RESEARCH ARTICLE

Research into occupational noise induced hearing loss in South African large-scale mines: Access denied? [version 1; peer review: 2 approved with reservations]

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Abstract

Background: The South African mining industry is frequently criticized for its poor health and safety record and high numbers of fatalities, thereby prompting researchers to conduct research on challenges faced by this industry. Therefore, this study aimed to investigate the feasibility of conducting audiological research into occupational noise induced hearing loss (ONIHL) within the South African mining sector. Specific objectives involved determining ease of identifying focal persons in charge of hearing conservation programmes (HCP); establishing response time and rate of identified focal person for interviews; and exploring focal person's willingness to share information regarding HCP.

Methods: A qualitative research strategy comprising online desk research and interviews was undertaken through purposive sampling to recruit participants. Data were collected through checklists, logbooks and interviews. Deductive thematic analysis was used to analyse data.

Results: Gaining access into the mining sector is negatively impacted by the following factors: firstly, contact details of focal person are not always listed on the websites. Secondly, prolonged response rate between initial contact and the time in which the participants respond. Lastly, unwillingness to share information regarding the management of ONIHL and progress made in HCP at various mines.

Conclusions: Findings contribute evidence regarding possible barriers to effective and successful implementation of application of best practice in HCPs; guided by evidence that is contextually relevant. Challenges with accessing mines for research purposes by external and independent researchers arguably impacts on the available evidence produced by mines, due to a possible unavoidable conflict of interest. Success of HCPs depend on objective evidence regardless of whether it paints the mining industry in positive or negative light. It is only when this evidence is critically engaged with, that real and

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Any reports and responses or comments on the article can be found at the end of the article.

effective solutions can be deliberated and implemented. Clear, transparent, and open lines of communication between various stakeholders are key to achieving this.

Keywords

Access, audiologists, hearing conservation programmes, large-scale mines, response rate, focal persons, occupational noise exposure, South Africa

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Introduction

The mining industry in South Africa remains one of the driving forces behind the development of the country's economy. Currently, mining in South Africa is reported as a significant contributor to the economy in that firstly, it contributes an average of 20% to South Africa's GDP. Secondly, it boasts a total annual income of nearly 550 billion rand. Thirdly, it is one of the country's biggest employers with more than a million personnel in the workforce in mining-related employment, with the majority of the workforce being black males. Lastly, it has been regarded as the largest contributor by value to black economic empowerment in the economy (See article from [Mining.com](#)). However, the South African mining industry is frequently criticized for its poor health and safety record and high numbers of fatalities, although these conditions are reported to be improving. Ear and hearing health in the form of noise induced hearing loss is one of the health and safety conditions requiring the attention of the South African mining industry.

ONHL is a prevalent condition in the mining industry and has been classified as a number one work-related disability, the second most common form of acquired hearing loss after presbycotic (age-related) hearing loss with severe consequences for those exposed to high levels of noise¹. This type of hearing loss is not a phenomenon that is unique to South Africa only. In the United States of America, it is estimated that approximately 30 million workers are exposed to excessive noise in the workplace, and these workers are reported to be at risk of developing ONHL². In Europe, an estimated figure of 30 to 50 million workers are exposed to hazardous noise levels and are also at risk of developing ONHL³. Approximately a million employees in Australia are potentially exposed to high levels of hazardous noise at work. In 2002, 4510 cases of compensation claims were reported and, as a result, the number of hearing loss compensation claims was estimated at 4510 individuals in 2002, and this represented 19% of all disease-related claims were processed in the same year⁴. Locally, data from some South African mines indicate that almost half of the mines' workforce is exposed to hazardous noise and that 90% of these workers are exposed to noise levels exceeding 85 decibel A weighted (dBA) in intensity over and above an 8 hour working shift for a 40 hour per week time weighted average (TWA). Furthermore, 11% of the workers are exposed to noise levels that far exceed this 85 dBA limit⁵.

Although hearing loss is not life threatening, unmanaged hearing loss may have a profound impact on the quality of life of the affected individual. Impoverished quality of life may manifest through reduced social activity, and feelings of exclusion from social participation, which may ultimately give rise to increased prevalence of symptoms of depression, stigma associated with hearing loss, loss of self-esteem⁶. Occupationally, noise induced hearing loss has a potential of reducing the worker's ability to perform or complete tasks that are dependent on auditory signals or verbal communication significantly⁷. Furthermore, due to hearing loss sustained at work, which subsequently results in a communication handicap, workers may be seen as incompetent or inactive, which ultimately, will impact

on team work and group productivity⁸. Moreover, hearing loss can negatively affect communication among workers, which can lead to safety concerns as workers may not be able to hear warning signals such as sirens since high frequency sounds are the most affected. Compromised ability to communicate may lead to increased risks of accidents⁹. Additionally, ONHL can present a limitation on the kind of employment suitable for a person with a hearing loss⁷, which may possibly lead to economic burdens for developing countries in particular. Störbeck, and Moodley¹⁰, argue that hearing loss represents a heavier burden in developing countries than in developed regions of the world because of the challenges faced by developing countries when compared to their developed counterparts. For instance, one of the biggest challenges in South Africa is that historically, black mine workers were not given an opportunity to obtain formal education. Consequently, most workers in the mining industry are illiterate and are restricted to performing jobs that require manual labour as these jobs do not often require any form of education¹¹. This has lifelong implications for miners as they may not be employable due to illiteracy and hearing disability caused by excessive exposure to noise in the workplace, thereby rendering them eligible for worker's compensation. However, compensation pay-out may not be sufficient; consequently, these workers will be eligible for state pension, thereby adding to economic burdens in a developing country. Therefore to avert these negative conditions associated with ONHL, it is important for audiologists, who are knowledgeable regarding the management of ONHL as detailed in their scope of practice¹² to take an active role in minimising the impact of ONHL on the exposed miner and to promote and advise on the implementation of hearing conservation programmes in the mining sector.

In 2003, the Mine Health and Safety Council (MHSC) in South Africa, comprising the State, Labour and Employer representatives signed an agreement with the mining industry to target two imperative milestones in addressing ONHL in the mines^{13,14}. The first target was to eliminate hearing deterioration greater than 10% by December 2008 in individuals who are exposed to excessive occupational noise. The second was to minimize the total noise emitted by any equipment to not exceed 110 dBA at any point in the workplace by December 2013. These milestones were reviewed and subsequently revised in 2014, as the mining industry did not meet these milestones. The revised 2014 milestones stipulate that: a) by December 2024, the total operational or process noise emitted by any equipment must not exceed a milestone sound pressure level of 107 dB (A). b) By December 2016, no employee's Standard Threshold Shift (STS) will exceed 25 dB from the baseline when averaged at 2000, 3000 and 4000 Hz in one or both ears¹⁵. The failure to achieve the initial milestones created the avenue for researchers to conduct studies into how these milestones can be achieved.

Post the failure for the mining industry to meet the 2003 MHSC milestones, the mining industry acknowledged that they are "not making the desired progress with noise-induced hearing loss, which is a major occupational health concern"¹⁶. Furthermore, the mining industry stated that ONHL is "prominent in the

mining industry because action plans aimed at eradicating this disease are not as well integrated as they should be. We need far more comprehensive noise-control programmes”; however, the industry itself is committed to “the massive reduction and elimination of occupational noise induced hearing loss”¹⁶.

The assertions by the mining industry highlight the importance of conducting research in this area to ensure that preventative measures are in place, the early identification of those with ONIHL occurs; and that early intervention is instituted. This is particularly important because enough evidence exists that illustrates the impact of unmanaged ONIHL. Therefore, in responding to these challenges highlighted by industry, independent researchers have embarked on conducting research into the mining sector with an aim to address these concerns. However, there seems to be challenges with allowing independent researchers access into the mines to conduct this highly needed research. Therefore, the current study aimed to investigate the feasibility of conducting research into the management of ONIHL in South African large-scale mines.

Methods

Research objectives

1. To determine ease of identifying focal person in charge of hearing conservation programmes in the mines
2. To establish the response time and rate of identified focal person for interviews regarding hearing conservation programmes in their mines
3. To explore the focal person’s willingness to share information regarding hearing conservation programmes in their mines.

This study is part of a bigger study entitled “Occupational noise induced hearing loss in South African large scale mines: from policy formulation to implementation and monitoring”.

Research design

A qualitative research strategy comprising secondary and primary data were used in the current study to collect and analyse data. The study had two phases: online desk research (secondary data) and conducting interviews (primary data). Phase one consisted of using secondary data in the form of external online desk research, which is a strategy for collecting data from existing online sources, outside the researcher’s organization (See [Management Study Guide Desk research methodology](#)), to search websites of large scale mines as well as private and public companies affiliated to the mining industry in South Africa. Online desk research was undertaken to investigate the ease of identifying different stakeholders who are responsible for managing ONIHL in the mining sector. Desk research was conducted prior to inviting different stakeholders to participate in the study. Desk research can be conducted prior to embarking on a field trip (see [User Focus article on Desk research](#)).

Phase two consisted of inviting focal person identified from the online desk search to participate in interviews regarding the

management of ONIHL in the mining sector. This phase of the study was concerned with determining the response rate and time of the participants recruited in this study. Furthermore, this phase investigated the participants’ willingness to participate in the study.

Sampling strategy

Purposive sampling strategy was utilised in the current study as the researcher sought to, as discussed by Etikan *et al.*¹⁷, identify and select individuals and group of individuals who have experience and are knowledgeable in the management of ONIHL in the mining industry. Furthermore, the researcher sought to recruit participants who are available and willing to participate in the current study. Possible participants were identified from the mining industry as well as private and public organizations affiliated to the mining industry. These participants were selected based on their work titles and credentials as listed in their personal profiles on the company’s website.

Description of participants

Three sets of participants formed part of the current study.

1. Large scale mines in South Africa

According to the information obtained from the online desk research, 26 mines in South Africa were identified, of which 14 were large-scale mines. These mines produce different commodities such as gold, platinum, diamond, coal, heavy metal, and iron ore and are situated in various provinces across South Africa.

2. Public organisation affiliated to the mines and the state

This organisation is a national public entity which consists of a tripartite board represented by state, employer, and labour members under the chairmanship of the Chief Inspector of Mines. This entity is funded by public revenue and is accountable to parliament. The main task of this entity is to advise the Minister of Mineral Resources on occupational health and safety legislation and research outcomes focused on improving and promoting occupational health and safety in South African mines.

3. Private organisation affiliated to the mines

This organisation, founded in 1894, is a non-profit assurance company. It is the administrator of workers’ compensation claims, including the medical payment of medical costs, once-off disability payments and the ongoing payment of pensions in the case of severe disability and death in the mining industry. Currently, there are approximately 26 mining companies under this administration.

Ethical considerations

Ethical clearance for the research study was obtained from the University’s Human Research Ethics Committee (Medical) (Protocol Number: M160264). Prior to the commencement of the study, participants were provided with information letters detailing the purpose and the nature as well as ethical considerations of the study. Therefore, participants were informed first, that all the information obtained from the interviews will be kept

confidential. Secondly, any identifying information such as the participant's name or the name of the company they are affiliated with will be removed. Thirdly, participants could withdraw from the study without any negative consequences. Lastly, anonymity was guaranteed as participants were identified by the researcher, however, in one case, an invited participant requested to bring along a participant who had occupied her current position.

Consent forms were given to participants to sign, indicating that they have agreed to participate. Permission to digitally record the interviews was also requested and obtained. Participants were made aware that all the data collected from the interviews will be kept in a pin-protected computer and will only be made available to the supervisor for peer evaluation purposes. The recorded information will be destroyed after 5 years as per the university's protocol. Additionally, participants were made aware that the findings emerging from this study will be made available to the public through publications.

Data collection

For the first phase of the study, data were collected through the use of a checklist. The checklist was created by the researchers and it contains the following categories: immediate availability of the focal person; their contact details; their occupation/title and their professional background. The information obtained from the online desk research was then input on the checklist to document the findings of the search. The second phase of the study, data was collected through the use of interviews. To record the response time and rate as well as the participants' willingness to participate in the study, the research made use of a logbook. The logbook recorded the first time contact was made, when a response was received, if the researcher had to follow up with participants due to no response and the date and time when the appointment was made. For telephonic interviews, the same information was kept. Every contact and engagement between the researcher and the possible participants, the researcher entered that information on the logbook to supplement the field notes collected during the interview period. Therefore, a careful record of response time and response rate was a record of the key person's willingness to participate in the study as well as barriers identified.

Data analysis

Data was analysed using deductive thematic analysis as recommended by Creswell¹⁸. This method of analysis was chosen because, according to Gale *et al*¹⁹; Braun *et al*²⁰, in deductive thematic analysis, the researcher predefines themes based on specific research questions and the researcher's specific area of interest, as was the case in the current study. Therefore, the researcher printed all electronic communication and the manually recorded telephonic responses to the invitation to participate in the interview as well as the checklists and logbook used to collect data. The researcher read through all the text to immerse themselves into the data collected from online desk research and the logbook from the interviews. Thereafter, responses that pertained to ease of identifying focal persons, response time and rate as well as the willingness of the participants to share

information was reduced to predefined themes as mentioned above. These themes were therefore reported using qualitative deductive thematic analysis.

Results

The findings of this study are reported according to the three sets of participants identified in this study as well as according to the objectives of this study which also served as predefined themes.

Objective 1: Ease of identifying focal person in charge of hearing conservation programmes in the mines

1. South African large scale mines

Out of the 26 South African mines that were identified online, 14 were deemed suitable to be included in this study as they were large-scale mines. The mines' websites were visited to identify persons to be invited for interviews. It was found that only six of the 14 mines had a focal person listed online. Of the remaining eight, six did not have a focal person listed and the remaining two did not display the members or executive managers of the company. [Figure 1](#) below illustrates the number of mines which listed their focal person on their website.

With the six listed focal persons, it was not overtly documented that the identified focal person was indeed directly involved in the management of ONIHL or implementation of hearing conservation programmes. The assumption that they are somehow involved in HCPs was inferred from the occupational titles that they were given. For instance some were listed as:

- Executive Member: Mining and Safety, Health and Environment
- Executive Vice President: Sustainable Development comprises the disciplines of Safety, Health, Environment, Social and Community Affairs, Human Rights and Global Security, and Government Relations
- Chief operating officer (Safety, mining projects, new development and corporate strategy)
- Group Executive: Health and Safety
- Executive Head-Safety and Sustainable Development
- The Safety, Health and Environment (SHE) Committee

It is worth noting that these focal persons are occupying important or key positions which allow them to influence and promote the success of a hearing conservation programme at their respective mines. As can be seen below, [Figure 2](#), three of the focal persons identified had a background in mining engineering, one in biological sciences; while two had no backgrounds listed.

All the identified focal persons did not have their contact details listed with their names and occupations. To contact these individuals, one would need to contact the company's secretary telephonically or electronically. When the researcher attempted to contact the focal person through the company's provided email address, an automatic acknowledgement of

The number of focal person listed on the mine's website

Figure 1. Number of focal persons listed on the mine's website.

Occupational background of focal persons

Figure 2. Occupational background of focal persons.

receipt email was sent to the researcher, however, no responses were subsequently received from either the company's secretary or the focal persons identified. When the company was contacted telephonically, the calls were either unanswered or transferred to the focal person's personal assistant. The personal assistants generally stated that the identified focal person had a busy schedule therefore; they will be unable to make time for the interviews. Some personal assistants requested the contact details of the researcher with a promise to contact the researcher once the focal person was available. Unfortunately, the researcher was not contacted by any of the personal assistants or focal persons. Consequently, none of the identified listed focal persons participated in this study.

Due to the fact that large scale mines are integral to this study, the researcher had requested help from the [Chamber of Mines](#) to assist with identifying focal persons who are directly involved with the HCP in the mines. To date, the researcher is still in contact with the large scale mines requesting permission to access the mines and to invite focal persons to participate in the study through interviews.

2. Public organisation affiliated to the mines and the state

This search identified 14 focal persons. Eight responded to the request to participate in the study, but in the end, only six participated in the interviews. The focal persons were identified with ease. The organisation's website provided and listed all

the members of this organisation and their affiliation: Labour, State and Employer. However, the individual's contact details were not provided. The researcher contacted the company's receptionist and requested the contact details of all the listed focal persons. The receptionist provided the telephone contact details of the personal assistants of the focal persons. The personal assistants were contacted and were able to provide email addresses of the focal persons. Following which, the identified focal persons were contacted electronically via email to invite them to participate in the study. Eight focal persons responded to the email indicating their willingness to participate in the study. However, due to time constraints, only eight participants participated in the interview. Interviews were conducted face-to face with five participants and one participant requested a telephonic interview as they were unable to commit to a specific time due to the nature of their job. Two participants, who were part of the face-to-face group requested to do the interview together. This arrangement was made as the other focal person had recently joined the company and they felt that they might not be in a position to answer all the questions which might require institutional memory. [Figure 3](#) shows the breakdown of the tripartite members who participated in this study.

Of the six participants, one was from labour, one from the State and four from the employer. As with the focal persons identified from the large scale mines, for these participants also, their roles as individuals were not clearly stated. However, the mission and vision of the company itself was listed. Five participants had a medical background before joining this organisation and still continue working in their capacity as medical doctors for various employers.

Private organisation affiliated to the mines

Identifying focal persons from this organisation's website was difficult. The website lists the board and executive members; however it does not list their occupations. To know more about

the role of each person listed, one needs to click on the person's name to get their profile. The researcher read the profiles of all the persons listed under executive management, and was still unable to identify the focal person involved in the management of ONIHL in the mines. Furthermore, none of the listed executive managers had their contact details listed. The researcher then attempted to contact the organisation to find out who the focal persons to approach were through the call centre number. The receptionist reported that they cannot provide the contact details of any staff member to the public. The research was advised to email the organisation's secretary and the email will be directed to the relevant person who will then contact the researcher. The researcher emailed and received a notification stating that the email had been received and the relevant person would respond to the email. The organisation was emailed twice; and on both occasions, other than the email stating that the sent email had been received; no response was received from the relevant person.

During the interviews with one of the participants from the public organisation affiliated to the mines and government, the researcher shared with the participants the challenges faced with finding participants for the study. It was at this stage that this participant furnished the researcher with the contact details (cell phone numbers) of the two focal persons at the organisation affiliated to the mines. This participant first obtained permission from the focal persons before giving the contact details to the researcher.

Following obtaining the contact details of the focal persons, the researcher contacted the two focal persons from OAM telephonically and none of them responded. The researcher then opted to utilize short messages service (sms) to contact them and requested their email addresses. A few days later, one of the contacted focal persons responded and provided the researcher with their email address. This focal person also has a background in medical science.

Tripartite members of the Mine Health and Safety Council

Figure 3. Tripartite members of the Organisation affiliated to the mines and the state who participated in the study.

Objective 2: The response time and rate of identified focal person for interviews regarding hearing conservation programmes in their mines

1. Large scale mines

To date, it is rather difficult to report on the response rate of the large-scale mines as none of the mines have committed to participating in the study. It suffices to say that it is now over 18 months since the initial request to gain access to the mines to collect data was made and still there is no response. This has led to the researcher having to explore other avenues to collect data for the main study. So far, only one mine committed to participate in the study; however, mine executives and managers have not participated in the interviews. This mine has however, partially furnished the researcher with some of the requested data. The discussions between this mine and the researcher are still on going.

2. Organisation affiliated to the mine and the state

Contact with OAMS was initially initiated on 19 April 2016. After obtaining contact details, [Table 1](#) below details the response rate in the current study.

3. Organisation affiliated to the mines

OAM was initially contacted telephonically in April 2016 to request the contact details of the focal persons. The researcher was advised to send the request electronically, using the company's email address. The email was sent the same day, after speaking to the company's secretary. The response was received immediately stating that the email has been received and will be forwarded to the relevant person. Exactly, 14 days later, in May 2016, the researcher sent another email to follow-up and requested another appointment. However, the same reply was received.

Upon realizing that this response was an automatic reply, it became a likely probability that no response was forthcoming. After obtaining the contact detail of the focal persons at OAM, the researcher contacted the two focal persons telephonically in July 2016. One focal person responded immediately and provided the email address to which the researcher sent her request and invitation. The focal person also stated that they were away from the office.

Mid July, the focal person forwarded the researcher's email to the general manager. A week later, after not receiving a response from the focal person, the researcher sent a sms to check whether the focal person received the email. The focal person responded immediately stating that they received the email and were awaiting feedback from the General Manager. Later on the same day, the researcher received a response with an invitation to a meeting in the first week of August 2016. In total, it took 18 days from the initial positive contact with a focal person to having a meeting. These focal persons did not participate in the interviews.

Objective 3: The focal person's willingness to share information regarding hearing conservation programmes in their mines

1. Large scale mines

The researcher is still in contact with various mine focal persons in order to continue requesting to be granted permission to access the mines for data collection. Of the focal persons that the researcher was able to contact from the list provided by the Chamber of Mines, two focal persons categorically told the researcher that they will not allow the researcher access to the mines. When the researcher enquired into the reasons why the researcher will not be allowed access, one focal person responded by stating that they have their own people conducting studies at their mine, so they will not allow any more researchers. The other stated that they were undergoing a restructuring process, so they will not be allowing any researchers into the mines. Another focal person indicated that they were interested in allowing the researcher to conduct their study at the mine but needed to request permission from the management team. However, this focal person has not responded to follow-up emails ever since.

2. Organisation affiliated to the mines

No further engagements took place between the research and this focal person as they stated that the research should contact the mines directly to obtain the required information.

3. Organisation affiliated to the mines and state

Generally, at face value, some members seemed eager to share the information with the researcher; but there were restrictions

Table 1. Time period between initial contact to conducting the interviews.

Participant	Affiliation	Responded first time round	Responded after follow-up	Type of interview	Total number of days
1	Labour	Yes	-	Face-to-face	12
2	Employer	Yes	-	Telephonic	16
3	State	-	Yes	Face-to-face	28
4	Employer	-	Yes	Face-to face and teleconference	51
5	Employer	-	Yes		51
6	Employer	-	Yes	Face-to-face	78

to how much could be shared with the researcher. For instance, one participant requested that the researcher provides background information and involvement with the mines before agreeing to participate in the interview. After the researcher gave the background, the focal person then participated in the interview. During the interview, the focal person shared some figures on the prevalence of ONIHL based on the report that was shared with the focal persons at the last health and safety summit. The researcher requested the copy of the report, and the focal person promised to send this to the researcher as soon as they returned to their office. A few days later, the researcher contacted the focal person again to request the report; and the focal person could not remember which document the researcher was referring to. The researcher has not received this document to date.

The researcher was advised by one of the participants to search the internet for the documents. Upon following the advice, the researcher searched the internet for the requested documents; however, there were challenges with accessing most of the documents relevant to main study. This was due to the fact that one needs to be registered with different companies in order to have access to files. Therefore, these files were not obtainable. When meeting with one of the focal persons, the researcher mentioned the difficulties in accessing online documents due to restricted and controlled access, the focal person responded by stating that “if one found answers easily, there would not be a point in doing research. It is called research because you have to do some searching.”

Another participant requested to do a telephonic interview provided the researcher sent them the interview questions electronically to preview the content of the interview before agreeing to the interview. The researcher informed the focal person that it was not possible to send them the interview questions. This participant then requested to have a face to face interview after office hours as they were unable to find a suitable time during office hours. Also, this participant stated that they wanted to see the person they were giving the information to. During the interview, the participant mentioned their weariness with sharing information with researchers as researchers often misinterpret the data and quote people out of context. Furthermore, this participant requested a copy of the completed thesis to verify the content of the report. One more participant requested to be sent the questions in advance in order to prepare for the interview.

Discussion

Current results illustrate the difficulty with the ease of identifying focal persons involved in the hearing conservation programmes in large-scale mines in South Africa. This difficulty is further exacerbated by the fact that, even where the focal persons are listed, their positions simply list the general health and safety position; with their exact role in the management of noise not overtly stated. This is deemed a challenge as Byrne²¹, asserts that the first step mines should consider before implementing a

hearing conservation programme is addressing administrative issues; where company regulations or policies are clarified, and where individuals' responsibilities and roles are identified and enforced. The roles and the responsibilities of individuals should be listed on the company's website for the ease of contacting the relevant persons should the need arise.

From current results, it was noted that of all the focal persons identified in this study, none had a background in audiology. Arguably, the fact that most of the persons/people interviewed either had a background in mining engineering or medical sciences might imply that they may have some knowledge about the impact of noise on the wellbeing of individuals exposed to excessive occupational noise. However, international evidence suggests a need for focal persons with a background in audiology. The American Academy of Audiology suggests that the audiologist is the principal advocate for and supervisor of programs that manage the hearing health of people exposed to hazardous noise²². This is based on the training and scope of practice of audiologists which states that “the audiologist designs, implements, and coordinates occupational and community hearing loss prevention programs which includes identification and amelioration of noise-hazardous conditions, identification of hearing loss, recommendation and counselling for use of hearing protection, employee education, and the training and supervision of non-audiologists performing monitoring audiometry in the occupational setting”²² no page.²³. This statement therefore highlights the important role that audiologists should have in the key positions in the management of noise induced hearing loss in the mines.

The fact that all the focal persons identified as being involved in management of noise at various mines in the current study, occupy key positions in the executive management at the mines is an important finding. This indicates the importance mines seem to place on ONIHL; and it also suggests that these individuals are in strategic positions where they are able to advocate and promote hearing conservation programmes at the mines.

As far as the response time and rate of identified focal person for interviews regarding hearing conservation programmes in their mines; current findings were disappointing. The results revealed that the minimum timeframe from when initial contact was made to the when the interviews were conducted is 12 days, with maximum at over 18 months. This is a concern for researchers as in most cases; studies are conducted within fixed time frames. Delays in obtaining data timeously may affect the quality and the completion of the study. This poor response time and rate also raises implications for prompt and efficient evidence-based interventions to reduce or eliminate ONIHL in the mines. Research provides evidence base that is both contextually relevant and contextually responsive; and so engagement in objective research that has minimal to no conflict of interest is important for mines to engage in in order to use best practice in HCPs instituted in the mines. This willingness to engage in objective research was demonstrated to be challenging in the current study.

As far as focal person's willingness to share information regarding hearing conservation programmes in their mines, current findings indicated that the identified focal persons are guarded when it comes to willingness to share information. The fact that participants wanted pre-access to the interview questions and also wanted to approve reports written about the study indicated some level of high anxiety and suspicion about the type and nature of information they can or cannot share; and a demonstrated fear of revealing information that might be deemed damaging to the individuals concerned or to the company. This restriction in information might have a significant impact in reality-based planning where real and accurate evidence is used to plan efficacious interventions.

Conclusions

Current findings regarding the ease of identifying and accessing focal persons involved in hearing conservation programmes in various large-scale mines in South Africa highlight the challenges faced by researchers in identifying and gaining access into the mines. Findings from this study highlight the perceived lack of transparency in the management of occupational noise induced hearing loss in the mining sector. This has implications for the mines as these findings suggest that focal persons are not easily identifiable and their roles are not clearly stated. Furthermore, the fact that the majority of the focal persons do not respond promptly to requests for interviews is concerning as opportunities to share information and knowledge on the management of noise induced hearing loss in the mines are lost and deliberations on efficacious HCPs reduced. Sharing of such knowledge may assist in identifying the factors that contribute both positively and negatively to the success of the hearing conservation programmes in various mines. Lastly, the fact that some participants requested to pre-view the interview questions creates the idea that there is certain information that should not be made available to the researchers or interested parties. Such a practice may hinder the success of the hearing conservation programme as information deemed confidential may not be shared thereby impacting negatively on the success of hearing conservation programmes in large scale mines. This is particularly important within an ethically approved research environment where researchers are bound by the ethical code of conduct which includes confidentiality and anonymity.

These findings highlight the importance of clearly demarcated and documented roles of key members in charge of HCPs; with clear communication lines. Findings indicating the minimal or absent role of audiologists in ear-specific occupational health within the South African mining industry raise important concerns which the Health Professions' Council of South Africa and the Department of Labour might need to deliberate on for future planning around noise pollution and the role of audiologists in the management of noise in the work place.

In conclusion, the authors do acknowledge that managers of private and public organizations are at liberty to resist independent investigations of health and safety hazards faced by their employees in the workplace. However, current findings potentially can make management appear derelict in their responsibilities towards their employees in the management of noise. These findings might even pressure regulatory agencies to enforce

regulations in the mining sector regarding transparency and ease of access to information for researchers. Such outcomes may be unpleasant from a management point of view; however, for HCPs to achieve their goal, such findings are important to share.

It is anticipated that all stakeholders involved in HCPs, and possibly other programmes relating to other health and safety concerns in the mines, will deliberate on the challenges presented in this paper and identify how these could be contributing to their inability to reduce and/or eliminate health hazards in the workplace. It is also hoped that this paper will spark debate within the mining sector about the reasons for the position of "in-house" research that seems to be prevalent; and how this could be negatively influencing their goals and targets with regards to health and safety.

Data availability

The purpose of this study was to investigate the feasibility of conducting research into the management of ONIHL in South African large-scale mines. The focus was on the ease of identifying focal persons in charge of hearing conservation programmes, establishing response time and rate of focal persons to participate in interviews and the participant's willingness to share information regarding hearing conservation programmes. Raw data from the interviews is not provided as the findings of this study do not include use of interviews to answer any of the questions mentioned above. Furthermore, personal electronic conversations between the researcher and stakeholders will not be made available on the public domain as this correspondence was of a personal nature. This correspondence was used to create a logbook for analysis. Therefore, data only in the form of checklists and logbook is available (please contact the corresponding author).

Competing interests

No competing interests were disclosed.

Grant information

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CARTA is jointly led by the African Population and Health Research Center and the University of the Witwatersrand and funded by the Carnegie Corporation of New York (Grant No--B 8606.R02), Sida (Grant No:54100029), the DELTAS Africa Initiative. The DELTAS Africa Initiative is an independent funding scheme of the African Academy of Sciences (AAS)'s Alliance for Accelerating Excellence in Science in Africa (AESA) and supported by the New Partnership for Africa's Development Planning and Coordinating Agency (NEPAD Agency) with funding from the Wellcome Trust (UK) (Grant No: 107768/Z/15/Z) and the UK government. The statements made and views expressed are solely the responsibility of the fellow.

The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.

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Christa L. Themann

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This is an interesting report on the challenges involved in conducting hearing conservation research in the South African mine industry. The paper provides perspective on how mines operate in South Africa, the extent of the noise and hearing loss problem in the country's mining sector, and goals for reducing the problem. This study is part of a larger project aimed at moving from making policy to implementing and monitoring effective hearing conservation practices in large-scale South African mines.

The stated aim of the current paper is to investigate feasibility issues related to conducting research on hearing conservation in mines in South Africa. However, the manuscript wanders into other areas and draws conclusions which go beyond the stated aims and are not supported by the data presented. The authors state that they used "deductive thematic analysis" to analyze the data, but it is not clear how this was done. Thematic analysis is usually applied to interview data, but the authors state that the focal person interviews which form a part of the larger study were not used to answer any of the research questions in this paper. Deductive thematic analysis involves identifying themes in the data which the researcher defines in advance; these themes are not specified in the paper and results are not reported in terms of them.

The "public" and "private" organizations affiliated with the mines form a large part of the targeted sample for the study, but it is not clear what these organizations are. The names of the organizations are not provided. The "Chamber of Mines" is mentioned once in the Results section, but it is not clear whether this is one of the public and private organizations or another entity altogether. "OAM" and "OAMS" are also mentioned in the Results section without further explanation. For readers who are not familiar with how mining is organized, managed, and regulated in South Africa, some background information on these organizations and how they can help with mine-related hearing conservation research would be helpful.

Results of the first aim of the study ("to determine ease of identifying focal persons in charge of hearing conservation programmes in the mines") are initially presented in a clear manner ("six of

the 14 mines had a focal person listed online”); however, nothing is reported of attempts to identify focal persons at the other eight mines through other means (aside from a brief mention of contacting the Chamber of Mines with no information regarding what came of this). Results of efforts to contact the identified focal persons are reported only generally (e.g., “some” calls were unanswered; “some” were answered by personal assistants; assistants “generally” said that the focal person had a busy schedule). Since the point of this part of the project was to detail successes and difficulties in identifying and contacting focal persons, specific data should be provided. The three pie chart figures summarizing the results of this part of the study are unnecessary; the numbers are small enough that the reader doesn’t need a visual summary to understand the findings.

Results of the second aim of the study (“to establish the response time and rate of identified focal person for interviews”) are reported clearly and precisely. Data from contacts made at the organization affiliated to the mines should be added to Table 1 for completeness.

Results of the third aim of the study (“to explore the focal person’s willingness to share information”) are provided descriptively. Although the focal person interviews were not meant to be used for the purpose of answering the three research questions in this paper, information provided during those interviews appears to be reported in this section of the manuscript.

The Discussion sections draws a number of conclusions that are not supported by the data. For example, based on the fact that some focal persons requested the interview questions in advance, the authors conclude that these persons had a “high level of anxiety and suspicion” and that focal persons believe “there is certain information that should not be made available to the researchers.” While this is one possible explanation for such a request, it is not the only potential explanation. Without specifically inquiring about the reason for the request, the authors should not draw a specific conclusion about the underlying motive. Another example of an unsupported conclusion is the authors’ statement that – as none of the identified focal persons had a specific background in audiology – there is a “minimal or absent role of audiologists in ear-specific occupational health.” They draw this conclusion despite the fact that they could only identify potential hearing conservation focal persons from the six of the fourteen mine websites, that it was unclear whether any of these six had a direct role in managing the hearing conservation program, that they could only identify the professional background of four of these six individuals, and that they were unable to directly contact any of them.

Finally, some references are not fully provided in the paper and some citations appear to be incorrect.

I believe this paper could contribute to our understanding of noise-induced hearing loss in the mining sector in South Africa. However, I believe it requires major revision. Specific comments are provided below.

Specific comments

Page 3, Paragraph 1: “See article from Mining.com.” – Provide full URL for article.

Page 3, Paragraph 1: “Ear and hearing health in the form of noise-induced hearing loss...” – NIHL is not a form of hearing health; rephrase sentence. For example, “Concerns about noise-induced

hearing loss...”

Page 3, Paragraph 2: “ONIHL” – First use of acronym in text... write out in full.

Page 3, Paragraph 2: 30 million workers exposed to noise in the US is an old estimate. The more recent estimate is 22 million. See Tak et al.¹; Kerns et al.²; <https://www.cdc.gov/niosh/topics/ohl/overall.html>.

Page 3, Paragraph 2: Reference 4 seems to be an incorrect citation for the Australian statistics.

Page 3, Paragraph 2: Definition of time-weighted average is confusing (and possibly incorrect). The TWA is the average exposure normalized to an 8-hour day.

Page 3, Paragraph 2: Define the level which is meant by “far exceed this 85 dBA limit.”

Page 3, Paragraph 4: Are references 13 and 14 the correct citations for the milestones developed in 2003? It seems like there should be a reference directly to the agreement, or similar to reference 15 for the 2014 milestones.

Page 3, Paragraph 4: Define what is meant by the goal to “eliminate hearing deterioration greater than 10%.” How is 10% hearing deterioration defined audiometrically?

Page 3, Paragraph 5: Change “Post the failure for...” to “Following the failure of...”

Page 4, Paragraph 2: Define what is meant by “large-scale mines” and explain why the study was limited to large-scale mines only.

Page 4, Paragraph 5: Provide full references for the “Management Study Guide Desk” and the “User Focus” articles on desk research methods.

Page 4, Paragraph 8: Clarify that the three sets of participants were defined based on their work setting.

Page 4, Paragraphs 10-11: What are the names of the public and private organizations affiliated to the mines/state? For readers who are not familiar with how mining is organized, managed, and regulated in South Africa, some background information on these organizations and how they can help with mine-related hearing conservation research would be very helpful.

Page 4, Paragraph 12: Presumably the university which provided ethical clearance was the University of Witwatersand, but this should be clearly stated.

Pages 4-5, “Ethical considerations”: Most of these ethical considerations appear to be relevant to the larger study and not the current study. This paper is focusing on identifying hearing conservations focal persons, documenting the response rates and times of the identified individuals, and gaging their willingness to be interviewed for the larger study. How participants for this part of the project could have been provided information letters in advance, signed consent forms, been advised of their right to withdraw, etc. is unclear. Digital recording of participant interviews does not seem likely to have occurred at this stage, either. How these

ethical considerations relate to the data collected for the purposes of the current paper should be clarified.

Page 5, Paragraph 1: It is not clear how a participant bringing along another participant impacted the guarantee of anonymity.

Page 5, Paragraph 3: It would be helpful to provide a copy of the checklist used in the first phase of data collection as an appendix.

Page 5, Paragraph 3: How was “immediate availability” of the focal person defined?

Page 5, Paragraph 3: Response times and response rates may not be valid measures of the key person’s willingness to participate in the study. Other factors (such as workload) might have affected these measures.

Page 5, Paragraph 4: Change “Data was...” to “Data were...” “Data” is a plural noun.

Page 5, Paragraph 5: Change “participants identified” to “participants recruited.”

Page 5, Paragraph 9: “All of the identified focal persons did not have...” could be interpreted two ways. Does this mean “None of the identified focal persons had...” or “Not all of the identified focal persons had...?”

Page 5, Paragraph 9: Did the researchers attempt to contact all of the mine focal persons both by phone and e-mail, or some by phone and some by e-mail? If some each, how many by phone only, how many by email only, how many by both?

Page 6, Paragraph 1: How many phone calls were unanswered, and how many were answered by the personal assistant?

Page 6, Paragraph 1: Reporting that personal assistants “generally” stated that the focal persons were too busy to participate in the interviews implies that this is not always what the personal assistants said. What else did personal assistants ask or say or do that fell outside what “generally” happened?

Page 6, Paragraph 1: Instead of reporting that “some” personal assistants requested the researcher’s contact information, report how many personal assistants requested this information.

Page 7, Paragraph 1: Something appears to be inaccurate in these two sentences – “Eight focal persons responded... However, due to time constraints, only eight participants participated...”

Page 7, Paragraph 2: It is unclear which company is referenced in the statement “...the mission and vision of the company...”

Page 7, Paragraph 5: “OAM” – First use of acronym in text... write out in full.

Page 7, Paragraph 5: Did the focal person who contacted the researcher with his e-mail address

after receiving the text (sms) agree to be interviewed? What about the second focal person whose contact information was provided by one of the participants from the public organization affiliated with the mines?

Page 8, Paragraph 1: The researchers report that "it is now over 18 months since the initial request... and still there is no response." Are attempts still being actively made? If not, information about when attempts ended would be useful in understanding the information presented.

Page 8, Paragraph 2: "OAMS" – First use of acronym in text... write out in full.

Page 8, Paragraph 6: Specify the number of focal persons "...that the researcher was able to contact..."

Page 8, Paragraphs 7-8: In all other sections of the manuscript, information about the organisation affiliated to the mines and state is given second and information about the organisation affiliated to the mines is given third. Here they are reversed, which is confusing.

Page 9, Paragraph 3: Why is it not possible to send interview questions in advance of the interview?

Page 9, Paragraph 4: Addressing administrative issues and clarifying company regulations and procedures is an essential part of an effective hearing conservation program. But that doesn't necessarily imply that this information needs to be made available on the company's public website. These are internal policies that – at least in some countries, such as the USA – would be more commonly found on a company's internal (intranet) site.

Page 9, paragraph 5: It is not unusual in some countries for the day-to-day operation of the hearing conservation program to be outsourced to a contracted audiology practice. Many companies do not have sufficient resources to have an audiologist on staff. In that case, it would not be surprising that the focal person at the mine have a more general medical or safety background rather than a specific background in hearing care. Such a situation would not necessarily indicate that the program was not well-managed by a subject-matter expert; only that the expert was on contract rather than on staff. It would be helpful to understand how hearing conservation programs are managed in other industries in South Africa for comparison.

Page 9, paragraph 5: The American Academy of Audiology is cited as stating that audiologists should be the principal advocates for hearing loss prevention programs and the specific roles an audiologist should fulfill in such programs, but the reference cites an American Speech-Language-Hearing Association document.

Page 9, Paragraph 7: The range in timeframe between contact and interview is given as 12 days to over 18 months. If attempts to contact a focal person stopped at a given point in time, that point in time is probably a more reasonable maximum.

Page 9, Paragraph 7: The response time frame is said to have been "disappointing" and a cause for "concern." What was the target time frame? How was the target time frame set?

Page 9, Paragraph 7: The following statement is unclear: "Research provides evidence base that is

both contextually relevant and contextually responsive; and so engagement in objective research that has minimal to no conflict of interest is important for mines to engage in in order to use best practice in HCPs instituted in the mines.”

Page 10, Paragraph 2: Participants requesting interview questions in advance does not necessarily imply that a belief that “certain information should not be made available to researchers or interested parties.” Other reasons for wanting to see the questions in advance are feasible – for example, wanting to make sure they have the information ready when the interviewer comes or a need to produce reports or remove identifying information from some types of records to protect worker confidentiality. The researchers may have missed an opportunity to explore why the participants wanted advance knowledge of the questions. There does not seem to be sufficient evidence that the request for questions implies a lack of transparency.

Page 10, Paragraph 3: The statement that “the role of audiologists in ear-specific occupational health” is “minimal or absent” in South African mines oversteps the aim of the study and the reported data. As noted earlier (see comment re: Page 9, Paragraph 5), audiology services may be outsourced in some companies which cannot support a staff audiologist. This is a question that would presumably have been asked in the interviews, but the results of the interviews are not reported in this paper. This paper reports only on the barriers to conducting research on hearing conservation programs in South African mines; this conclusion is outside that scope.

Page 10, Paragraph 4: The conclusion that “current findings potentially can make management appear derelict in their responsibilities towards their employees in the management of noise” also oversteps the aim of the study and the nature of the data collected. The researchers can conclude that focal persons are not easily contacted or recruited to participate in research about hearing loss prevention at their mine, but many factors could contribute to this. Postulating that managers are irresponsible regarding hearing safety without suggesting any other possibilities is unsupported.

Page 10, Paragraph 4: The researchers state that regulations exist in the mining sector “regarding transparency and ease of access to information for researchers.” This seems contrary to the statement earlier in the paragraph that “managers of private and public organizations are at liberty to resist independent investigations of health and safety hazards faced by their employees.” If regulations regarding researcher access to mines exist, they should be cited and explained in the introduction of the paper. These two statements which appear to be contradictory should be reconciled.

Page 10, Paragraph 5: What is the “position of ‘in-house’ research” that the authors hope will be debated as a result of this paper? How does it relate to this study? Perhaps this concept should be presented as part of the introduction and background.

References: Citations are not consistently formatted in the Reference list; some article titles are fully capitalized (e.g., references 1 and 17) while others are not. Reference citations are also not formatted consistently in the text (e.g., reference 10 is cited as “Storbeck & Moodley” and reference 20 is cited as “Braun et al.” even though both references have two authors). References to position statements (12 and 22) should include a link to the statement online. Reference 10 has no location information. In reference 23, the journal name is an acronym and should be given as “ASHA” (all caps).

Note: The findings and conclusions in this report are those of the author and do not necessarily represent the official position of the National Institute for Occupational Safety and Health, Centers for Disease Control and Prevention

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Is the work clearly and accurately presented and does it cite the current literature?

Partly

Is the study design appropriate and is the work technically sound?

Partly

Are sufficient details of methods and analysis provided to allow replication by others?

Yes

If applicable, is the statistical analysis and its interpretation appropriate?

Not applicable

Are all the source data underlying the results available to ensure full reproducibility?

Partly

Are the conclusions drawn adequately supported by the results?

No

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Audiology (hearing conservation) and epidemiology

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.

Reviewer Report 15 June 2018

<https://doi.org/10.21956/aasopenres.13895.r26461>

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Robert H. Eikelboom

Ear Science Institute Australia, Subiaco, Australia

The authors describe a fundamental study regarding the ability of independent researchers to conduct work in occupational NIHL in the mining sector in South Africa.

The report is one of disappointment of the barriers faced to collecting data. It is not clear if this is related to insufficient authority of the research team, or other factors. The team have been patient (waiting 18 months), and so it is not fair to say that the report is premature. It will be interesting to see whether this report has any effect - in breaking down the barriers, in the opposite, and/or attracting someone with more authority to help.

When reading through the paper I wonder if the nitty-gritty of attempts to contact people is necessary (it's almost a diary), or whether a generic summary of the attempts at contact would be better.

There are a number of typographical and writings (some of which are detailed below); but some editorial assistance would be worthwhile.

"classified as a number one work-related disability" It is not clear what this means - please rephrase.

This sentence repeats itself and is incomplete; please rewrite: "In 2002, 4510 cases of compensation claims were reported and, and as a result, the number of hearing loss compensation claims was estimated at 4510 individuals in 2002, and this represented 19% of all disease-related claims were processed in the same year"

This sentence does not add any useful information in it's use of the words 'far exceeds': "Furthermore, 11% of the workers are exposed to noise levels that far exceed this 85 dBA limit". The previous sentence already says that 90% are exposed to >85dBA.

"Impoverished quality of life" - 'Impoverished' is a bit too dramatic a word to use. 'Decreased' or 'Diminished' is probably better to use.

"Störbeck," remove comma.

"in one or both ears¹⁵." Is this the correct wording? The word 'or' indicates that only one ear needs to be unaffected.

page 5: "who had occupied her current position". Perhaps this can be made more anonymous by using the word 'their' instead of 'her'.

"Permission to digitally record the interviews". Clarify whether this is video and voice, or just voice.

"pin-protected computer" 'Password-protected' is the usual phrase.

This section on ethics is not written in the correct tense.

"The second phase of the study, data"; should be "In the second..." or "For the ..."

"the research.." Should that be "the researcher"?

"Therefore, a careful record of response time and response rate was a record of the key person's willingness to participate in the study as well as barriers identified." Rephrase this is more scientific language. e.g. 'careful' is not needed. And the 2nd use of the word 'record' could be substituted with 'measure'.

"It is worth noting that these focal persons are occupying important or key positions which allow them to influence and promote the success of a hearing conservation programme at their respective mines." This is of course an assumption; does the title allow them to? Surely they also need to be empowered to do so.

It is a weakness of the study that someone in the company may have had responsibility for health and safety, but they were not listed on the website or it was not clear from their job title?

One may also ask the nature of the inquiry; it appears that the non-respondents did not sense any authority in the request to respond.

Page 7: "However, due to time constraints" Whose time constraints?

The figures/illustrations do not add much to the report.

"The research was advised to email the organisation's secretary and the email will be directed to the relevant person who will then contact the researcher." The word 'will' (2x) is not correct.

"This is a concern for researchers as in most cases; studies are conducted within fixed time frames." The ; should be a comma.

Discussion - the authors should consider that their lack of authority may also have been a barrier. This is acknowledged towards the end of the report (page 10).

Furthermore, I have not seen the relevant Act, but does not someone in government have the authority to audit this information? Have they been involved?

I agree that the lack of interest and lack of clearly identifiable people is symptomatic of a lack of focus on hearing conservation.

Is the work clearly and accurately presented and does it cite the current literature?

Yes

Is the study design appropriate and is the work technically sound?

Partly

Are sufficient details of methods and analysis provided to allow replication by others?

Yes

If applicable, is the statistical analysis and its interpretation appropriate?

Not applicable

Are all the source data underlying the results available to ensure full reproducibility?

No

Are the conclusions drawn adequately supported by the results?

Partly

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Audiology and hearing conservation

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.