionals, who do hearing tests on employees and safely keep your medical records.

A list of all mine-workers that work in areas with loud noise during work was obtained from your Human Resource (HR) Department. A number (research number) was given to all workers on the list so that your information can remain secret and we cannot identify you. This was also done to make sure that I (as the PI) have not been unfair in choosing who will take part.

A computer randomly chose your name from the list provided by your HR Department using the research number given to you.

Why have you been invited to participate?

You were invited to take part in this study, because you work directly in a mine in Namibia

What will your responsibilities be?

As someone who has agreed to take part, you will need to:

1. ***Sign an informed consent form***

- This form says that this study was explained to you and that you understand:
- the purpose of the study, how the study will develop and how it will be done,
- that you are free to take part in this study (if you want to). You are also free to let me know at any time if you do not agree to take part in this project.
- that any identifying and information of personal nature obtained **will** remain secret/confidential.
- that you have agreed to allow the PI to look at your work and medical records, especially your first (when you started working at this mine) and your latest hearing test.
- that you have agreed to allow the PI to look your work and medical records in order to establish whether you have ever been treated for medical conditions that have been known to be associated with hearing loss.

2. ***Fill in a Worker's hearing health questionnaire as honestly as possible***

This questionnaire has 62 questions which will include nine sections. These sections include participant details (e.g. research number and your home language), demographic information (e.g. age, gender, population group), medical history, hearing and balance history, work history, workplace hearing loss prevention programme, exposure to toxic chemicals, family history and leisure activities. Each question will be presented one at a time in a power-point presentation whilst you are filling in the questionnaire simultaneously. This will be done so that should you have any questions, they can be answered immediately and other participants may have a better understanding of what is being asked. The PI will speak in either English or Afrikaans. If you cannot speak English or Afrikaans, the PI will ask an interpreter to speak to you.

Will you benefit from taking part in this research?

There is no material or financial incentives for participating in this study. However, this research will allow your employer to be aware of other risk factors such as medical conditions (e.g. High-blood pressure, Diabetes) associated with hearing loss. Recommendations can be made to introduce or improve the current wellness programme in companies that will reduce the occurrence of hearing loss and promote health of all mine-workers in general.

Are there any risks involved in your taking part in this research?

Any risks related to this study will be minimal, because this study entails looking at data that has already been captured in your medical records and information from the questionnaire, which you will fill in. All identifying information and personal information will be removed and data in the medical records will be kept strictly secret/confidential. Also, your medical records will be looked at where they are being stored in the Occupational Health Department. The PI will not be allowed to remove any information or relocate your medical records.

Who will have access to your medical records?

All information collected during this study will remain secret and protected. As mentioned before you will be given a number (Research number), which will be used when collecting information. If the information collected will be used in a publication or thesis, all information that identifies you will be removed to ensure that nobody knows who you are or that you took part in the study. Only the PI will be allowed to look at your information.

Will you be paid to take part in this study and are there any costs involved?

No you will not be paid to take part in the study**.** As previously mentioned, participation in this study is **voluntary.** There will be no costs involved for you, if you do take part.

Is there anything else that you should know or do?

You can contact **Ms Irene M. Barrion** at Tel. **081 320 3049** if you have any further queries or encounter any problems **related to this study**.

You can contact the Health Research Ethics Committee at +27 21-938 9207 if you have any concerns or complaints that have not been adequately addressed by your PI.

You will receive a copy of this information and consent form for your own records.

Declaration by participant

By signing below, I ……..……. agree to take part in a research study entitled ***Risk factors associated with hearing loss in the mining sector in Namibia.***

I declare that:

- I have read or had read to me this information and consent form and it is written in a language with which I am fluent and comfortable.
- I have had a chance to ask questions and all my questions have been adequately answered.
- I understand that taking part in this study is **voluntary** and I have not been pressurised to take part.
- I may choose to leave the study at any time and will not be penalised or prejudiced in any way.
- I may be asked to leave the study before it has finished, if the study doctor or PI feels it is in my best interests, or if I do not follow the study plan, as agreed to.

Signed at (*place*) .....…..…….. on (*date*) ……...…….. 2005.

Signature of participant Signature of witness

Declaration by investigator

I *(name)* ……..…… declare that:

I explained the information in this document to ……..

I encouraged him/her to ask questions and took adequate time to answer them.

I am satisfied that he/she adequately understands all aspects of the research, as discussed above

I did/did not use an interpreter. (*If an interpreter is used then the interpreter must sign the declaration below.*

Signed at (*place*) .....…..…….. on (*date*) ……...…….. 2005.

Signature of investigator Signature of witness

Declaration by interpreter

I *(name)* ……..…… declare that:

I assisted the investigator (*name*) ……. to explain the information in this document to (*name of participant*) ……..…….. using the language medium of..... *(language name).*

We encouraged him/her to ask questions and took adequate time to answer them.

I conveyed a factually correct version of what was related to me.

I am satisfied that the participant fully understands the content of this informed consent document and has had all his/her question satisfactorily answered.

Signed at (*place*) .....….....…….. on (*date*) ……...……..

Signature of interpreter Signature of witness

APPENDIX L2

Afrikaans information leaflet & informed consent

DEELNEMERINLIGTINGSBLAD EN -TOESTEMMINGSVORM

TITEL VAN DIE NAVORSINGSPROJEK:

Risk factors associated with hearing loss in the mining sector in Namibia

VERWYSINGSNOMMER: S13/02/025

HOOFNAVORSER: Me Irene M Barrion

ADRES: Afdeling Spraak-Taal- en Gehoorterapie

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Beste deelnemer

U word hiermee uitgenooi om aan ’n navorsingsprojek deel te neem. Lees asseblief hierdie inligtingsblad deeglik deur, aangesien die details van die navorsingsprojek hierin verduidelik

word. Indien daar enige deel van die navorsingsprojek is wat u nie ten volle verstaan nie, is u welkom om die navorsingspersoneel daaroor uit te vra. Dit is baie belangrik dat u tevrede is dat u ten volle verstaan wat die navorsingsprojek behels en hoe u daarby betrokke kan wees. U deelname is ook **volkome vrywillig** en dit staan u vry om deelname te weier. U sal op geen wyse hoegenaamd negatief beïnvloed word indien u sou weier om deel te neem nie. U mag ook te eniger tyd aan die navorsingsprojek onttrek, selfs al het u ingestem om deel te neem.

Hierdie navorsingsprojek is deur die Gesondheidsnavorsingsetiekkomitee van die Universiteit Stellenbosch (GNEK) **goedgekeur en sal uitgevoer word volgens die etiese riglyne en beginsels van die internasionale Verklaring van Helsinki, die Suid-Afrikaanse Riglyne vir Goeie Kliniese Praktyk en die Etiese Riglyne vir Navorsing van die Mediese Navorsingsraad (MNR).**

Wat behels hierdie navorsingsprojek?

Die doel van die navorsingsprojek om uit te vind watter moontlike faktore betrekking het op gehoorverlies in die myne in Namibië.

Deur deel te neem aan hierdie navorsingsprojek sal u help deur inligting te verskaf oor u gehoorvermoë in vergelyking met ander mynwerkers. Die navorsing sal ook kyk na wat gedoen word deur u werkgewer en deur u self (as werknemer) om gehoorprobleme te voorkom. Verder sal dit kyk na watter mediese toestande, soos herhaaldelike oorinfeksie, kop-trauma/beserings, cholesterol, hipertensie (hoë bloeddruk), suikersiekte, tuberkulose, MIV/vigs, kanker, malaria en kroniese pyn, wat geassosieer word met gehoorverlies in u werkplek. Dit sal u werkgewer help om sy werknemerswelweesprogram verder te verbeter om u en ander werkers in die toekoms beter te beskerm.

'n Totaal van 150 mynwerkers (*wat geverifieer sal word op grond van deelnemendemyn-seleksiekriteria*) van vyf myne in Namibië is genooi om deel te neem aan hierdie navorsingsprojek. U is een van die dertig mynwerkers uit u werksplek.

As ’n mynwerker is u naam op die volgende manier gekies:

Uit dertien myne in Namibië is die bestuur van vyf mynwese-/eksplorasiemaatskappye genader, en hulle het ingestem om aan hierdie studie deel te neem (*wat geverifieer sal word op grond van deelnemendemyn-seleksiekriteria*). U myn is gekies omdat dit werkende en betroubare toerusting het, sowel as toepaslike gesondheidswerkers wat gehoortoetse op werknemers doen en u mediese rekords veilig bewaar.

’n Lys van alle mynwerkers wat werk in areas met harde geraas gedurende werkstyd is verkry van u menslikehulpbronne-afdeling. ’n Nommer (navorsingsnommer) is aan elke werker op die lys gekoppel, sodat u inligting vertroulik kan bly en ons u nie kan identifiseer nie. Dis ook gedoen om seker te maak dat ek (die hoofnavorser) nie op ’n onregverdige manier kies wie gaan deelneem nie.

Deur slegs gebruik te maak van die navorsingsnommer wat aan u toegeken is, is u naam ewekansig deur ’n rekenaar gekies uit die lys wat voorsien is deur u menslikehulpbronne-afdeling.

Waarom is u genooi om deel te neem?

U is uitgenooi om deel te neem aan hierdie navorsingsprojek omdat u direk in ’n myn in Namibië werk.

Wat sal u verantwoordelikhede wees?

As iemand wat ingestem het om aan hierdie navorsingsprojek deel te neem, sal u moet:

1. *'n Ingeligtetoestemmingsvorm onderteken*

Op hierdie vorm staan dat die navorsingsprojek aan u verduidelik is en dat u die volgende verstaan:

- Wat die doel van die navorsing is, hoe die navorsing sal ontwikkel en hoe dit gedoen sal word.
- Dat dit u vrystaan om deel te neem aan hierdie navorsing as u wil. Dat dit u ook vrystaan om my (die hoofnavorser) enige tyd te laat weet as u nie meer deel wil neem aan hierdie navorsingsprojek nie.
- Dat enige identifiserende inligting en inligting van 'n persoonlike aard wat verkry word, **geheim gehou sal word/konfidensieel sal bly**.
- Dat u ingestem het dat die hoofnavorser kan kyk na u werk en mediese rekords, veral na u eerste (toe u begin werk het by hierdie myn) en u laaste gehoortoets.
- Dat u ingestem het dat die hoofnavorser na u werk en mediese rekords kan kyk om vas te stel of u al ooit behandel is vir mediese toestande wat geassosieer word met gehoorverlies.

2. *'n Werknemersgehoorgesondheid-vraelys so eerlik as moontlik voltooi*

Hierdie vraelys het 62 vrae wat nege afdelings opmaak. Hierdie afdelings sluit in deelnemersinligting (bv. navorsingsnommer en u huistaal), demografiese inligting (bv. ouderdom, geslag, bevolkingsgroep), mediese geskiedenis, gehoor- en balansgeskiedenis, werksgeskiedenis, werksplek-gehoorverlies-voorkomingsprogram, blootstelling aan toksiese chemikalieë, familiegeskiedenis en ontspanningsaktiwiteite.
Elke vraag sal afsonderlik as 'n PowerPoint-skyfie met 'n oorhoofse projektor aangebied word, terwyl u die vraelys op dieselfde tyd invul. Hierdie metode word gevolg sodat enige vrae wat u moontlik mag hê onmiddellik beantwoord kan word, en ander deelnemers ook 'n beter begrip kan vorm van wat verlang word. Die hoofnavorser sal óf in Afrikaans óf in Engels praat. As u nie Engels of Afrikaans kan praat nie, sal die hoofnavorser 'n tolk vra om met u te praat.

Sal u voordeel trek deur deel te neem aan hierdie navorsing?

Daar is geen materiële of finansiële insentiewe vir deelname aan hierdie navorsing nie. Die navorsing sal egter u werkgewer bewus maak van ander risikofaktore, soos mediese toestande (bv. hoë bloeddruk en suikersiekte), wat met gehoorverlies geassosieer word. Aanbevelings

kan gemaak word om ’n welweesprogram in maatskappye bekend te stel, of huidige welweesprogramme in maatskappye te verbeter, om sodoende gehoorverlies te verminder en die algemene gesondheid van alle werkers te bevorder.

Is daar enige risiko's verbonde aan u deelname aan hierdie navorsing?

Aangesien hierdie navorsing kyk na data wat reeds in u mediese rekords opgeneem is en na inligting uit die vraelys, wat u sal invul, is enige risiko’s verbonde aan die navorsing minimaal. Alle identifiseerbare inligting en persoonlike inligting sal verwyder word en die data uit die mediese rekords sal streng konfidensieel/geheim gehou word. U mediese rekords sal bestudeer word, spesifiek waar hulle geberg word in die arbeidsgesondheid-afdeling. Die hoofnavorser sal nie toegelaat word om enige inligting te verwyder of om u mediese rekords te verskuif nie.

Wie sal toegang hê tot u mediese rekords?

Alle inligting wat bymekaar gemaak word gedurende hierdie navorsing sal bewaar word en geheim bly. Soos voorheen genoem, sal ’n nommer (navorsingsnommer) aan u toegeken word wat gebruik sal word wanneer inligting ingewin word. As die inligting wat ingewin is in ’n publikasie of tesis gebruik word, sal alle inligting wat u kan identifiseer verwyder word om te verseker dat niemand weet wie u is of dat u deelgeneem het aan hierdie navorsing nie. Net die hoofnavorser mag na u inligting kyk.

Sal u betaal word vir deelname aan die navorsingsprojek en is daar enige koste verbonde aan deelname?

U sal nie betaal word om aan hierdie navorsing deel te neem nie. Soos voorheen genoem, is deelname aan hierdie navorsing vrywillig. Daar sal geen onkoste vir u wees as u deelneem nie.

Is daar enigiets anders wat u moet weet of doen?

U kan vir **me Irene M. Barrion** by tel. **081 320 3049** skakel as u enige verdere navrae het of as u enige probleme ondervind **wat met hierdie projek te doen het**.

U kan die Gesondheidsnavorsingsetiekkomitee by +27 21 938 9207 skakel as u enige bekommernisse of klagtes het wat nie bevredigend deur u hoofnavorser aangespreek is nie.

U sal ’n afskrif van hierdie inligtingsblad en toestemmingsvorm vir u eie rekords ontvang.

Verklaring deur deelnemer

Met die ondertekening van hierdie dokument, onderneem ek, …….....……...……..……., om deel te neem aan die navorsingsprojek getiteld **Risk factors associated with hearing loss in the mining sector in Namibia**.

Ek verklaar dat:

- Ek hierdie inligtingsblad en toestemmingsvorm gelees het of aan my laat voorlees het en dat dit in ’n taal geskryf is waarin ek vaardig en waarmee ek gemaklik is.
- Ek geleentheid gehad het om vrae te stel en dat al my vrae bevredigend beantwoord is.
- Ek verstaan dat deelname aan hierdie navorsing **vrywillig** is, en ek verklaar verder dat daar geen druk op my geplaas is om deel te neem nie.
- Ek verstaan dat ek te eniger tyd aan hierdie navorsing mag onttrek en dat ek nie op enige wyse hierdeur benadeel sal word nie.
- Ek verstaan dat ek gevra mag word om aan hierdie navorsing te onttrek voordat dit afgehandel is, indien die studiedokter of hoofnavorser voel dat dit in my beste belang is of indien ek nie die ooreengekome navorsingsplan volg nie.

Geteken te *(plek)* .....……. op *(datum)* ……...…….. 2013.

..... **.....**

Handtekening van deelnemer **Handtekening van getuie**

.....

(Plaas asseblief die plakker hier)

Verklaring deur navorser

Ek *(naam)* ……...…… verklaar dat:

- Ek die inligting in hierdie dokument aan …….....……. verduidelik het.
- Ek hom/haar aangemoedig het om vrae te vra en dat ek voldoende tyd gebruik het om dit te beantwoord.
- Ek tevrede is dat hy/sy al die aspekte van die navorsing, soos hierbo bespreek, voldoende verstaan.
- Ek ’n tolk gebruik het/nie ’n tolk gebruik het nie. (*Indien ’n tolk gebruik is, moet die tolk die onderstaande verklaring teken.)*

Geteken te *(plek*) .....…….. op *(datum*) ……...…….. 2013.

....

Handtekening van navorser **Handtekening van getuie**

Verklaring deur tolk

Ek *(naam)* ……..…… verklaar dat:

- Ek die navorser *(naam*) …….....…….. bygestaan het om die inligting in hierdie dokument aan *(naam van deelnemer)* ……..... te verduidelik in die taalmedium van ……..... *(naam van taal).*
- Ons hom/haar aangemoedig het om vrae te vra en dat ons voldoende tyd gebruik het om dit te beantwoord.
- Ek ’n feitelik korrekte weergawe oorgedra het van wat aan my gesê is.
- Ek tevrede is dat die deelnemer die inhoud van hierdie ingeligtetoestemmings-dokument ten volle verstaan en dat al sy/haar vrae bevredigend beantwoord is.

Geteken te *(plek*) .....…….. op *(datum*) ……...…….. 2013.

....

Handtekening van tolk **Handtekening van getuie**

APPENDIX M1:

Letter to Medical Superintendent requesting permission to carry out Pilot Study at Laundry Department at XXXXX

P. O. Box 50157
Bachbrecht
Windhoek
NAMIBIA

TO: Dr XXXXXXX
Medical Superintendent
Private Bag XXXXX
Windhoek

CC:
Manager of the Laundry Services
XXXXXXXXX

Date: XXXX 2013

REQUEST TO CONDUCT A PILOT STUDY ON FIVE (5) EMPLOYEES FROM THE LAUNDRY SERVICES, XXXXXX HOSPITAL.

I am writing this letter with regards to the above-mentioned topic. As a Master's in Audiology student at Stellenbosch University (R.S.A.), Interdisciplinary Health Division, Speech & Hearing Department as well as the Audiologist for the Ministry of Health & Social Services, I am conducting a study on *"The risk factors contributing to hearing loss in the mining sector in Namibia"*. Part of my study includes that I carry out a Pilot study to test whether the questionnaire that has been designed and which will be used to collect data is appropriate and understood by the informants (mine-workers).

In order to test whether the questionnaire is appropriate and will be understood by the informants, I would like to present the questionnaire to five (5) randomly selected participants who may present with similar educational backgrounds and English language proficiency, which is the language used in the questionnaire. The employees at the laundry services at the

XXXXXX hospital have been identified as possible participants who may have similar backgrounds, and who may be willing to participate.

Please see the attached Worker's Hearing Health Questionnaire.

I look forward to your positive response.

Yours faithfully

……
(Ms) Irene M. Barrion.

APPENDIX M2:

Evaluation forms of participants for Pilot Study

EVALUATION FORM OF THE WORKER'S HEARING HEALTH QUESTIONNAIRE & IT'S ADMINISTRATION

Please mark the block that you think applies to you	**Strongly Agree**	**Agree**	**Disagree**	**Strongly Disagree**
1. I understood the questions clearly.				
2. The questions were NOT offensive				
3. The questionnaire took long to answer.				
4. The presenter was organized.				
5. The presenter explained **the purpose** of the study clearly.				
6. The presenter explained **the method of selection of participants** clearly.				
7. The presenter explained **the questionnaire** clearly.				
8. The presenter answered **other questions** regarding the study clearly.				

9. Which questions **were difficult** to understand?

_____

_____

10. Which questions **were offensive**?

_____

_____

THANK YOU.

APPENDIX N

Comprehensive summary of individual extrinsic and intrinsic risk factors

Table 15: Summary of Intrinsic risk factors

Variable (n=total valid responses)	Total number of respondents with variable (%)	Total number of respondents with variable and potential hearing loss (%)	OR (95% CI)	p value	Total number of respondents excluded out 132 (%)	Exclusion reason/Description
Age>30 years (n=131)	99 (75.57)	33 (25)	4.8 (0.4 - 17)	0.008	1 (0.76)	1 did not complete question
Age > 40 years (n=131)	45 (34.35)	20 (15.27)	3.5 (1.6 - 7.8)	0.002	1 (0.76)	1 did not complete question
Age > 50 years (n=131)	18 (13.74)	11 (8.4)	5.5 (1.9 - 15.8)	0.001	1 (0.76)	1 did not complete question
Age >60 years (n=131)	2 (1.53)	1 (0.76)	2.7 (0.2 - 44.1)	0.4761*	1 (0.76)	1 did not complete question
Gender						
Male (n=132)	115 (87.12)	34 (25.76)	3.1 (0.7 - 14.5)	0.153*	0 (0)	
Female (n=132)	17 (12.88)	2 (1.52)				
Family history of hearing loss						
Yes(n=114)	27 (23.68)	8 (7.02)	0.9 (0.4 - 2.4)	0.890	18 (13.64)	15 did not know the answer to this question and 3 did not answer this question
No(n=114)	87 (76.32)	27 (23.68)				
Consanguineous marriage between parents						
Yes(n=108)	10 (9.26)	3 (2.78)	1.2 (0.3 - 4.9)	1*	24 (18.18)	13 did not know the answer to this question and 11 did not answer this question
No(n=108)	98 (90.74)	26 (24.07)				

Table 16: Summary of Extrinsic medical factors

Variable (n=total number of valid responses)	Number (%) of respondents with variable	Number (%) of respondents with variable and potential hearing loss	OR (95% CI)	p value	Excluded (%)	Exclusion reason/Description
Chronic ear infection(n=132)						
Yes	13 (9.85)	4 (3.03)	1.2 (0.3 - 4.2)	0.705*	0 (0)	
No	119 (90.15)	32 (24.24)				
Head injury/trauma(n=132)						
Yes	7 (5.3)	3 (2.27)	2.1 (0.4 - 9.8)	0.392*	0 (0)	
No	125 (94.7)	33 (25)				
Cholesterol (n=132)						
Yes	13 (9.85)	5 (3.79)	1.8 (0.5 - 5.8)	0.34*	0 (0)	
No\	119 (90.15)	31 (23.48)				
Hypertension(n=132)						
Yes	17 (12.88)	8 (6.06)	2.8 (1 - 7.8)	0.077*	0 (0)	
No	115 (87.12)	28 (21.21)				
Diabetes(n=132)						
Yes	8 (6.06)	5 (3.79)	5 (1.1 - 22.1)	0.035*	0 (0)	
No	124 (93.94)	31 (23.48)				
Diabetes diagnosed >1 year of study*	3 (42.86)	2 (28.57)	2 (0.1 - 44.4)	1*	125 (94.7)	124 N/A(Non diabetic) & 1 diabetic did not complete this question
Diabetes diagnosed <1 year of study*	4 (57.14)	2 (28.57)				
Diabetes treated > 1 year of study*	4 (66.67)	2 (33.33)	1 (0 - 29.8)	1*	126 (95.45)	124 N/A(Non-diabetic) & 2 diabetics did not complete this question
Diabetes treated < 1 year of study*	2 (33.33)	1 (16.67)				
Uncontrolled diabetes*	1 (14.29)	1 (14.29)	3 (0.1 - 102.1)$	1*	125 (94.7)	124 N/A (Non diabetic) & 1diabetic did not complete this question
Controlled*	6 (85.71)	3 (42.86)				

Tuberculosis (TB)(n=132)						
Yes	8 (6.06)	2 (1.52)	0.9 (0.2 - 4.6)	1*	0 (0)	
No	124 (93.94)	31 (23.48)				
HIV/AIDS (n=132)						
Yes	7 (5.3)	2 (1.52)	1.1 (0.2 - 5.8)	1*	0 (0)	
No	125 (94.7)	34 (25.76)				
Cancer (n=132)						
Yes	2 (1.52)	1 (0.76)	2.7 (0.2 - 44.6)	0.473*	0 (0)	
No	130 (98.48)	35 (26.52)				
Malaria (n=132)						
Yes	7 (5.3)	0 (0)	0.2 (0 - 5.6)$	0.189*	0 (0)	
No	125 (94.7)	36 (27.27)				
Chronic pain (n=132)						
Yes	10 (7.58)	1 (0.76)	0.3 (0 - 2.3)	0.285*	0 (0)	
No	122 (92.42)	35 (26.52)				

Table 17: Summary of Extrinsic social factors

Variable	Number (%) of respondents with variable	Number (%) of respondents with variable and potential hearing loss	OR (95% CI)	p value	Excluded (%)	Exclusion reason/Description
Ever smoke (n=129)						
Yes	36 (27.91)	14 (10.85)	2.1 (0.9 - 4.7)	0.084	3 (2.27)	3 did not complete this question
No	93 (72.09)	22 (17.05)				
Drinking(n=130)						
Yes	91 (70)	21 (16.15)	0.5 (0.2 - 1.2)	0.131	2 (1.52)	1 did not answer this question, 1 misresponse
No	39 (30)	14 (10.77)				
Engage in at least one leisure activity that exposes him/her to loud sound(n=126)						
Yes	72 (57.14)	17 (13.49)	0.8 (0.4 - 1.8)	0.595	6 (4.55)	6 misresponses
No	54 (42.86)	15 (11.9)				

Table 18: Summary of Extrinsic occupational factors

Variable (n=total number of valid respondents)	Number (%) of respondents with variable	Number (%) of respondents with variable and potential hearing loss	OR (95% CI)	p value	Excluded (%)	Exclusion reason/Description
Shout in work environment due to noise (exposed 85dBA) (n=122)						
Yes	68 (55.74)	18 (14.75)	0.9 (0.4 - 1.9)	0.699	10 (7.58)	5 did not complete this question and 5 did not know
No	54 (44.26)	16 (13.11)				
Exposed to toxic chemicals (n=117)						
Yes	64 (54.7)	20 (17.09)	2 (0.8 - 4.7)	0.127	15 (11.36)	11 I don't know responses, 1 misresponse & 3 did not answer this question
No	53 (45.3)	10 (8.55)				
WHLPP available (n=108)						
Yes	71 (65.74)	19 (17.59)	1 (0.4 - 2.4)	0.976	24 (18.18)	19 did not know and 5 did not respond to this question
No	37 (34.26)	10 (9.26)				

Table 19: Comprehensic summary of variables categorised under WHLPP-Training and education component

Training & Education						
Variable (n=total number of valid responses)	**Number (%) of respondents with variable**	**Number (%) of respondents with variable and potential hearing loss**	**OR (95% CI)**	**p value**	**Excluded (%)**	**Exclusion reason/Description**
Formal training at least once a year (n=90)						
No	52 (57.78)	11 (12.22)	0.5 (0.2 - 1.2)	0.101	42 (31.82)	19 did not know, 7 did not answer this question, 4. Other (16 gave a different answer)
Yes	38 (42.22)	14 (15.56)				
Formal training on hearing loss prevention (n=123)						
No	42 (34.15)	6 (4.88)	0.3 (0.1 - 0.9)	0.024	9 (6.82)	8 did not answer this question and 1 misresponse
Yes	81 (65.85)	27 (21.95)				
Use of HPDs (n=126)						
No	4 (3.17)	1 (0.76)	0.9 (0.1 - 8.6)	1*	6 (4.55)	6 did not answer this question
Yes	122 (96.83)	34 (26.98)				
Training received on HPD use (n=130)						
No	19 (14.62)	2 (1.54)	0.3 (0.1 - 1.3)	0.094*	2 (1.52)	1 did not answer this question, 1 misresponse
Yes	111 (85.38)	33 (25.38)				
Length of time wearing HPD<8hours (n=121)						
Yes	91 (75.21)	26 (21.49)	2 (0.7 - 5.8)	0.195	11 (8.33)	3 misresponses and 8 did not answer this question
No	30 (24.79)	5 (4.13)				
Noise areas are clearly labelled/marked/visible (n=123)						
No	16 (13.01)	3 (2.44)		0.553*	9 (6.82)	

Yes	107 (86.99)	32 (26.02)	0.5 (0.1 - 2)			3 did not complete this question & 6 did not know the answer the question
Use of protective clothing (n=74)						
No	8 (10.81)	3 (4.05)	1.4 (0.3 - 6.3)	0.28	58 (43.94)	18 misresponses, 32 N/A(not exposed to chemicals), 8 did not answer the question
Yes	66 (89.19)	20 (27.03)				
Training received on protective clothing (n=128)						
No	22 (17.19)	6 (4.69)	1 (0.4 - 2.8)	0.993	4 (3.03)	4 did not answer this question
Yes	106 (82.81)	29 (22.66)				
Areas with toxic chemicals clearly marked/labelled/visible (n=116)						
No	4 (3.45)	2 (1.72)	2.9 (0.4 - 21.3)	0.29*	16 (12.12)	11 did not know the answer, 5 did not answer the question
Yes	112 (96.55)	29 (25)				

Table 20: Comprehensive summary of variables categorised under WHLPP Supervisory involvement component

Supervisory Involvement						
Variable (n=total number of valid responses)	**Number (%) of respondents with variable**	**Number (%) of respondents with variable and potential hearing loss**	**OR (95% CI)**	**p value**	**Excluded (%)**	**Exclusion reason/Description**
Use of HPD strictly and regularly monitored (n=115)						
No	30 (26.09)	6 (5.22)	0.6 (0.2 - 1.7)	0.377	17 (12.88)	11 don't know the answer and 6 did not answer this question
Yes	85 (73.91)	24 (20.87)				
Length of time supervisor wears HPD<8hours	94 (90.38)	22 (21.15)	0.7 (0.2 - 3)	0.255	28 (21.21)	12 don't know, 1 misresponses, 2 N/A, 13 did not answer this question
Length of time supervisor wears HPD≥8 hours	10 (9.62)	3 (2.88)				
Use of protective clothing strictly and regularly monitored (n=122)						
No	16 (13.11)	5 (4.1)	1.3 (0.4 - 4.2)	0.761*	10 (7.58)	8 don't know and 2 did not answer this question
Yes	106 (86.89)	27 (22.13)				
Length of time supervisor wears protective clothing <8hours	68 (65.38)	16 (15.38)	0.7 (0.3 - 1.7)	0.437	28 (21.21)	16 did not answer this question, 6 misresponses and 6 did not know
Length of time supervisor wears protective clothing ≥8 hours	36 (34.62)	11 (10.58)				

Table 21: Comprehensive summary ofvariables categorised under WHLPP-Measurement component

Measurement						
Variable (n=total number of valid responses)	**Number (%) of respondents with variable**	**Number (%) of respondents with variable and potential hearing loss**	**OR (95% CI)**	**p value**	**Excluded (%)**	**Exclusion reason/Description**
Regular monitoring of noise levels (n=77)						
No	23 (29.87)	4 (5.19)	0.5 (0.2 - 1.9)	0.333	55 (41.67)	52 did not know the answer to this question and 3 did not answer the question did not complete this question
Yes	54 (70.13)	15 (19.48)				
Regular monitoring of toxic chemical levels (n=56)						
No	20 (35.71)	4 (3.03)	0.7 (0.2 - 2.4)	0.52	76 (57.58)	67 don't know the answer to this question, 1 misresponse,8 did not answer this question
Yes						

Table 22: Comprehensive summary of variables categorised under WHLPP Engineering and Administration control component

Engineering & Administration Control						
Variable (n=total number of valid responses)	**Number (%) of respondents with variable**	**Number (%) of respondents with variable and potential hearing loss**	**OR (95% CI)**	**p value**	**Excluded (%)**	**Exclusion reason/Description**
Mufflers installed(n=83)						
No	44 (53.01)	12 (14.46)	1.7 (0.6 - 4.9)	0.313	49 (37.12)	46 did not know and 3 did not answer the question
Yes	39 (46.99)	7 (8.43)				
Walls/barriers installed to reduce sound (n=106))						
No	64 (60.38)	17 (16.04)	0.7 (0.3 - 1.5)	0.315	26 (19.7)	24 I don't know responses and 2 did not answer this question
Yes	42 (39.62)	15 (14.15)				
Sound absorbing materials installed(n=103)						
No	86 (83.5)	24 (23.3)	1.8 (0.5 - 6.9)	0.175	29 (21.97)	25 did not know responses and 4 did not answer this question
Yes	17 (16.5)	3 (2.91)				
Devices installed to reduce shaking/vibration (n=85)						
No	53 (62.35)	13 (15.29)	1.2 (0.4 - 3.3)	0.78	47 (35.61)	42 I don't know responses & 5 did not answer this question
Yes	32 (37.65)	7 (8.24)				
Machines serviced and maintained regularly(n=116)						
No	18 (15.52)	2 (1.72)	0.3 (0.1 - 1.4)	0.148*	16 (12.12)	13 did not know and 3 did not answer this question
Yes	98 (84.48)	29 (25)				

Work schedule arranged in a way to reduce noise exposure (n=118)						
No	59 (50)	20 (16.95)	1.8 (0.8 - 4.1)	0.151	14 (10.61)	8 did not know, 1 misresponse, 3 did not answer this question
Yes	59 (50)	13 (11.02)				
Workplace restrict number of employees working in noise areas (n=103)						
No	75 (72.82)	16 (15.53)	0.6 (0.2 - 1.5)	0.255	29 (21.97)	25 did not know and 4 did not answer this question
Yes	28 (27.18)	9 (8.74)				
No walls/barriers or enclosures to reduce toxic chemical exposure (n=108)						
No	19 (17.59)	7 (6.48)	1.5 (0.5 - 4.2)	0.448	24 (18.18)	20 did not know the answer to this question and 4 did not answer this question
Yes	89 (82.41)	25 (23.15)				
Work schedule arranged in a way to reduce toxic chemical exposure (n=102)						
No	15 (14.71)	3 (2.94)	0.7 (0.2 - 2.7)	0.23	30 (22.73)	23 did not know the answer to this question and 7 did not answer this question
Yes	87 (85.29)	23 (22.55)				
Number of employees exposed to toxic chemicals areas is restricted (n=83)						
No	25 (30.12)	5 (6.02)	0.7 (0.2 - 2.2)	0.57	49 (37.12)	42 did not know and 7 did not answer this question
Yes	58 (69.88)	15 (18.07)				

Table 23: Comprehensive summary of variables categorised under WHLPP assessment, monitoring and record keeping component

Assessment, Monitoring & Record keeping						
Variable (n=total number of valid responses)	**Number (%) of respondents with variable**	**Number (%) of respondents with variable and potential hearing loss**	**OR (95% CI)**	**p value**	**Excluded (%)**	**Exclusion reason/Description**
Annual medical checkups (n=128)						
No	2 (1.56)	0 (0)	0.5 (0 - 18.2)	1*	4 (3.03)	1 did not complete this question & 2 misresponses 1 every month Other responses.
Yes	126 (98.44)	34 (26.56)				
Knows who keeps medical records (n=128)						
No	15 (11.72)	1 (0.78)	0.2 (0 - 1.3)	0.067*	4 (3.03)	3 participants did not complete this question and 1 misresponse
Yes	113 (88.28)	34 (26.56)				
Do you have hearing difficulties? (n=117)						
Yes	7 (5.98)	4 (3.42)	3.7 (0.8 - 17.7)	0.09*	15 (11.36)	9 did not know and 6 did not answer this question
No	110 (94.02)	29 (24.79)				
Hearing tested at least once a year (n=128)						
No	5 (3.91)	0 (0)	N/A	0.322*	4 (3.03)	1 did not complete question, 1 marked that he/she was tested for the first time that year and 2 misresponses (Marked 8G I don't know, but still marked other categories A-F&H)
Yes	123 (96.09)	35 (27.34)				
Number of years employed in whole life (n=131)						

>1 year	129 (98.47)	35 (26.72)	0.4 (0 - 6.1)	0.476*	1 (0.76)	1 did not answer this question
≥5 years	121 (92.37)	35 (26.72)	3.7 (0.4 - 30)	0.283*	1 (0.76)	1 did not answer this question
≥10 years	83 (63.36)	29 (22.14)	3.1 (1.3 - 7.9)	0.012	1 (0.76)	1 did not answer this question
≥15 years	47 (35.88)	18 (13.74)	2.3 (1 - 5)	0.038	1 (0.76)	1 did not answer this question
≥20 years	29 (22.14)	14 (10.69)	3.4 (1.4 - 8.1)	0.004	1 (0.76)	1 did not answer this question
≥25 years	15 (11.45)	10 (7.63)	6.9 (2.2 - 22.1)	0.001*	1 (0.76)	1 did not answer this question
Number of years worked in current job (n=128)						
>1 year	119 (92.97)	34 (26.56)	3.2 (0.4 - 26.6)	0.443*		
≥5years	94 (73.44)	30 (23.44)	2.7 (1 - 7.7)	0.054		
≥10 years	38 (29.69)	18 (14.06)	3.9 (1.7 - 8.8)	0.001	4 (3.03)	1 misresponse and 3 participants did not complete this question
≥15 years	29 (22.66)	15 (11.72)	4.2 (1.8 - 10.2)	0.001		
≥20 years	16 (12.5)	11 (8.59)	8.1 (2.6 - 25.5)	0*		
≥25 years	11 (8.59)	5 (3.91)	2.4 (0.7 - 8.5)	0.171		
Number of hours exposed to loud sound >8 hours (n=125)						
Yes	40 (32)	10 (8)	0.9 (0.4 - 2.1)	0.808	7 (5.3)	2 misresponses and 5 did not complete this question
No	85 (68)	23 (18.4)				
Use noisy equipment (n=132)						
Yes	125 (94.7)	33 (25)	0.5 (0.1 - 2.3)	1*	0 (0)	
No	7 (5.3)	3 (2.27)				

Average number of hours working with noisy equipment >8hours (n=132)						
Yes	13 (9.85)	2 (1.52)	0.5 (0.1 - 2.2)	0.513*	0 (0)	
No	103 (89.57)	27 (23.48)				
Was your hearing affected in your previous job? (n=108)						
Yes	1 (0.93)	0 (0)	0.8 (0 - 27.5)$	N/A	24 (18.18)	19 did not know and 5 did not complete this question
No	107 (99.07)	31 (28.7)				

Table 24: Comprehensive summary of variables categorised under WHLPP Protective clothing provided component

Protective clothing provided						
Variable (n=total number of valid responses)	**Number (%) of respondents with variable**	**Number (%) of respondents with variable and potential hearing loss**	**OR (95% CI)**	**p value**	**Excluded (%)**	**Exclusion reason/Description**
Hearing protection provided (n=129)						
No	3 (2.33)	2 (1.55)	5.4 (0.5 - 61.6)	0.188	3 (2.27)	2 did not know and 1 did not answer this question
Yes	126 (97.67)	34 (26.36)				
Protective clothing provided (n=76)						
No	4 (5.26)	1 (1.32)	0.8 (0.1 - 8.2)	0.425	56 (42.42)	21 misresponses, 32 N/A (not exposed to chemicals), 3 did not answer this question
Yes	72 (94.74)	21 (27.63)				