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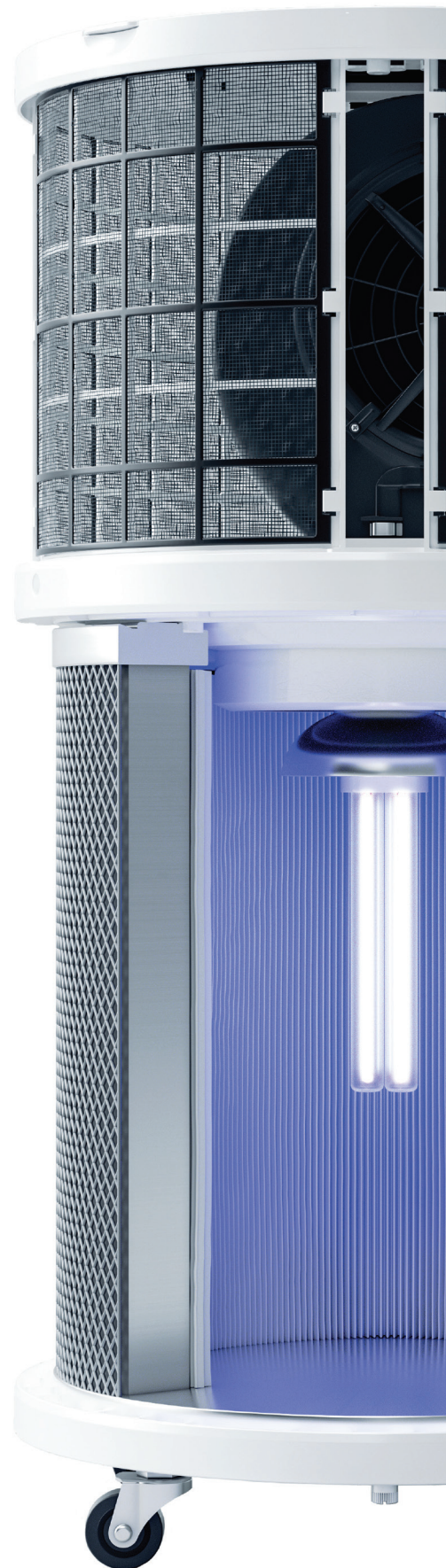
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# From the Guest Editor . . .

**Daan Kocks:** SASOM Chair; OHSA Editorial Board member; Professor: School of Medicine, University of Pretoria, South Africa  
e-mail: [info@sasom.org](mailto:info@sasom.org)



**Prof. Daan Kocks**

Photograph: courtesy of SASOM

It is that time of year again when everyone is winding down at their workplaces and looking forward to the upcoming festive season during December 2022 and January 2023. This is also the last issue of *Occupational Health Southern Africa* for 2022. Best wishes are extended to all our readers for good health and wellbeing, happiness, and prosperity in 2023.

Wellbeing is one of the themes in this issue of the journal. It is a priority in employment where

awareness, attitudes, and practices play a role to improve the wellbeing and quality of life of workers. The 'quality of life' of a person is conceptualised as having three components:

1. a mental or intellectual "*appraisal that one's life is good (life satisfaction)*";
2. "*experiencing positive levels of pleasant emotions*," and
3. "*experiencing relatively low levels of negative moods*."<sup>1</sup>

The World Health Organization (WHO) conceptualises mental health – a critical pillar of quality of life – as a "*state of wellbeing in which the individual realises his or her own abilities, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to his or her community*."<sup>2</sup>

The 66th World Health Assembly, consisting of ministers of health of 194 member states, adopted the WHO's 'Comprehensive Mental Health Action Plan 2013–2020' in May 2013. In 2019, the action plan was extended to 2030 by the 72nd World Health Assembly. Then, in 2021, the 74th World Health Assembly endorsed updates to the action plan, including updates to the plan's options for implementation and indicators.<sup>3</sup>

Promoting and protecting mental health at work is, therefore, a growing area of interest and concern, globally (and increasingly so since the onset of the COVID-19 pandemic), and can be supported in many ways. To this end, the recently launched 'WHO guidelines on mental health at work'<sup>4</sup> provide evidence-based global public health guidance on organisational interventions, manager and worker training, and individual interventions for the promotion of positive mental health and prevention of mental health conditions. Additionally, recommendations are offered in terms of returning to work following absence associated with mental health conditions, and gaining employment for people living with mental health conditions.

Wellbeing activities are carried out by skilled employed individuals and professionals who may be exposed to various health risks in their workplaces, in their daily tasks to facilitate and ensure improvement in, and sustainability of, quality of life in society at large, as described in some of the papers published in this issue of the journal.

Ministers of religion can be exposed to psychosocial stressors in their daily tasks of preaching, praying, and interacting with, and

supporting, their congregations, which can adversely affect mental health. Psychosocial hazards as workplace risks in religious occupations are discussed in the paper by Janse van Rensburg et al., titled 'The psychosocial work environment of ministers in the Dutch Reformed Church, South Africa'. The authors conclude that occupational health programmes should be purpose-designed for ministers to address these adverse health issues and improve their working environments and quality of life.

Beauty care can also result in improvements in quality of life. However, various risks linked to occupational exposures exist for workers in the beauty industry, such as nail salon workers. Keretsetse et al., in their paper 'Evaluating awareness of health risks and self-reported symptoms among nail technicians in Johannesburg, South Africa – a pilot study', investigate the exposure of nail salon workers to solvents and acrylates, which are known to be irritants. Their study suggests that a knowledge gap may exist among nail technicians relating to risks associated with exposure to chemicals in nail products. We look forward to the results of the main study.

In an approach that makes a strong association between musculoskeletal disorders and their impact on wellbeing and quality of life, Kurten et al. investigate different methods for evaluating postural changes among rural South African female youths who habitually carry head loads. In their article 'The reliability of smartphone goniometry technology in measuring postural changes in South African female youths carrying head loads', the authors test manual goniometry methods against smartphone goniometry technology, and conclude that the latter is a feasible alternative in terms of cost and reliability.

I know that some of our older and mature readers might need clarification of this terminology in 'laymen's terms'. Goniometry is the measurement of range of motion in a joint; the technique may be used as a diagnostic or therapeutic measure to determine the functional status of a patient with a musculoskeletal or neurological disability.

The parting message to our readers, from the South African Society of Occupational Medicine (SASOM) and in my capacity as Guest Editor, is our wish for the best wellbeing and quality of life for you, your families and friends, your employers and employees, and your communities for the New Year 2023 – may it be healthy and safe.

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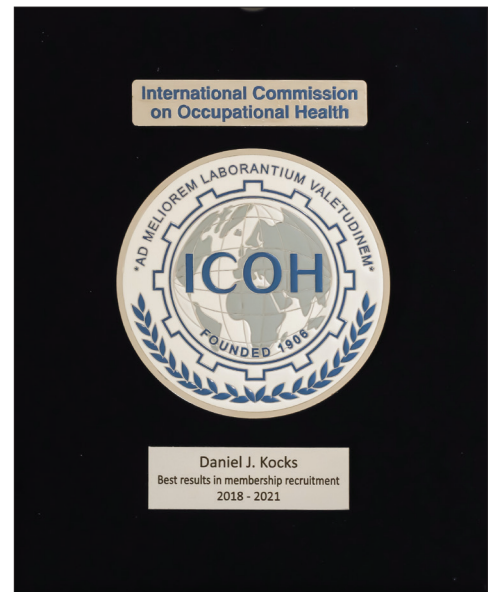
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## Prof. Daan Kocks wins ICOH award

The International Commission on Occupational Health (ICOH) Secretary for South Africa, Prof. Daan Kocks (Chair of the South African Society of Occupational Medicine (SASOM), an ICOH affiliate member), is to be congratulated for recruiting the highest number of new ICOH members from Africa during the past triennium (2018–2022).

**Prof. Daan Kocks**  
 Photograph: Claudia Frost



## Amendments to the Hazardous Biological Agents Regulations

On 31 October 2022, the amendments to the Regulations for Hazardous Biological Agents, as described in the previous issue of *Occupational Health Southern Africa*, were published in the *Government Gazette* (Mhlope, J. Hazardous Biological Agents, 2022, promulgated under the Occupational Health and Safety

Act No. 85 of 1993, as amended. *Occup Health Southern Afr.* 2022; 28(5):205-206).

The link to the amended Regulations can be found at: [https://www.gov.za/sites/default/files/gcis\\_document/202211/47413rg11505gon2693.pdf](https://www.gov.za/sites/default/files/gcis_document/202211/47413rg11505gon2693.pdf)

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In a study conducted in South Africa and published in 2011, 73.2% of miners from 14 mines were exposed to excessive noise, above the legislated occupational exposure limit of 85 dB,<sup>1</sup> despite hearing conservation programmes implemented in the mining sector. Hearing conservation programmes in South Africa are characterised as very complex, expensive, time intensive, and dependent on equipment and soundproof booths.

Audiometric testing in occupational health settings helps to determine if occupational hearing loss is being prevented by the noise control measures in place. As occupational hearing loss occurs gradually, workers often fail to notice changes in their hearing ability until significant deterioration occurs. This can be avoided by conducting annual hearing checks, and taking appropriate action as soon as a change is detected – when comparing audiometry results with those from previous years. Annual hearing checks also contribute to increased productivity in the workforce, reduced workplace injuries and communication barriers, and ensure adherence to regulations.

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- [mHealth Studio](#), which is included free with any [hearTest Occ Health](#) subscription. [mHealth Studio](#) allows for online data management, surveillance, referrals and report generation, safe and reliable storage of clinical data, and a graphical comparison of baseline and screening tests, providing you with **full access and control over all employee test data**.

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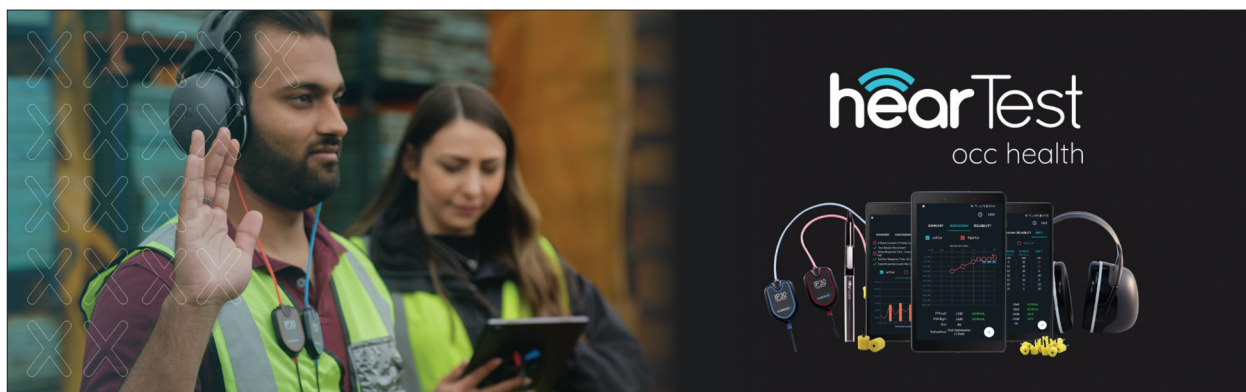


Image: courtesy of hearX

# World Health Organization (WHO) Workplace Mental Health Guidelines: towards inclusive occupational environments

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Data (both global and from the sub-Saharan African (SSA) region) suggest that there is a relationship between occupation and mental health and that this relationship appears multi-directional.<sup>1</sup> Occupational environments and tasks can be stressful and are linked to the onset of mental disorders.<sup>2</sup> Studies have focused on the risks of mental disorders among specific occupational groups, such as healthcare workers, first responders, veterinarians, lawyers, and informal workers.<sup>2-6</sup> A systematic review and meta-analysis, published in 2020, suggested that depression and anxiety were highly prevalent among health workers during the COVID-19 pandemic.<sup>7</sup> In South Africa, Makhubele et al. (2019) conducted a cross-sectional study to estimate the prevalence of common mental disorders (anxiety and depression) among informal waste pickers. Their findings suggested a prevalence of more than 30%.<sup>3</sup> It is difficult to determine whether the occupational environment was a causal factor in the onset of the mental disorder, given the interplay of several confounding and modifying variables, e.g. independent family stressors or a pre-existing mental disorder.<sup>8,9</sup> These mental disorders can lead to absenteeism and a loss of productivity.<sup>10</sup> On the other hand, individuals with pre-existing mental disorders also need employment, and the work environment needs to be inclusive.<sup>11</sup> Nevertheless, maintaining an environment in which individuals with mental disorders can sustain productivity and also feel included needs to be fostered.<sup>12</sup>

This year, the World Health Organization (WHO) published its Guidelines on Mental Health at Work<sup>13</sup> (<https://www.who.int/publications/item/9789240053052>). The Guidelines suggest interventions for reducing work-related stress among all workers, especially aid workers, and human rights-based approaches for those who have mental disorders. The Guidelines are evidence based and extracted from systematic reviews. Rigorous assessments are required to develop a comprehensive understanding of the risk, followed by fidelity to implemented interventions. It is important to encourage mental health literacy. It is also essential to assess the impact of any interventions, i.e. to measure if they reduce outcomes of interest. The WHO Guidelines further include recommendations regarding organisational interventions, manager and worker training, individual interventions, return to work, and gaining sustainable employment.

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**Quantitative fit testing of respirator**  
 Photograph: courtesy of Sedulitas

Sedulitas can also assist with noise assessments at multiple levels such as personal, area, and environmental noise. Noise assessments focus on personal noise exposure using dosimeters such as the Larson Davis Spartan Noise Dosimeter Model 730, and area noise using sound level meters such as the Larson Davis Sound Level Meter Model 831C.

Sedulitas also offers real-time dust monitoring with lightweight, self-contained continuous personal dust monitors such as the Trolex XD One or Nanozen DustCount 9000, which assist in protecting workers at risk from respirable particulates and determine whether they are being exposed to dangerous levels of silica.



**Trolex's XD One personal dust monitor**  
 Photograph: courtesy of Sedulitas



**Nanozen's DustCount 9000 personal dust monitor**  
 Photograph: courtesy of Sedulitas

Proximity detection in the form of Reactec's R-Link smart watch is the next-generation workplace-wearable technology that can accurately detect proximity to danger, offering workplace risk monitoring and prevention. The R-link smart watch is a wrist-worn device that advises workers of vibration exposure risk. The R-link watch informs the wearer of their exposure by calculating and displaying in real-time their Health and Safety Executive (HSE) hand-arm vibration (HAV) risk assessment exposure points. The R-link eco-system and cloud-based analytics are easy to deploy and simple to use.



**Reactec's R-Link smart watch**  
 Photograph: courtesy of Sedulitas

Asbestos is a silent killer. The ALERT PRO 1000 early warning device for airborne asbestos fibres is the only known device capable of distinguishing asbestos fibres from other non-asbestos fibres in the air in real time. ALERT uses patented light scattering technology, the paramagnetic properties of asbestos fibres, and a complex algorithmic statistical analysis that works to a 99.98% confidence level.



**Alert Technologies' ALERT PRO 1000 real-time asbestos sampler**  
 Photograph: courtesy of Sedulitas

Sedulitas offers other innovative health-monitoring solutions, apart from those mentioned above.

Amongst its services, the company presents accredited Occupational Hygiene Training Association (OHTA) training, contributing to the International Certificate in Occupational Hygiene (ICertOH), that helps clients to perform real-time sampling for various risk exposure components.

# Evaluating awareness of health risks and self-reported symptoms among nail technicians in Johannesburg, South Africa – a pilot study

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## Keywords

KAP study, nail products, artificial  
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## ABSTRACT

**Background:** The professional nailcare industry is expanding rapidly in South Africa. Nail treatment involves the use of solvents and acrylates. Exposure to these chemicals is associated with skin, eye, and respiratory tract irritation, and neurological and reproductive health effects.

**Objective:** To test the feasibility of conducting a study on formal and informal nail technicians, which included testing a self-developed questionnaire, and to collect preliminary data about their knowledge and awareness of health risks associated with exposure to chemicals in nail products, and associated symptoms.

**Methods:** A self-developed questionnaire was administered to 10 formal and 10 informal nail technicians working in conveniently selected nail salons in Johannesburg. Work practices and exposure control measures were observed. Demographic characteristics, working conditions, awareness of health risks, and self-reported symptoms in the two groups are presented as frequency distributions.

**Results:** Poor phrasing was identified in some of the questions. Participants provided the correct terminology to describe nail services. The revised questionnaire comprised 39 questions. Seven of the informal nail technicians were male while all the formal nail technicians were female. Informal nail technicians worked longer hours per week than formal nail technicians (median of 61.5 and 46.5 hours, respectively) and reported more symptoms. Informal nail technicians used a wider range of nail products than formal nail technicians and used some unknown brands. Although all participants indicated that they were aware of health risks associated with nail products, only four of the formal nail technicians and one informal nail technician reported receiving training (although not specific to health and safety). Informal nail technicians reported using personal protective equipment (PPE); however, this practice was inconsistent, and they used the incorrect PPE.

**Conclusions:** We showed that conducting a larger study in nail technicians is feasible. The questionnaire was revised to include more information about the chemical content of nail products, a wider range of symptoms, the frequency of their occurrence, and the work-relatedness nature of the self-reported symptoms. A knowledge gap was identified among nail technicians relating to risks associated with exposure to chemicals in nail products. The questionnaire was refined to assess more accurately nail technicians' understanding of exposure and awareness of health risks associated with chemicals in nail products.

## INTRODUCTION

Professional nailcare is a rapidly expanding industry which has seen tremendous growth globally.<sup>1-6</sup> South Africa has also experienced growth in the nailcare industry, in both the formal and informal sectors.<sup>7</sup> While some research has been conducted in the formal sector,<sup>8</sup> little is known about nail salons in the informal sector.

The 15th International Conference of Labour Statistics (ICLS) defined the informal sector as “non-registration of the enterprise in terms of national legislation such as taxation or other commercial legislation; non-registration of employees of the enterprise in terms of labour laws; or small size of the enterprise in terms of the numbers of people employed”.<sup>9</sup> Statistics South Africa defines informal work as “economic activity which takes place without a registered value-added tax (VAT) number”, and the informal sector as “those businesses that are non-registered”.<sup>10</sup>

Nailcare establishments, including those in South Africa, offer nailcare services only, or as part of a comprehensive cosmetics business.<sup>11</sup> The treatment of nails ranges from simple buffing, to basic manicures, to the application of sculptured artificial nails.<sup>12,13</sup> The chemicals in

all treatments of natural nails and the application of artificial nails are associated with potential adverse health effects. These include solvents, such as acetone, ethyl acetate, and n-butyl acetate. Additionally, artificial nail applications use acrylic polymers and monomers,<sup>14</sup> which may pose risks to the health of both the nail technicians applying the products and their clients.

One of the main chemical monomers found in acrylic nail products is methyl methacrylate (MMA), a chemical that was banned by the United States Food and Drug Administration (US-FDA) in 1974 due to its skin sensitisation properties, which are associated with allergic contact dermatitis.<sup>15,16</sup> Exposure to MMA causes eye, skin, and respiratory tract irritation, and is associated with asthma.<sup>17</sup> Methyl methacrylate has been replaced with a similar chemical, ethyl methacrylate (EMA), which is considered, in the United States of America (USA) and several other countries, to have lower toxicity.<sup>14</sup> However, some countries, such as South Africa, and certain states in the USA continue to use nail products that contain MMA as they are cheaper than those containing EMA.<sup>18</sup> Consequently, there are pockets of unregulated workers and small

industries where nail products containing MMA are still used.<sup>17,19,20</sup>

Acetone and butyl acetate (contained in nail polish removers) may lead to headaches, dizziness and eye, skin and throat irritation.<sup>2,21</sup> Some nail polishes contain toluene, formaldehyde, and dibutyl phthalate (DBP) – a combination referred to as the 'toxic trio'.<sup>22,23</sup> Toluene can affect the central nervous system (CNS) and cause reproductive harm.<sup>24</sup> The CNS effects include headache, light-headedness, dizziness, confusion, nausea, impaired judgment, and blurred vision.<sup>19,25,26</sup> The reproductive effects, such as risk for pregnancy complications, as well as developmental delays and neurobehavioral difficulties, have been reported to be higher in the offspring of women who have been exposed to high concentrations of toluene during pregnancy.<sup>27</sup> Formaldehyde has been classified as a Group 1 carcinogen by the International Agency for Research on Cancer (IARC), based on the findings of nasopharyngeal cancer and leukaemia studies.<sup>28</sup> Exposure to DBP has been linked to reproductive problems such as birth defects and negative developmental and reproductive system effects.<sup>19,22,29,30</sup> There are many other harmful chemicals used in nailcare products. Park, et al. (2014), in a study on the comparison between nail technicians and office workers, showed that a significantly higher proportion of nail technicians were exposed to airborne acetone, toluene, butyl acetate, and MMA reported respiratory, neurologic, eye, skin, and musculoskeletal complaints.<sup>17</sup> Symptoms such as headaches and light-headedness have been reported to worsen after starting work in the nail salon industry.<sup>3</sup>

Internationally, several studies have investigated the characteristics, work conditions, and self-reported symptoms in nail technicians, and knowledge of health and safety regulations and products used.<sup>21,31,32</sup> Studies in Korea, the United Kingdom (UK), Vietnam, and the USA have reported musculoskeletal disorders, respiratory symptoms, skin problems, and headaches.<sup>17,21,31</sup> Only one study has been conducted in South Africa, on the respiratory and dermal exposures to volatile organic compounds (VOCs) from products used in nail salons.<sup>8</sup> The authors reported that nail technicians were exposed to VOCs at levels below the recommended occupational exposure limits specified by the Regulations for Hazardous Chemical Agents framed under the South

African Occupational Health and Safety Act (Act No. 83 of 1995).<sup>33</sup> The study assessed only VOC exposures, in the formal sector. Worker characteristics and health effects associated with exposure were not included.

The aim of this pilot study was to test the feasibility of conducting a study on nail technicians in Johannesburg, South Africa in the formal and informal sectors. The study included testing a self-developed questionnaire, and collecting preliminary data about the nail technicians' knowledge and awareness of health risks associated with exposure to chemicals in nail products, and associated symptoms.

## METHODS

Formal nail salons were defined as those that are licensed and registered as part of a franchise. Informal nail salons comprised those not licensed or registered with any formal enterprise or establishment.

Ten nail technicians, working in six conveniently selected nail salons from the three largest nail salon franchise companies in Johannesburg, and 10 working in conveniently selected informal nail salons in Braamfontein, near the Johannesburg central business district (CBD), were invited to participate.

Data were collected, using a self-developed questionnaire, designed to gather information on sociodemographic characteristics, perceptions of working with nail products, knowledge of associated health effects, and self-reported symptoms. The questions were adapted from questionnaires used in other studies on nail technicians.<sup>17,21,31</sup> Those studies incorporated standardised and validated questions on respiratory health from the American Thoracic Society questionnaire and the Protocol for the European Community Respiratory Health Survey,<sup>34</sup> while the skin-related questions were based on the Nordic Occupational Skin Questionnaire – NOSQ 2002.<sup>35</sup> Questions adopted from these studies addressed careers, average number of clients seen per day, type and duration of nail services, knowledge of health and safety issues in the workplace, self-reported health problems, and measures taken to protect their health. Open-ended questions were added to elicit responses about their experiences and their work environments.

**Table 1. Characteristics of formal and informal nail technicians**

Characteristic	Category	Formal sector (n = 10)		Informal sector (n = 10)	
		n	%	n	%
Sex	Male	0	-	7	70.0
	Female	10	100.0	3	30.0
Age (years)	< 30	4	40.0	8	80.0
	30–40	4	40.0	2	20.0
	> 40	2	20.0	0	-
Work history (years)	< 1	0	-	1	10.0
	1–5	5	50.0	7	70.0
	6–9	3	30.0	2	20.0
	≥ 10	2	20.0	0	-
Working hours per day	8–9	7	70.0	6	60.0
	10–11	3	30.0	1	10.0
	≥ 11	0	-	3	30.0
Number of clients per day	4–6	3	30.0	4	40.0
	7–9	5	50.0	3	30.0
	≥ 10	2	20.0	3	30.0
Smoking	Yes	1	10.0	2	20.0
	No	9	90.0	8	80.0

The first draft questionnaire, comprising 35 questions, was assessed by experienced researchers to address face validity. Feedback highlighted issues such as redundant questions, and clarity and phrasing of some questions. The questionnaire was modified for the pilot study.

The questionnaire was paper-based and was administered in English by the researcher before the start of the work day, or between clients at the salon where the nail technicians worked. The participants' responses were audio-recorded to assess their initial reactions to the questions and the need for clarification. The questionnaire was timed and, at the end of administering it, the participants were asked how they perceived both the study and the questionnaire. Work practices and exposure control measures during nail treatments were observed and documented; photographs were taken.

The study was approved by the University of the Witwatersrand Human Research Ethics Committee (Medical), certificate number M151194.

### Data analysis

All data from the questionnaires were captured in Microsoft Excel, checked for missing data, and cleaned for any data entry errors. Data analysis was performed using STATA iC15.0. Sociodemographic characteristics, awareness of health effects, and self-reported symptoms were described using frequencies and proportions for categorical variables. Means and standard deviations, and medians and ranges, were used to describe continuous variables. The self-reported symptoms were categorised into four categories: respiratory effects, neurological effects, skin irritation, and eye irritation. Since the sample size was small (< 30), Cronbach's alpha could not be calculated to determine the internal consistency of the tool.<sup>36</sup>

## RESULTS

### Characteristics of study participants

Most of the informal nail technicians in the study were men ( $n = 7, 70.0\%$ ), while all those in the formal sector were women (Table 1). Nail technicians in the formal nail salons were older and had worked for longer in the nail industry than those in the informal nail salons.

Informal nail technicians worked for more hours per week (median 61.5 (56–72)) than formal nail technicians (median 46.5 (45–54)). The mean number of clients serviced per day, however, was similar for both groups, viz.  $7.4 \pm 2.2$  and  $7.4 \pm 2.1$ , respectively.

### Face validity of the questionnaire

The piloted questionnaire initially comprised 35 questions. The researchers who assessed the content found the questions to be inclusive and able to capture the purpose of the pilot study; however, they recommended rewording some of the questions for clarity. Seven questions

were thus modified. The question about the perception of how harmful the nail products are was preceded by two questions asking the participant's knowledge about health effects related to the chemicals found in nail products ("Do you know if the chemicals in nail products may cause any health effects?"; and "If yes, please list the health effects"). Two questions were deemed very similar and were merged: "Do the symptoms experienced when working with nail products improve or worsen while at work?" and "Do the symptoms experienced when working with nail products improve while away from work?" The resultant question was "Do the symptoms experienced while working with nail products get better when away from work?"

The pilot study participants expressed that they were comfortable with the questions asked and felt that the study was important to address health- and safety-related issues in the nailcare industry. In some instances, they corrected the terminology used to describe the services they offer. For example, the phrase 'nail treatment', used to describe the services offered, was replaced with 'nail application'. The question, "Do you know the chemical content of the nail products that you use?" was often confused with knowledge about the nail products themselves. This question was therefore preceded by two additional questions: "What type of nail products do you use?" and "Have you ever read the label of these nail products?", to give clarity to the question on chemical content. Three nail technicians asked for clarity about the question, "How harmful do you think these nail products are?" as they assumed that it referred to the potential harm caused to the client and not themselves. After modifying seven questions, merging two, and adding four new ones, the questionnaire – to be used in a larger study – comprised 39 questions (see [Supplementary Appendix 1](#)). The estimated time taken to complete the questionnaire was 45 minutes; the actual time was around 35 minutes, including the time taken to explain the study and for participants to sign the consent form.

### Health risk awareness, working conditions and self-reported symptoms

The formal nail salons were part of the three big franchises in South Africa and operated under a franchise model, with several nail salons employing more than one nail technician per salon. The informal nail technicians worked independently, often as freelancers, leasing a space in a hair salon. This influenced the work practices, procurement procedures, and the types of products they used. The formal nail salons purchased their products from common suppliers, following the company's procurement procedures, while procurement of products in the informal nail salons was at the discretion of the individual nail technicians.

All the study participants knew the names of the products and their intended use, but none were familiar with the chemical contents (Table 2). Information related to the use and handling of nail products

**Table 2. Knowledge and awareness about nail products among formal and informal nail technicians**

Item	Formal sector (n = 10)		Informal sector (n = 10)	
	n	%	n	%
Knowledge about products	10	100.0	10	100.0
Knowledge about chemical content of products	0	-	0	-
Health and safety information	4	40.0	1	10.0
Awareness of health risks	7	70.0	10	100.0
Use of PPE	5	50.0	10	100.0

PPE: personal protective equipment

was reportedly provided to four (40.0%) of the formal nail technicians during their training, while only one (10.0%) of the informal nail technicians indicated they had received training. Some participants reported that the training did not incorporate health and safety aspects of their work, but focused on nail application methods, and the use and disposal of nail products. Seven (70.0%) nail technicians in the formal and all those in the informal (n = 10, 100.0%) nail salons said that they were aware of the health risks associated with working with nail products. This was informed mainly by their experiences of working with nail products every day and the ill-health symptoms that they experienced.

Although the participants reported using masks as personal protective equipment (PPE), this was at their discretion. The masks were dust masks and did not provide protection against the chemical compounds to which they were exposed. Dust masks protect only against exposure to particulates, whereas nail technicians are exposed to VOCs. They wore the dust masks when using nail products that they perceived to emit toxic chemicals, e.g. when applying acrylic nail products or using acetone. These tasks involve the use of nail products that have a distinct odour.

Figure 1 shows the acute health-related symptoms reported by nail technicians since they started working in the nail industry. These included sneezing, coughing, flu-like symptoms, sinusitis, dizziness, headache, red/itchy skin, and red eyes. Informal nail technicians reported more health-related symptoms than formal nail technicians.

The nail technicians reported many similar symptoms – most were related to sinuses and the upper respiratory tract. The symptoms most frequently reported by the informal nail technicians were respiratory effects (n = 6), neurological effects (n = 5), and skin and eye irritation (n = 2). The formal nail technicians reported respiratory effects (n = 3), neurological effects (n = 1), and skin irritation (n = 1).

Some of these symptoms were perceived to be caused by specific nail products or related to specific nail treatments:

*“It (runny nose) only occurs during the day when using the product (monomer). It starts as I am busy with a client and when I am done it stops.”* (formal nail technician)

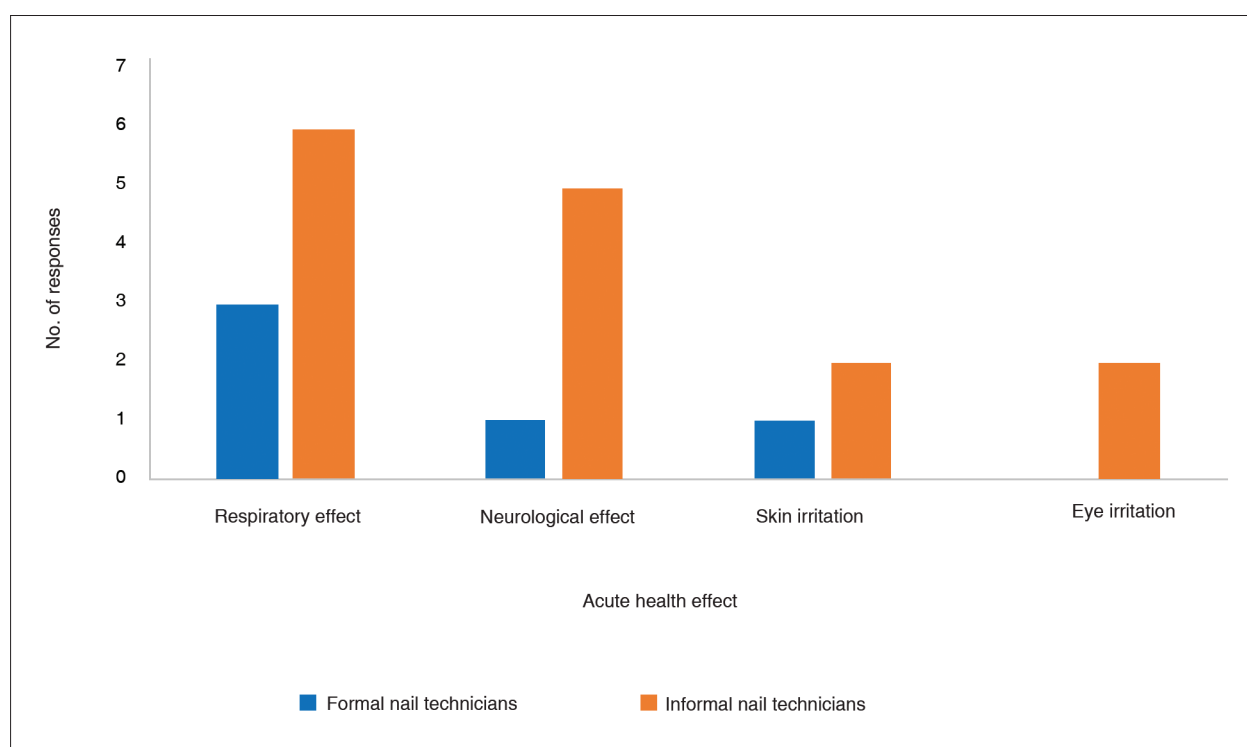
The symptoms were also perceived to be related to dust generated when performing a specific task during a nail application:

*“Around the chest, there is (are) always complications there, even now you can hear my voice is not coming out clearly. I think there is a congestion of dust. Especially when we file the nails it brings out dust.”* (informal nail technician)

## DISCUSSION

The primary objective of this study was to test the feasibility of conducting a study on formal and informal nail technicians, which included testing a self-developed questionnaire, and collecting preliminary data about their knowledge and awareness of health risks associated with exposure to chemicals in nail products, and associated symptoms. We demonstrated that such a study is feasible with respect to accessing participants and administering the questionnaire in a clear and understandable manner. The initial questionnaire needed to be revised as the phrasing of some questions was unclear, especially those related to awareness of potential health risks associated with working with nail products. After conducting the pilot study, the tool was further refined to include knowledge and awareness about the specific chemical contents of the nail products and the related potential health effects, and a wider range of symptoms and their work-relatedness.

Information about room size, ventilation, and confounding factors such as chemicals emitted from other activities in the



**Figure 1. Self-reported ill-health symptoms among formal and informal nail technicians**

nail salon (e.g. hairdressing) will be included in a larger study, where exposures to specific chemicals used in nail treatments will be assessed.

Although this was a pilot study, with very few participants, there were some interesting findings, the validity of which will need to be tested in a larger study. The informal nail technicians worked for more hours and reported more symptoms than the formal nail technicians. This might be attributed to the flexible nature of their work as they do not have defined working hours, which is common in the formal sector.

In the pilot study, the informal nail technicians were predominantly male, which was unexpected. Formal nail technicians were older and had worked in the industry for longer periods. This may be due to the formalised structure of the sector and the security that the job provides in terms of regular working hours and set salaries.<sup>37</sup>

The results from the pilot study also suggested that there are some similarities between the two groups. Nail technicians in both sectors could easily identify the nail products and their intended use but did not know their chemical contents or the related potential health effects of exposure to them. The formal nail technicians reported having received training; however, the training focused on nail treatment procedures, and how to handle and dispose of nail products, rather than the health and safety aspects of their work. The majority of the informal nail technicians relied on training while on the job, and their awareness of health risks was based on their individual experiences of working with nail products. Formal training and health and safety training is not a requirement in the informal industry due to the industry not being regulated. A study on nail technicians from a mixture of rural and urban areas in the UK, published in 2011, reported that the majority of the participating nail technicians (99%) had received training that included aspects of health and safety, and most were aware of the Control of Substances Hazardous to Health (COSHH) regulations and risk assessments.<sup>31</sup> Nail salons in the UK are more formalised and most nail technicians undergo training by their employers or colleges in order to qualify as nail technicians.

Although awareness of health risks was high in both groups, differences were noted in the reporting of PPE use. All informal nail technicians reported using PPE, compared to 50% of the formal nail technicians. However, PPE use was at their discretion, and they wore masks only when performing tasks they perceived to be emitting toxic chemicals, based on the distinct odours. This was both reported and observed. This practice was misinformed as the nail technicians were not knowledgeable about the chemical contents of the nail products or their associated health effects. The choice of PPE was also inappropriate as they used dust masks that only protect against exposure to particulate matter and not VOCs. A study conducted on Vietnamese-American nail salon workers reported similar findings of inappropriate PPE usage, where disposable surgical masks were used.<sup>21</sup> These types of masks are designed for infection control and do not reduce exposure to chemical vapours.

This was a pilot study on a small number of participants; thus, inferences and generalisations cannot be made. However, the preliminary findings suggest that there is a potential for identifying behaviours and practices that are unique to the industry, and differences between the formal and informal sectors.

## CONCLUSION

Pilot studies are important for testing the feasibility of conducting large epidemiological studies and collecting preliminary data to support the justification for undertaking a larger study. They are also

useful for pre-testing data-collection tools, such as questionnaires and devices. This small pilot study drew attention to the nature of the work of nail technicians and levels of awareness of potential health risks. A comprehensive data-collection tool has been developed for use in the assessment of nail technicians' exposure to, and awareness of health risks associated with, chemicals in nail products, for use in a larger study.

Larger studies are needed to quantify the exposure to chemicals that are associated with adverse health symptoms, and to identify the long-term health effects of these exposures in both the formal and informal nail sectors. Such studies are imperative to ensure the health and safety of vulnerable groups, such as informal nail technicians, due to the nature of their work and the lack of regulation. The findings from such studies can influence policy development to ensure the protection of the health of both workers and patrons in this industry.

## KEY MESSAGES

1. Pilot studies provide insight regarding the feasibility of conducting a study and provide preliminary data.
2. Nail technicians in the formal and informal sectors of the beauty industry differ with regard to working hours, number of clients, and types of products.
3. A larger study on nail technicians will determine chemical exposure assessment and the relationship with symptoms; and health risk awareness.

## DECLARATION

The authors declare that this is their own work; all the sources used in this paper have been duly acknowledged and there are no conflicts of interest.

## AUTHOR CONTRIBUTIONS

Conception and design of the study: GK, DB, GN

Data acquisition: GK

Data analysis: GK

Interpretation of the data: GK, GN, DB

Drafting of the paper: GK

Critical revision of the paper: DB, GN, GK

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# The psychosocial work environment of ministers in the Dutch Reformed Church, South Africa

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## ABSTRACT

**Background:** The psychosocial work environments of ministers of religion have not been extensively researched. However, the literature suggests that ministers of religion are exposed to psychosocial stressors, which can adversely affect their mental health.

**Objective:** To describe the psychosocial work environments of ministers in the Dutch Reformed Church in the Western Cape and KwaZulu-Natal provinces of South Africa, in 2015.

**Methods:** This was a cross-sectional mixed methods survey. An adapted version of the self-administered short Copenhagen Psychosocial Questionnaire II (COPSOQ II) was sent to 414 active ordained ministers. The COPSOQ II scoring system was used to identify psychosocial dimensions needing attention. Two open-ended questions were added.

**Results:** The responses of 138 participants who returned completed questionnaires (33.3%) were analysed. Self-reported medical conditions included work-related stress (n = 73, 52.9%), depression (n = 41, 29.7%), and burnout (n = 36, 26.1%). Although 71.7% of participants (n = 99) indicated that they had good social support structures, the themes identified were lack of support systems, trust, and training. Only 20.3% of participants (n = 28) were familiar with the Occupational Health and Safety Act, and only 8% (n = 11) were part of an occupational healthcare programme. Most (118, 85.5%) personally paid for healthcare services related to health in the previous two years. High emotional work demands and poor leadership qualities were identified as high psychosocial risks. One fifth (n = 29, 21.0%) of participants reported experiencing bullying.

**Conclusion:** Most Dutch Reformed Church ministers in this study were exposed to psychosocial hazards in the work environment, such as poor social support, high emotional demands, poor leadership, and bullying. Occupational health programmes should be purposefully designed for ministers to address these hazards, and to improve their working environments and mental health.

## INTRODUCTION

Traditionally, ministers of religion are perceived to be the moral and ethical pillars of society. Religious communities expect ministers always to be available in times of stress and to provide services beyond ministry, which include marriage counselling, funeral services, sermons, mentoring through life's challenges, etc. If ministers take on these various roles for the community, who supports them? Can ministers live up to their employer's and congregation's expectations and demands? How do ministers address challenges in their workplaces?

From an occupational health perspective, anecdotal data from 2015 indicated that ministers in the Dutch Reformed Church of South Africa experienced consistently high levels of burnout, depression, and ill-health, suggesting that they did not have safe and healthy work environments as required by the Occupational Health and Safety Act No. 85 of 1993.<sup>1</sup> The Dutch Reformed Church, like most religious institutions, employs ministers, administrative staff, and other personnel. All are automatically included under legislation that directs the employer to provide and maintain a workplace that is safe and without risk.

The psychosocial aspect of the work undertaken is one of the primary occupational health hazards in the workplace, which causes stress and negatively influences an employee's psychological and physical health.<sup>2</sup> Psychosocial hazards are defined by the International Labour Organization (ILO) "in terms of the interactions among job content, work organisation and management, and other environmental and organisational conditions, on the one hand, and the employees' competencies and needs on the other".<sup>3</sup>

Empirical research, published in 2017 by the South African Depression and Anxiety Group (SADAG), identified that poor psychological health cost South Africa more than R232 billion per year.<sup>4</sup> Only 40% of South African organisations had a strategy for health in the workplace and only 36% understood the impact of health issues at their workplaces.<sup>4</sup> Prior research in the workplace, including those of ministers of religion, identified that psychosocial hazards, characterised by high demands at the workplace combined with poor resources, precede burnout and ill-health.<sup>2,5-7</sup> The World Health Organization (WHO) has identified the following psychosocial hazards: job content (unpleasant tasks), workload, work pace, time spent working, work organisation (influence on work, commitment to workplace), interpersonal relations (poor relationships with co-workers, bullying, no support), organisational culture (leadership, communication), emotional demands, and congregational commitment.<sup>2</sup>

The aim of this study was to describe the psychosocial work environment of ministers in the Dutch Reformed Church of the Western Cape and KwaZulu-Natal provinces of South Africa.

## METHODS

This was a cross-sectional mixed methods study. The Western Cape and KwaZulu-Natal provinces were conveniently selected for the study, based on cost-effectiveness. The relevant church council, ring or synod is the employer in the Dutch Reformed Church,<sup>8</sup> which at the time of this study (2015) employed 1 602 ordained ministers. Four hundred and fifty-seven ordained ministers were registered with the synods in these provinces, 414 of whom were actively involved in a congregation and/or church community. These 414 were invited to participate in the survey, via e-mail.

**Table 1. Socio-demographic characteristics of participants (N = 138)**

Characteristic	Category	n	%
Province	KwaZulu-Natal	27	19.6
	Western Cape	111	80.4
Area	Rural	68	49.3
	Urban	70	50.7
Sex	Male	127	92.0
	Female	11	8.0
Age (years)	25–34	11	8.0
	35–44	23	16.7
	45–54	40	29.0
	55–64	59	42.8
Highest qualification	65–73	5	3.6
	Bachelor's degree	28	20.3
	Master's degree	93	67.4
Position	PhD	17	12.3
	Fixed-term contract	57	41.3
	Tent maker	7	5.1
	Contract work	11	8.0
	Missionary	2	1.5
	Pastoral minister	50	36.2
Marital status	Other	11	8.0
	Single	5	3.6
	Married	132	95.7
Dependants	Divorced	1	0.7
	0–2	99	71.7
	3–4	38	27.5
Developmental stages of children	5	1	0.7
	Baby	5	3.6
	Toddler	15	10.9
	Child	25	18.1
	Adolescent	34	24.6
	Young adult	42	30.4

The participants completed the survey online, using REDCap, which comprised a socio-demographic questionnaire and the Copenhagen Psychosocial Questionnaire II (COPSOQ II) 2007 (short version).<sup>9</sup> The latter was developed and validated by the Danish National Institute for Occupational Health in Copenhagen and assesses the psychosocial work environment, health, and wellbeing of study participants.<sup>9</sup> The socio-demographic questionnaire included questions on self-reported medical history, sex, age, education, marital status, and knowledge plus experience of occupational health and safety.

Two open-ended questions were added. The first, "Please tell me how you would like to be supported in dealing with stress or stressful situations in the workplace other than those mentioned", afforded the participants the opportunity to identify what support they would prefer in the workplace when experiencing stress or exposed to stressful situations. The second allowed participants the opportunity to disclose more about their workplace, health, and stress.

Data on psychosocial factors were collected using the short version COPSOQ II, which comprises of scales. The COPSOQ II scales have seven domains, with 23 dimensions and 44 questions. The

**Table 2. Characteristics of work environments of participants (N = 138)**

Characteristic	Category	n	%
Years in ministry	0–10	18	13.0
	11–20	30	21.7
	21–30	54	39.1
	31–42	36	26.1
Years in current congregation	0–10	75	54.4
	11–20	23	16.7
	21–30	31	22.5
	31–42	9	6.5
Number of members in congregation	< 500	38	27.5
	501–1 000	35	25.4
	1 001–1 500	23	16.7
	1 501–2 000	12	8.7
Number of ministers working in congregation	2 001–2 500	11	8.0
	> 2 500	19	13.8
	1	56	40.6
Contracted hours per week	2–4	75	54.4
	5–8	7	5.1
	< 45	80	58.0
Average no. overtime hours/month	≥ 45	58	42.0
	< 40	122	88.4
Weekends off in a 3-month term	≥ 40	16	11.6
	0	7	5.1
	1	107	77.5
Time since last holiday (months)	≥ 2	24	17.4
	≤ 3	66	47.8
	4–6	64	46.4
Location of last holiday	7–12	8	5.8
	Away from home	109	79.0
	At home	29	21.0
Reported symptoms/diseases	Work-related stress	73	52.9
	Depression	41	29.7
	Hypertension	38	27.5
	Burnout	36	26.1
	Anxiety	31	22.5
	Asthma	7	4.4
	Diabetes mellitus	6	5.1
Epilepsy	2	1.5	
Thoughts of leaving the ministry	Yes	78	56.5
	No	60	43.5

seven domains are demands at work, work organisation and job content, interpersonal relations and leadership, work-individual interface, values at workplace level, health and wellbeing, and offensive behaviour.<sup>10</sup>

The COPSOQ II scoring system is based on a mean score per dimension. Each dimension has one or more Likert scale-type questions. The responses to each question are assessed individually and then summed as a total score for that dimension.<sup>11</sup> The dimension score is used to determine the risk of the psychosocial work environment with regard to each dimension.

The Human Research Ethics Committee (Medical) of the University of the Witwatersrand approved this study (clearance certificate no. M150306), and permission to conduct the study was obtained from the Dutch Reformed Church synods of the Western Cape and KwaZulu-Natal.

### Data analysis

Mean scores for the responses to the Likert scale questions from the COPSOQ II were calculated for each dimension, using Microsoft Excel. The first digit was used for interpretation in the scoring system, i.e. the means were not rounded, following the COPSOQ II guideline.<sup>11</sup>

The COPSOQ II scoring system categorises risks as green, red, or yellow, indicating that they are low (the risk is acceptable), medium (risk mitigation is required to resolve the issue) or high (the risk is exceptionally high and needs immediate attention and elimination), respectively.

The responses to the open-ended questions were thematically analysed.

### RESULTS

A total of 158 participants completed the survey, giving a response rate of 38.2%. However, 138 participants (33.3%) provided complete responses; data from these participants were analysed.

The socio-demographic characteristics of the participants are summarised in Table 1. Most (n = 127, 92.0%) of the participants were male and all the participants had bachelor's degrees; 67.4% (n = 93) had master's degrees and 12.3% (n = 17) had PhDs. Most were 45 years or older (75.4%) and married (95.7%).

More than half (n = 75, 54.4%) of the participants had worked in the same congregation for 10 or fewer years (Table 2). Many (n = 38, 27.5%) were working in congregations with fewer than 500 parishioners, and 54.4% (n = 75) of participants worked together with two to four colleagues. Fifty-eight (42.0%) of the participants were contracted to work for 45 or more hours per week. Most worked overtime; 16 (11.6%) worked more

than 40 hours overtime per month with no additional remuneration. More than half (n = 73, 52.9%) reported that they suffered from work-related stress, and almost a third reported being depressed (n = 41, 29.7%) or burnt out (n = 36, 26.1%). More than half (n = 78, 56.5%) had considered leaving the ministry.

As shown in Table 3, 99 (71.7%) participants indicated that they had good social support structures in family and friends, and 81.2% (n = 112) confirmed that there were labour relations commissions in their churches.

About a fifth (n = 28, 20.3%) of the participants were familiar with the Occupational Health and Safety Act; 8.0% (n = 11) were part of an occupational healthcare programme; and 85.5% (n = 118) personally paid for healthcare services in the previous two years.

The participants' preferred support was spiritual development (n = 88, 63.8%), followed by mentor support (n = 78, 56.5%), and retreats on their own (n = 67, 8.6%).

The responses related to the seven domains and 23 dimensions of the COPSOQ II scales are shown in Tables 4 and 5.

Two dimensions had high risk scores, namely emotional work demands (under the domain, 'Demands at work') and leadership quality (under the 'Interpersonal relations and leadership' domain) (Table 4). Eleven dimensions were identified as medium risk and needing attention, and six dimensions were low risk.

As shown in Table 5, 47 incidents of offensive behaviour (from a few times to weekly) were experienced by participants in the previous 12 months, perpetuated mainly by colleagues. Bullying was identified as the most serious offensive behaviour (29 incidents), most of which occurred in the workplace (n = 22, 75.9%).

**Table 3. Support structure rating for participants (N = 138)**

Characteristic	Category	n	%
Social support structure	Poor	4	2.9
	Average	35	25.4
	Good	99	71.7
Labour relations commission in the church	Yes	112	81.2
	No	26	18.8
Familiar with the Occupational Health and Safety Act	Yes	28	20.3
	No	110	79.7
Part of an occupational healthcare programme	Yes	11	8.0
	No	127	92.0
Healthcare services accessed in the last two years	Medical evaluation	91	65.9
	Counselling	29	21.0
	Peer counselling	23	16.7
	Immunisation	15	10.9
	Debriefing	5	3.6
Who paid for healthcare services accessed?	Employer (DRC)	20	14.5
	Self	118	85.5
Preferred support choices	Spiritual development	88	63.8
	Mentor support	78	56.5
	Retreats (alone)	67	48.6
	Courses on psychosocial hazards	40	29.0
	Marriage/family retreats	31	22.5
	Administrative/secretarial support	31	22.5
	Mental health counselling	20	14.5
	Financial advice seminars	19	13.8
	Health education	17	12.3

DRC: Dutch Reformed Church

**Table 4. Psychosocial risks identified from the first 19 dimensions of the COPSOQ II**

Scale	Domain	Dimension	Mean score	COPSOQ II risk score*
Workplace	Demands at work	1 Quantitative work demands	3.43	3
		2 Work pace	5.14	5
		3 Emotional work demands	5.57	5
	Work organisation and job content	4 Influence on work	5.02	5
		5 New skill development	5.32	5
		6 Meaningful work	5.52	5
		7 Commitment to workplace	4.79	4
		10 Role clarity	4.36	4
	Interpersonal relations and leadership	8 Predictability	4.68	4
		9 Appreciation and recognition	4.79	4
		11 Leadership quality	3.59	3
		12 Social support from superiors	5.12	5
Work-Individual	Work-individual interface	13 Job satisfaction	2.27	2
		14 Work-family conflict	3.31	3
	Values at workplace level	15 Management/worker trust	6.57	6
16 Justice and respect		5.72	5	
Individual outcomes	Health and wellbeing	17 Self-rated health	2.72	2
		18 Burnout	3.47	3
		19 Stress	3.46	3

\*rounded score; green: low risk, yellow: medium risk, red: high risk

When participants were asked, in the open-ended question, what support they preferred for managing stress, three themes were identified: support, trust, and training. Support was requested in terms of mentorship, an effective church council, leadership, time off, and finances.

*"I think that leadership support is a shortfall in my present situation, as well as a lack of support and encouragement from labour relations commission."* (P138)

*"Church council giving more attention to work-related stress and then giving time off... encouraging me to take time off to rest and recuperate, rather than just accepting it as part of the job."* (P125)

Contrary to what is expected in a religious community, it appeared that the participants had no one they could trust (the second theme identified). Responses on what they needed, included:

*"People who are honest and sincere in support of ministers and not let them be influenced by others."* (P53)

*"The minister must be protected in the congregation. Some people have too much power and uses it against the minister. The church office must protect the minister, but it does not always happen. Specially in the rural areas there is no protection."* (P100)

The third theme identified was a request for training and further development. This included training/education in leadership development, coping skills, and healthy lifestyle.

*"Die geloofsreis VBO kursus saam met (naam weerhou) het baie gehelp om my emosionele toestand te hanteer en te groei te midde van die werkstres."* (P19). [*"The faith journey in the VBO course with (name withheld) helped a lot to deal with my emotional state and growth amid the work stress."*]

A common thread regarding workplace health or stress was the lack of communal support, including that from colleagues, parishioners, and management.

**Table 5. Psychosocial risks identified from the offensive behaviour domain**

Dimension	Frequency in previous 12 months			Perpetrator			Total offensive behaviour	
	A few times	Weekly	Colleague	Manager/ supervisor	Subordinate	Client	n	%*
	n	n	n	n	n	n		
20 Sexual harassment	6	0	3	0	0	3	6	4.3
21 Threats of violence	10	0	0	1	0	6	10	7.2
22 Physical violence	2	0	0	0	0	2	2	1.4
23 Bullying	24	5	12	9	1	10	29	21.0
All	42	5	15	10	1	21	47	34.1

\*percentage of total participants

*"Some members of the congregation tend to gossip a lot about ministers making up very negative stories. My previous colleague was very abusive verbally and slandered my name in the congregation. Even now, two years after he left, I am still confronted by things he said and the negative image of me he promoted in the congregation." (P68)*

*"I have a colleague who insists on being nearer to me than my wife. It causes a lot of stress." (P66)*

Responses from some participants confirmed that they were coping and enjoying their work. It appeared that those who could self-manage their time and work schedules coped better in the workplace.

*"I am allowed to function independently with minimum interference from my church council. They are not the cause for my stress. Time management, my own expectations, work ethics and an over-developed sense of responsibility create opportunities that led to situations where you often extend yourself at the detriment of your family and private life." (P35)*

*"I would just like to mention, I do not have a direct superior. The church council employs me but does not direct my work. Therefore, I have to be my own superior in task management etc. Which has its own issues." (P99)*

Encouraging feedback was received from a participant who experienced the workplace as positive.

*"Enough said. I enjoy my work. The working environment is pleasant. I have a wonderful colleague and we have good relationships with the rest of the personnel. I look after my health and minimalise stress as far as possible. I have one life, and I live it to the fullest." (P158)*

## DISCUSSION

We investigated the psychosocial work environment of ministers in the Dutch Reformed Church by exploring the work environment and describing existing psychosocial support.

Participants in this study were exposed to high emotional demands and poor leadership, which indicated the high risk of exposure to psychosocial hazards in the workplace. As a result, the participants reported that they suffered from ill-health, work-related stress, depression, and burnout. Similar findings have been reported in previous studies.<sup>3,6,12-14</sup> Emotional demands experienced by ministers in the workplace include those related to high work demands, high expectations from colleagues, time pressures, dealing with parishioners with personal crises, coping with angry parishioners, and hiding their own emotions in the process.

Daily diverse roles add to emotional demands in the workplace. In one day, a minister might see a new parent to plan the baptism of a baby, manage an emotionally draining funeral, provide marriage counselling, and attend a church meeting. The incongruence of ever-changing emotions and paradoxes in roles is psychologically draining at the expense of ministers' mental and physical health. Most of the participants stated that they experienced work-related stress, anxiety, depression and/or burnout, which supports findings from previous research.<sup>13</sup> Consistent with previous empirical studies,<sup>3,13</sup> poor leadership quality increased the psychosocial risk as they felt that their immediate superiors were not good at work planning and did not care about the participants' job fulfilment. The lack of recognition and/or appreciation by superiors and parishioners also contributed to high emotional demands and poor leadership.

A disconcerting finding was that bullying was perpetrated predominantly by colleagues. The church should be a safe place for ministers and others – a place of unconditional acceptance and love, but this was not the case. Bullying can lead to psychological and physical ill-health.<sup>3,13</sup>

Responses to the COPSOQ II indicated that social support from superiors in the workplace was a medium risk for the participants. Most of the participants stated, in the questionnaire, that their social support structures (friends and family) were good.

Responses to the open-ended questions also revealed the lack of support from colleagues in the workplace, struggle with self-management, and poor leadership, as has been found in other studies.<sup>15,16</sup>

The participants shared their needs for support from colleagues and the church council, and support regarding their emotions, time management, self-management, and finances. A concerning outcome from this study was the lack of trust amongst ministers. Trust is fundamental in any relationship; however, the participants preferred not to share their feelings with colleagues. Good leadership from the employer should address these issues of the participants.

Another finding from this study was that most participants felt that they had good social support from family and friends, although, at the same time, they identified poor support at the workplace as a risk in the psychosocial work environment. Support rendered by the employer should include the provision of a mentor and some form of counselling. However, challenges exist with this model, including poor access to this kind of support in rural areas. Previous studies have indicated that poor social support can lead to ill-health, and that stress can be prevented through social support.<sup>5,15</sup>

Although most churches have a labour relations commission, most participants were not aware of the Occupational Health and Safety Act of 1993.<sup>1</sup> Very few participants indicated that they were part of an occupational health programme rendered by the employer. Most paid for healthcare services, which included occupational health, themselves. The employer is responsible for the cost of complying with legislation, including an occupational health surveillance programme, so this highlights non-compliance with occupational health and safety legislation by the Dutch Reformed Church. The Act<sup>1</sup> requires the employer to create a healthy and safe workplace, including the psychosocial environment. Completing a health risk assessment with specific reference to psychosocial hazards, and occupational health surveillance, would provide information that the Dutch Reformed Church could use to comply with legislation. Not addressing occupational health hazards could have a negative impact on the church organisation and the community in terms of cost, increased absenteeism, and lower productivity – something that is supported by previous research.<sup>3</sup> The autocratic leadership style, which appears to be embedded in the church culture (personal observation), potentially contributes to the psychosocial stress experienced by ministers.

Many of the participants' preferred choice of support in the workplace was spiritual development. As the participants are preaching for others, delivering the Word of God, they have a need to receive and be served with the Word of God themselves. Previous research has shown that study participants' concepts of health include spiritual wellbeing; thus, a holistic approach should be used to address these needs.<sup>17</sup> Additional choices for support, in order of preference, were mentor support, retreats on their own, courses on psychosocial hazards, marriage/family retreats, administrative/secretarial support, mental health counselling, financial advice seminars, and health education. These preferences have been demonstrated in previous research.<sup>18</sup>

There was a low response rate (33.3%) in this study, which was conducted in two of the nine provinces of South Africa. The findings cannot be generalised to other provinces. The study was conducted

seven years ago but, from personal observations, ministers in the Dutch Reformed Church still appear to be exhibiting signs of stress. Taking these findings as a baseline, the study should be repeated to ascertain if there has been any significant improvement in the psychosocial environment of these ministers.

### Recommendations

Interventions, including spiritual development, mentor support, and retreats on their own, are necessary to prevent occupational stress. We recommend that the employer, the relevant church council, should provide the appropriate risk-based occupational health service, to comply with relevant legislation.

Future research should focus on key areas identified in the study. The short COPSOQ II questionnaire can be used to assess the effectiveness of any intervention that is implemented. Additional investigations could be conducted on cognitive demands, sensory demands, behavioural stress, somatic stress, and personalities, which can be assessed with the long version of COPSOQ II.

### CONCLUSION

The psychosocial work environment of the ministers of religion in the Dutch Reformed Church we explored was identified as being hazardous. High risk areas identified included poor support structures, high emotional demands, poor leadership, and bullying. As existing support structures were deemed to be insufficient, interventions to improve the psychosocial work environment need to be identified. Occupational health programmes should be purposefully designed to address these hazards, and to improve the working environment and ministers' mental health.

### KEY MESSAGES

1. Ministers of religion are exposed to many psychosocial hazards in the workplace.
2. Ministers prefer to discuss their problems with someone not associated with the church or community, since they do not trust their leaders and colleagues within the church.
3. Psychosocial support for ministers in the Dutch Reformed Church should be improved.
4. An occupational health programme would assist in creating a safe and healthy workplace, leading to legal compliance.

### DECLARATION

The authors declare that this is their own work; all the sources used in this paper have been duly acknowledged and there are no conflicts of interest.

### AUTHOR CONTRIBUTIONS

Conception and design of the study: AH, LLJVR

Data acquisition: LLJVR

Data analysis: LLJVR

Interpretation of the data: LLJVR, AEVDH

Drafting of the paper: LLJVR, AH

Critical revision of the paper: LLJVR

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# The reliability of smartphone goniometry technology in measuring postural changes in South African female youths carrying head loads

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## ABSTRACT

**Background:** Four empirical studies have measured the impact of head-loading on female African porters' posture using expensive radiography and manual kinanthropometry and goniometry. The reliability of cheaper, pragmatic smartphone goniometric technology as an alternate clinical tool to assess posture is needed.

**Objectives:** This study was designed to test the inter-rater reliability of smartphone goniometry technology against manual goniometry in measuring selected sagittal postural angles in South African female youth who habitually head-load.

**Methods:** Female South African youth who habitually head-load voluntarily participated in the study (N = 100) and were randomly allocated into experimental (n = 50) and control (n = 50) groups. An observational randomised control design involving a pre-test post-test crossover was used, after which the control group crossed over into the experimental group and vice versa. The control group stood in the unloaded phase without a head load, while the experimental group carried the head load. The daily head loads and body mass were measured on an electronic scale. Demographic characteristics (age, body mass, and stature) were recorded and selected biomechanical angles were measured on the right side.

**Results:** The mean age of the study participants was  $12.3 \pm 2.5$  years; average body mass was  $44.5 \pm 13.7$  kg. The average head load habitually carried was  $8.0 \pm 2.5$  kg. The inter-rater reliability between the smartphone goniometry technology and manual goniometry was 0.9.

**Conclusion:** The findings support the use of smartphone goniometry as a pragmatic method for assessing sagittal plane postural changes among rural South African youth who habitually head-load. Further studies are needed to validate these findings.

## INTRODUCTION

The most popular mode of transporting food, water, and firewood in rural South African communities is through head-loading, as performed by young girls.<sup>1</sup> These loads are transported over distances of two to 10 km, and their mass varies from 3 to 35 kg.<sup>2</sup>

Empirical health research has revealed that habitual head-loading causes spondylolisthesis, intervertebral disc compression, and decreased standing vertex height, all of which adversely affect posture.<sup>3-5</sup> Measuring joint angles, using manual goniometry, is the traditional and validated method used to detect postural misalignment in clinical settings.<sup>6</sup> It involves physically measuring the angle created by two body segments, using a plastic goniometer. The method is easy, quick, and cost-effective, but is practitioner dependent. Radiographic and digital camera imaging were developed to eradicate the variance in manual goniometry testing among practitioners.

Radiographic imagery uses X-rays and/or gamma rays to examine the internal structure (skeletal alignment) to identify any flaws, defects and/or misalignment, thereby limiting measurement variance among practitioners. However, radiographic imagery is expensive and time consuming, and requires sophisticated equipment and trained practitioners. A practical limitation is the need for continuous supply of electricity, which can be a challenge in rural communities.

There is, thus, need for a cheap, reliable clinical postural goniometry screening tool that can be used in rural African communities. Camera imagery is a pragmatic method of assessing joint angles and has the benefit of being able to review the picture to determine the accuracy of the measurements. Smartphone technology allows for 1) the immediate analysis and transmission of primary digital imagery, 2) the digital imagery to be reviewed by an independent expert distant from the site, and 3) the subsequent confirmation of postural misalignments and prescription of therapeutic rehabilitation, where required. However, while the reliability of smartphone technology has been tested in controlled clinical environments,<sup>7,8</sup> it has not been tested in a non-clinical field setting.

The aim of this study was to compare reliability of smartphone goniometry technology with the manual goniometry method among female South African youth, when loading and unloading head loads.

## METHODS

This was an observational randomised control study, involving a pre-test post-test crossover. The participants were randomly disseminated into the experimental (n = 50) and control (n = 50) groups by their personal selection of different-coloured balls from a hat, as described previously.<sup>9,10</sup> Thereafter, the control group crossed over into the experimental group and vice versa. This allowed both groups to be subjected to the same intervention,

which was carrying their normal habitual head loads (Figure 1). The control group stood in the unloaded phase without a head load, while the experimental group carried the head load. The required sample size of 100 was calculated using the Cochran formula.

Head loads and body mass were measured using an electronic scale. Demographic data recorded were age, body mass, and height; biomechanical angles were measured on the right side of the body.

Three biomechanical angles, viz. the craniovertebral angle (CVA), the craniohorizontal angle (CHA), and the standing pelvic angle (SPA), which measures anterior pelvic tilt, were measured using manual goniometry and smartphone goniometry application technology (Huawei P30, smartphone application: Angulus). The smartphone was mounted onto a tripod 3 m away from the participant. The angles were measured in a private room by two female biokineticists in the presence of the participants' parents or guardians.

**Manual goniometry biomechanical angles**

The CVA and CHA were measured according to a protocol described by Chueng Lau et al. (2009)<sup>11</sup> (Figure 2). This required the tester to place the goniometer over the seventh cervical vertebra, aligning the stationary arm parallel to the ground, while the mobile arm was placed on the tragus of the right ear.<sup>11</sup> The CVA indicates the anterior translation of the cervical vertebrae in relation to the thorax. The CHA was measured by placing the centre of the goniometer on the tragus of the ear, with the stationary arm parallel to the ground, while the mobile arm was placed on the external canthus of the right eye (Figure 2).<sup>11</sup> The CHA indicates translation of the head to the cervical vertebrae in the sagittal plane. The SPA was measured according to a protocol described by Kim et al. (2009).<sup>12</sup>

**Smartphone goniometry biomechanical angles**

Using the smartphone application, the three angles were measured according to the same protocols used for the manual goniometry. Relevant anatomical sites were marked with small, coloured stickers, which served as points to which the smartphone goniometer was digitally aligned. The smartphone photographed the person's static posture, after which the smartphone goniometer was digitally placed on the picture and aligned with the anatomical reference points to measure the respective angles.

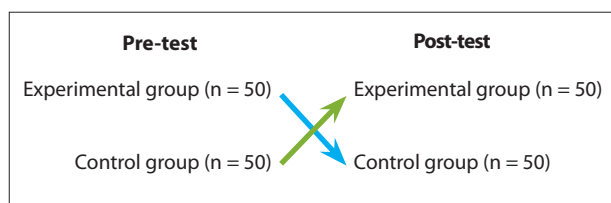
Ethical approval was secured from the Tshwane University of Technology (REC2020-12-001). iLembe Royal ethical consent was granted prior to the commencement of data collection. All participants habitually carried head loads and resided in the Glendale region of iLembe district in KwaZulu-Natal province.

**Data analysis**

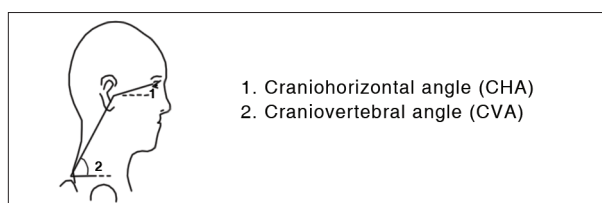
Descriptive analyses included calculating means, standard deviations, and percentage changes in the three angles. Intra-class correlations were used to determine reliability of the smartphone goniometry technology compared to the manual goniometry. Paired t-tests determined if there were significant differences between the smartphone goniometry and manual goniometry measurements. Significance was set at 95%.

**RESULTS**

Young women aged nine to 17 years (mean 12.3 ± 2.5 years) voluntarily participated in the study. The mean body mass of the study participants was 44.5 ± 13.7 kg, mean height was 1.45 ± 0.1 m, and mean head load was 8.0 ± 2.5 kg (17.9% of the participants' mean body mass). The inter-rater reliability between smartphone goniometry technology and manual goniometry measurements was high for all measured angles (ICC = 0.99, Table 1). There were no statistically significant differences between the mean biomechanical angles in the head-loaded and unloaded phases when comparing smartphone goniometry and manual goniometry measurements (Table 1).



**Figure 1. The observational randomised pre-test post-test crossover design of the study**



**Figure 2. Depiction of craniohorizontal and craniovertebral angles**

**Table 1. Inter-rata reliability of manual versus smart phone goniometry**

Measured angle (°)	Manual goniometry	Smart phone application	ICC	p value*
	mean ± SD	mean ± SD		
Unloaded CVA	13.730 ± 5.3	13.857 ± 5.2	0.99	0.482
Unloaded CHA	51.960 ± 6.9	52.142 ± 6.8	0.99	1.000
Unloaded SPA	17.950 ± 7.7	17.989 ± 7.8	0.99	0.740
Loaded CVA	19.430 ± 5.8	19.602 ± 5.6	0.99	0.095
Loaded CHA	54.540 ± 6.6	54.775 ± 6.4	0.99	0.842
Loaded SPA	20.520 ± 7.9	20.581 ± 8.0	0.99	0.469

\*Paired t-test

## DISCUSSION

This study was part of a larger research project that investigated the biomechanical and electromyographical impact of cranial loading portage among children residing in the Glendale region (iLembe district) of KwaZulu-Natal province.<sup>9,10</sup>

Altered cervical angles, kyphosis, lordosis, and anterior pelvic tilts are postural screening elements that occupational therapists, physiotherapists, athletic trainers, and biokineticists routinely perform to identify serial distortion of the vertebral column in the sagittal plane.<sup>6,13</sup> The use of smartphone technology to capture and analyse postural screening results among international therapeutic rehabilitation specialists is growing.

This study is the first to compare manual goniometry with smartphone goniometry technology among participants in a rural non-clinical setting in South Africa. There was strong reliability between the manual and smartphone goniometry technology measurements, supporting findings from previous studies that were conducted in clinical settings.<sup>7,8</sup> Boland et al. (2016)<sup>7</sup> and Szucs and Brown (2018)<sup>8</sup> both reported high ICCs (0.71 and 0.81, respectively), although they were lower than those reported in our study. Boland et al. (2016) reviewed the inter- and intra-rater reliability of static posture analysis using a mobile phone application in a clinical controlled setting, with a small sample size of 10 participants (a major criticism of the study).<sup>7</sup> They reported strong intra- and inter-rater reliability between static postural analyses and mobile phone application.<sup>7</sup> Similarly, Szucs and Brown (2018) reported strong inter-rater reliability between smartphone goniometry and manual goniometry when assessing posture in a small sample of 20 participants, in a controlled clinical setting.<sup>8</sup>

The sample size in our study was 10 times larger than that in the Boland et al. study and five times larger than that in the Szucs and Brown study.<sup>7,8</sup> Small sample size reduces external validity, while larger sample size reduces the margin of error. Most statisticians agree that the minimum sample size to get a meaningful result is 100.<sup>14</sup> In randomised control trials involving experimental and control groups, it is recommended that a minimum of 30 participants be in each group. Our study met both criteria.

It is important to note that different smartphone brands and models, in combination with the various mobile phone goniometry applications, may lead to different results/findings. Therefore, different smartphone applications software should be validated and tested for reliability.

## Recommendations

The reliability of smartphone goniometry technology should be tested as a diagnostic tool in the field. We assessed the reliability of static smartphone goniometry technology. A study using smartphone dynamic goniometry technology is needed to determine the reliability of porters' gait measurements, compared to biomechanical software such as Dart Fish and/or Quantarsalis. These biomechanical software tools generally require a clinical setting to identify biomechanical gait deviation. The application software is, however, very expensive and not conducive to field-work experimentation. Smartphone dynamic goniometry technology may be a cheaper and reliable alternative.

## CONCLUSION

Our experimental study showed that smartphone goniometry technology is a pragmatic, user-friendly, and reliable tool to measure sagittal plane static posture. Most practitioners have smartphones and

the goniometry application is free, reducing the cost of assessing posture. Smartphone goniometry technology is a reliable method for assessing changes in the sagittal plane or postural misalignment among rural South African youth who habitually head-load. Expensive radiographic equipment is scarce in rural communities. The use of smartphone technology will improve the quality of diagnostic and rehabilitation services in rural communities and potentially improve quality of life.

## KEY MESSAGES

1. Smartphone goniometry technology is a reliable tool for measuring static sagittal posture.
2. Smartphone goniometry is an affordable tool that can be used in non-clinical rural settings.

## DECLARATION

The authors declare that this is their own work; all the sources used in this paper have been duly acknowledged and there are no conflicts of interest.

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None received.

## AUTHOR CONTRIBUTIONS

Conception and design of the study: MK, TJE

Data acquisition: MK, TJE, YP

Data analysis: MK, TJE

Interpretation of the data: MK, TJE

Drafting of the paper: MK, TJE, YP

Critical revision of the paper: TJE, MK, YP

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# Regional quest to implement an occupational safety and health information system continues

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## INTRODUCTION

Since the inception of the Southern Africa Tuberculosis and Health Systems Support (SATBHSS) project, implementing countries have been exploring means to strengthen the occupational safety and health (OSH) information system. However, this endeavour has met with a number of challenges, such as limited open-source platforms and finding an OSH-specific tool that is available for use for the public good. One of the tools investigated and still on the radar is the occupational health and safety information system (OHAIS), administered by the National Institute for Occupational Health (NIOH) in South Africa.<sup>1</sup> The project is now investigating the viability of a second health management information system (HMIS) tool developed by the University of Oslo, Norway, called the District Health Information Software 2 (DHIS2) platform. This is the world's largest open-source HMIS available for the public good, and is currently deployed in more than 100 countries globally, including 73 in low- and middle-income countries (LMICs). One of the key advantages of the platform is data ownership, which has been a challenge for many HMIS platforms, as member states would like to have full control of their data.<sup>2,3</sup> The Health Information Systems Program (HISP) at the University of Oslo is the developer of the software. They have had several chapters in almost all regions on the African continent, and in countries such as Tanzania and Mozambique.

Due to the unavailability of adequate public open-source OSH information systems on the continent, the project-implementing countries resolved to adapt the DHIS2 platform and develop a freely available comprehensive OSH information system to cater to the needs of their ministries of health, labour, and mines. At a regional level, the system would be of great benefit to various African Union (AU) organisations and member states in terms of providing up-to-date OSH information for policy formulation and decision making.

To get the process moving, AUDA-NEPAD convened a stakeholders' workshop at the Urban Hotel Ndola in Zambia. The stakeholders comprised information technology (IT) and OSH experts from the SATBHSS-implementing countries, as well as DHIS2 experts from the Universities of Zambia and Oslo, including HISP centres. The countries elected the DHIS2 platform on the basis that they are already using the system – mostly in the ministries of health – and possess a sound knowledge of use and expertise to implement the system. Project countries have comprehensive data governance processes in place. Over the years, the platform has seen the development and inclusion of various modules, including the recent COVID-19 vaccination module. Therefore, the idea is to develop the OSH modules, linking the three ministries (health, mines and labour). At a later stage, more ministries will be added, depending on the member states' OSH implementation arrangements.

## AIM

The aim of the workshop was to define, discuss and agree on the African Union-Occupational Safety and Health Information System (AU-OSHS) using the DHIS2 tool.

## OBJECTIVES

The objectives of the workshop were:

- To clarify roles and responsibilities, including reporting and communication mechanisms, of all participating partners in the project
- To map out the available IT and infrastructure, and recommend additional required equipment
- To outline the necessary human resource and financial resource requirements for the smooth implementation of the project
- To develop and agree on the project implementation plan and the establishment of a governance structure, including finalisation of operational agreements
- To develop detailed functional and non-functional requirements and technical specification documents for implementing the (AU-OSHS) system
- To agree on the business and operational requirements, and provide a way forward

## OUTCOMES AND RESOLUTIONS

Most of the workshop objectives were met. To gain an in-depth understanding of the current OSH business environment, the team travelled to the Occupational Health and Safety Institute (OHSI) and Mine Safety Department (MSD) premises in Kitwe, Zambia. The team was walked through all the processes involved in occupational medical surveillance at the Institute, while the MSD Director emphasised the critical need to have the information system operationalised.

A demonstration of the DHIS2 platform was provided by representatives from HISP Mozambique and the University of Oslo. The general feedback from stakeholders was that the platform is rich with relevant features, and that its customisation to meet their needs would be highly beneficial.

The draft work plan was developed, and the key software development activities were planned to take place from November 2022 to April 2023, while testing and deployment would be implemented in the latter half of 2023. The system's modules were discussed at length and the team identified key modules to be prioritised. The lowest hanging fruit was the profiling module, which covers registration of companies, commodities, workforces, and other similar issues in the system. Second were the workplace assessment and employee health modules, while the incident reporting and investigation modules were identified as the third priority. The remaining

**Table 1. Draft AU-OSHS business processes summary for Zambia**

Ministry	Institution	Service	Sub-service	Description		
Labour	Occupational Health and Safety Institute (OHSI)	Occupational hygiene	Risk assessments, workplace inspections	<ul style="list-style-type: none"> <li>• Workplace risk assessments to determine exposures and appropriate medical examinations</li> <li>• Workplace inspections to determine compliance with exposure limits</li> </ul>		
			Billing	<ul style="list-style-type: none"> <li>• Payment for appointments</li> <li>• Amount varies according to client and exam type (e.g. initial, periodical, discharge, village benefits)</li> <li>• Applies to individual/corporate clients</li> </ul>		
		Medical surveillance	Registrations/bookings	<ul style="list-style-type: none"> <li>• General office: receipt/listing presented for confirmation of appointment date</li> <li>• Booking slip generated showing appointment date, medical examinations required, and stages to be followed</li> </ul>		
			Radiology	<ul style="list-style-type: none"> <li>• Acquisition of chest X-ray images for reading/classification</li> </ul>		
		Nursing	Laboratory	Nursing	<ul style="list-style-type: none"> <li>• Anthropometric measurements</li> <li>• Recording of medical, family, socio-economic, and occupational histories for clients</li> <li>• Recording of vital signs and vision records</li> <li>• HIV counselling and testing</li> </ul>	
				Laboratory	<ul style="list-style-type: none"> <li>• Physiological: spirometry, vision screening, audiometry, ECG</li> <li>• Microbiology: sputum (FM microscopy, GeneXpert)</li> <li>• Parasitology: urinalysis, stool microscopy, malaria-RDT, MPS slide, occult blood</li> <li>• Serology: HIV, <i>Salmonella typhi</i>, hepatitis A, B (HBsAg), C (HCV), syphilis (VDRL test), gravindex, prostate specific antigen (PSA), cryptococcal antigen (CAT), ABO blood grouping, rheumatoid factor (RF), clotting time</li> <li>• Haematology: full blood count (FBC), haemoglobin (HB)</li> <li>• Biochemistry: liver function test (LFT), kidney function test (KFT), lipid profile, uric acid, electrolytes, blood sugar, creatinine kinase</li> <li>• Toxicology: mineral blood levels</li> <li>• Hygiene: XRD (chemical hazard analysis)</li> </ul>	
		Clinical	Medical panel	Clinical	<ul style="list-style-type: none"> <li>• Clinical examinations: mining (ordinary, confined space, heights, professional drivers); non-mining: (divers, comprehensive check, agriculture, food handlers, ordinary wellness)</li> </ul>	
				Medical panel	<ul style="list-style-type: none"> <li>• Constitute panel of occupational doctors/radiologists to read chest X-rays and make certification decisions based on medical examination results</li> </ul>	
		Results	Claims	Safety	Results	<ul style="list-style-type: none"> <li>• Printing of results for clients</li> <li>• Making referrals to hospitals for treatment</li> <li>• Making referrals to WCFCB for compensation</li> </ul>
					Health	<ul style="list-style-type: none"> <li>• Fatal accident claims</li> <li>• Medical expense claims</li> </ul>
		Workers Compensation Fund Control Board (WCFCB)	Inspections	Ex-mine workers	Ex-mine workers	<ul style="list-style-type: none"> <li>• Transport and upkeep claims</li> </ul>
					Baseline inspection	Baseline inspection
		Routine inspections	Self-inspections and reports	Accident reports		Routine inspections
					Self-inspections and reports	
Occupational Safety and Health Services Department (OSHSD)	Occupational hygiene	Enforcement of occupational safety and health legislation	Safety	<ul style="list-style-type: none"> <li>• Reports for fatal/non-fatal, fall of ground/seismological accidents</li> </ul>		
			Health			
Occupational Safety and Health Services Department (OSHSD)	Mechanical and electrical engineering	Enforce occupational safety and health legislation	Enforcement of occupational safety and health legislation	<ul style="list-style-type: none"> <li>• Inspections</li> <li>• Investigation of occupational incidents and accidents</li> </ul>		
			Risk assessments	<ul style="list-style-type: none"> <li>• Inspections</li> <li>• Examine and test pressure vessels (steam boilers, steam receivers, and air receivers)</li> <li>• Examine and test lifting equipment in buildings, factories, and at construction sites</li> </ul>		
Occupational Safety and Health Services Department (OSHSD)	Construction and civil engineering works	Enforce occupational safety and health legislation	Enforce occupational safety and health legislation	<ul style="list-style-type: none"> <li>• Inspections</li> <li>• investigation of occupational incidents and accidents</li> <li>• Review of factory drawings on safe design, etc.</li> </ul>		
			Risk assessments			
Mines	Mine Safety Department	Explosives	Incidents reports	<ul style="list-style-type: none"> <li>• Inspections, investigations, and audits pertaining to various aspects of the mining environment</li> </ul>		
			Inspections			
			Investigations			
			Audits			
			Machinery		Incident reports	
					Inspections	
		Environment	Inspections			
			Investigations			
		Mines	Incident reports			
			Inspections			
		Mines	Investigations			
			Audits			

modules will be developed later. The available human resources and IT infrastructure for each implementing institution were also assessed. The only issue that remained unresolved was whether the implementation of the system would be by way of institutional instances as opposed to one-country instance.

In the proposed system, industries will be classified according to industry (mining and non-mining), geographical area (provinces, districts, and sub-districts), commodity (copper, gold, platinum, etc.), size (artisanal and small-scale mining (ASM), small, medium, and large), population/workforce (total number of workers, permanent, temporary, seasonal/vocational), sex (male/female), nationality (local or immigrant), and occupation (using occupation/activity coding systems), etc. The development process should be prioritised through consideration of the most urgently needed modules and the lowest hanging fruits in order to develop a tool that will be used for further resource mobilisation. Identification and training of the technical working group (TWG) on the fundamentals of DHIS2 will be undertaken, followed by technical training on the development process and needs. This will be followed by the training of implementation developers who will form part of the OHS DHIS2 academy, based in Zambia and supported by the University of Zambia (UNZA) through the Centre of Excellence in Occupational Health and Safety (CoE-OHS). Implementing partners, viz. Occupational Health and Safety Institute (OHSI), Occupational Safety and Health Service Department (OSHSD), Mine Safety Department (MSD), and Workers' Compensation Fund Control Board (WCFCB) will submit a list of Zambia's mining company names. A draft business analysis or process summary was developed (see Table 1).

## CONCLUSION

Development and implementation of open-source web or cloud-based government-owned occupational safety and health information systems is long overdue. Availability of such a system will provide member states, regional economic communities, and the continent with information regarding real-time workplace incidents, accidents, and diseases statistics. The data will influence and promote accident and incident prevention, influence behaviour, act as a learning- and best practices-sharing platform, provide instant information to regulatory authorities, and inform and influence policy.

## ACKNOWLEDGEMENTS

The World Bank funds the SATBHSS project: P155658 and P173228. For more information, visit [www.satbhss.org](http://www.satbhss.org) and [www.nepad.org](http://www.nepad.org). AUDA-NEPAD acknowledges the member states, University of Oslo, University of Zambia, HISP Mozambique, and Tanzania for their invaluable contributions.

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The logo for the British Occupational Hygiene Society (BOHS) features the letters 'BOHS' in a bold, blue, sans-serif font. The letter 'O' is stylized with a white circle inside it.

British Occupational  
Hygiene Society



**IOHA**



OCCUPATIONAL  
HYGIENE SOCIETY  
OF IRELAND

# 13th IOHA International Scientific Conference

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Dublin, Ireland  
June 2024

The Occupational Hygiene Society of Ireland (OHSI) and the British Occupational Hygiene Society (BOHS) are privileged to jointly host this conference and to contribute to its successful outcome.

The conference theme has been confirmed as - 'Protecting workers from health hazards: Advancing in this changing world'.

The conference aims to promote occupational hygiene and worker health protection by the minimisation of worker exposure to hazardous agents globally through plenary sessions, keynote lectures, parallel talks, workshops, poster presentations and

professional development as well as networking opportunities and social functions.

A strong Global media campaign will publicise the main causes of occupational disease throughout the conference.

More information including venue, dates and abstract submission arrangements will be announced very soon. Please mark your diaries for June 2024 in Dublin, Ireland!

Edited by **Dr Thomas P Fuller**: IOHA Past President  
e-mail: [tpfuller1@gmail.com](mailto:tpfuller1@gmail.com)

# Application of virtual gamification in the training of workers in health and safety at work in Guatemala, El Salvador and Nicaragua

**Edgar Armando Car Chigüichón**

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## Introduction

In the field of occupational health and safety (OHS), many control measures that are implemented to improve worker health and safety must be supported by administrative measures, induction programmes, training, information, and/or education. Since the start of the COVID-19 pandemic in 2020, social distancing, short interactions between people, and avoidance of meetings in poorly ventilated spaces were promoted to reduce risk of exposure to the virus. This introduced a need to innovate teaching/learning techniques aimed at workers, moving from face-to-face to virtual teaching platforms. During the Pandemic, OHS managers needed to consider the latest job trends: 1) work was done via the internet, 2) training became digital, 3) most of the attention, in the user's experience, was focused on the virtual, and 4) there was a video revolution in micro-learning and online gaming. Therefore, the implementation of digital gamification platforms was developed as a means to set a new trend of success in virtual training sessions in place of face-to-face training.

## Gamification

Gamification is a learning technique that uses game mechanics in the educational-professional field to achieve better results – to absorb better knowledge, improve skills, or reward specific actions, among other goals.<sup>1</sup> The global trend of gamification applied at work shows that:

- 83% of workers feel more motivated when training is gamified
- 90% of workers feel more productive when using gamification
- 97% of workers older than 45 years consider that gamified activities improve the quality of their work
- 89% of workers say that gamified tasks make them more competitive

## Ludification

Ludification is the concept that, when applying virtual gamification, it is essential to conduct the activities in a playful way.<sup>2</sup> Using special techniques, the game's own dynamic and elements, and leisure in recreational activities with the goal to enhance motivation, as well as to reinforce behaviour to problem-solve, can: improve productivity, help develop and clarify goals, and activate learning. When in a virtual session, one must entertain the audience to keep its attention.

## Andragogy

Andragogy is the practice of teaching adult learners. As OSH training targets adults, it must adopt teaching techniques aimed at educating adults.<sup>3</sup> Active, experiential learning based on collaboration, cooperation, and competition is important.

## Application of virtual gamification

In virtual training, workers have various levels of knowledge about the use of digital devices, are of different ages, and have different cultures, customs, and professions or occupations. A company needs to create a gamification culture to unify these factors. Combining virtual gamification, ludification, and andragogy positively influences the training of workers in OSH.

In April 2020, this method began to be applied in some companies in Guatemala in Central America. Initial indicators showed less than 40% attendance and participation by workers. Adapting to change is not easy. By December 2021, progress with this innovation had improved, and virtual platforms were applied in companies in Guatemala, El Salvador, and Nicaragua. Surveys conducted after the sessions showed:

- > 90% attendance and participation
- > 97% satisfaction in the application of virtual gamified platforms
- > 95% of workers enjoyed competitive virtual gamified tasks

Introducing and innovating virtual training methods results in challenges, difficulties, and adversities. The following advice can help achieve the innovation and produce positive teaching and learning outcomes:

1. Academic competence and periodic training in gamification platform application updates should be sought; this field is evolving rapidly.
2. Prevention starts with top management. Involving the employer in the gamification application should be the first goal. Management must experience the use of the tool.
3. Start with the application of practical and easy-to-use digital platforms. Workers should learn gamification from the OSH instructor. When the workers gain confidence and experience, they can use complex platforms.
4. Find the platform that best suits the target group of workers. Sometimes, the use of a platform does not achieve the expected success.
5. Personalise the training session with the company's identity and with the OHS topic to be taught.
6. Many platforms allow one to analyse the results obtained after the execution, which is useful for continuous improvement in the application and measuring of indicators.
7. Limit sessions to 45 minutes; set session goals and focus directly on them.
8. The instructor should have fun and enjoy the application being used.

## GLOBAL EXPOSURE MANAGER

It is not easy to achieve a culture of occupational risk prevention but, with this type of innovation, significant advances will surely be made in OSH management.

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# AIHA Emerging Economies Microgrant Programme

### Lawrence Sloan

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The American Industrial Hygiene Association (AIHA) prides itself on having a robust community of volunteers, altruistically minded and focused on helping communities worldwide to achieve worker health, safety, and wellbeing. In 2018, the AIHA Board of Directors formally requested that the AIHA International Affairs Committee form an Emerging Economies Microgrant Programme subcommittee. Its purpose is to provide a fair, structured, transparent, and consistent mechanism for funding education and research projects that promote occupational hygiene in economically developing nations. Reflective of the Association's vision, the AIHA Microgrants Programme promotes global occupational hygiene awareness and capacity to reduce the risk of injury, illness, and fatality to workers in nations with limited resources.

The importance of the Microgrant Programme reflects part of the [AIHA 2022–24 Strategic Plan](#) under the domain of Advancement and Dissemination of Knowledge. Earlier this year, the AIHA Board approved elevating the subcommittee to the status of a national-level advisory group, namely the [Emerging Economies Microgrant Advisory Group](#). This move ensures that there are no conflicts of interest amongst those reviewing funding proposals. The advisory group structure also helps provide better stability and means to track the organisational history of the programme, which is not done for a subcommittee.

The AIHA will soon announce the [open call](#) for microgrant applications. Occupational hygiene non-profit organisations from developing countries are encouraged to submit educational and research project proposals. The advisory group will review the submissions and recommend allocating funds according to various criteria, which include:

- Organisation eligibility: a preference for projects led by non-profit entities, such as charities, and non-government, academic, and philanthropic organisations. Corporations and individuals are not excluded from applying, but the benefits to the project recipients should outweigh the benefits to the individual or the company providing the services.
- A stand-alone project, addressing primary prevention, consistent with the AIHA's mission and strategic priorities. The project promotes occupational hygiene through education, research, training, and development.
- The proposed project potentially advances the development and promotion of the occupational hygiene profession. It supports



research and development efforts to solve occupational health problems and improve working conditions/environments. Capacity building is evident through education, research, training, and outreach.

- The project addresses known or potential worker health issues. It demonstrates research on hazardous workplace exposures, outcomes, and emerging problems of control methods to minimise associated workplace risks. It may address any emerging or ongoing occupational health and safety concerns.
- The support requested does not exceed US\$3 500. The project can achieve its goals with smaller overall budgets and still significantly impact regions of greatest need.
- The needs to make the project viable and successful are adequately described. The project is likely to achieve its stated objectives within the required project timeframe limits (one year from receiving funding).
- Sources of proposal support, technical assistance, and collaboration are described. The proposal illustrates how the project may fit into a larger picture of regional or host country development through other support and organisations.
- An ability to improve public and environmental health, and achieve results must be demonstrated. Feasibility and practicality must be evident. A project submission or sponsoring organisation can show past experience and success in goal-oriented tasks through prior AIHA microgrant programmes or other means.

Looking ahead, the advisory group intends to create a permanent fund to finance a greater number of projects over time. Individuals and companies are encouraged to contribute; they will be recognised on the microgrants webpage.

The AIHA is pleased to provide a funding mechanism that helps further awareness and provide critical training and research where needed most – to create healthier workplaces, worldwide. Please direct questions about this initiative to AIHA staff member, Gouhar Nayeem [gnayneem@aiha.org](mailto:gnayneem@aiha.org).

# Employers' liability for sexual harassment in the workplace

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With the Code of Good Practice on the Prevention and Elimination of Harassment in the Workplace published earlier this year, harassment in the workplace is the subject of many training sessions, both on the shop floor and in boardrooms. The importance of this education cannot be overstated given how prevalent harassment is in our country, particularly sexual harassment.

On 10 November 2022, the Labour Appeal Court in Qheberha handed down the judgment *Amathole District Municipality v CCMA* in which the Court clarified the principles of dealing with cases of alleged sexual harassment in the workplace by an employer.

## Background

The complainant alleged that she was sexually harassed by her manager with whom she shared an office. She alleged that her manager subjected her to multiple acts of sexual harassment, including a request that she perform oral sex on him. The complainant said she did not resist because she feared dismissal as her manager was senior and had authority over her. The manager denied the allegations and said the conduct was consensual.

The complainant informed her boyfriend of this harassment, and he advised her to report the matter, failing which he would do so. The complainant reported the matter to a shop steward, who referred the complainant to the Human Resources Department (HR).

After the alleged sexual harassment ceased, the complainant lodged a grievance with HR. Around the same time, the complainant was subject to negative reports from her manager relating to her work performance.

The grievance outcome was that no sexual harassment had occurred.

## CCMA and the Labour Court

The complainant referred an unfair discrimination case in terms of the Employment Equity Act to the CCMA and claimed compensation for the unfair discrimination. The CCMA found that the complainant had indeed been subjected to sexual harassment and that there was no reason to believe that the complainant had fabricated the allegations. The CCMA found that the evidence of the shop steward corroborated that of the complainant, whilst the manager's evidence was rejected as flimsy and unbelievable.

Moreover, the manager's documentary evidence was rejected as selective and unauthenticated. Consequently, the employer was found to have failed to protect the complainant and was held liable to pay the complainant ZAR150 000 as compensation.

The Labour Court dismissed the employer's appeal on the basis that it could not find anything impugnable with the award and that, as a court of appeal, it lacked the ability to judge the credibility of witnesses.

## Labour Appeal Court

From the record of the CCMA hearing, the Labour Appeal Court (LAC) found that the complainant was not truthful and had given contradictory testimony. At the CCMA, the complainant testified that her manager had asked her for oral sex, which she refused, and that she felt disgusted by the suggestion.

However, under cross-examination it was put to her that she had admitted that she performed the oral sex. The complainant denied this, and audio evidence was played to prove it. The uncontested evidence of the Grievance Chair corroborated this.

The LAC also found that the veracity of the complainant's evidence tainted her credibility in that, during the period she was allegedly sexually harassed, she was sending flirtatious messages to her manager. Particularly, the court held that a message sent by the complainant to her manager on 24 March 2015 that *"U know what I am hungry for u now serious sweetie, what's ur plan today"* was irreconcilable with harassment and not indicative of unwelcome conduct.

The LAC upheld the appeal and held that the CCMA erred in excluding the documentary evidence as its authenticity was never in question. Moreover, the LAC held that the Labour Court erred in saying that it was not best placed to interfere with the credibility findings of the CCMA, given the glaring contradictions on the record. The LAC further held that, in order for liability to arise for an employer, the act of harassment must be immediately reported to the employer and the employer must have failed to take steps to protect the employee.

## Why is this case important?

This judgment crystallises three important principles, which are important for employers to bear in mind.

First, the credibility of evidence regarding the alleged sexual harassment must be proven on a balance of probabilities and not simply be taken for granted (as happened in this case). Second, the credibility of witnesses must be carefully assessed. In this regard, their demeanour is important but so too is other evidence regarding the surrounding circumstances. Third, the employer's liability for damages or compensation flowing from sexual harassment in the workplace is not automatic. It has to be established that the employee reported the alleged harassment and that the employer failed to take steps to protect the employee from such harassment for liability to occur.

# Rensair launches a smarter solution for indoor air pollution

## Amtronix

e-mail: [info@amtronix.co.za](mailto:info@amtronix.co.za)

[www.amtronix.co.za](http://www.amtronix.co.za)

Indoor Air Quality specialist **Rensair** has launched an affordable, WiFi-connected air purifier for smaller indoor spaces. Lightweight (21 lbs) with heavyweight performance (clean air delivery rate of 270 CFM), the **Compact** is ideal for small and medium-sized companies, conference rooms, doctor and dental surgeries, classrooms, and homes.

Leveraging Rensair's proven, hospital-grade technology, the Compact combines high-efficiency particulate absorbing (HEPA) filtration with germicidal UVC light in a smaller, quieter package. It is highly effective in removing a minimum of 99.97%+ of pathogens and other forms of airborne particulate matter, including bacteria, pollen, dust, and mould. Five airflow speeds offer maximum flexibility, while 360-degree outflow ensures that clean air penetrates the entire room no matter where the unit is placed.

*"Compact is our light heavyweight champion",* said Frederik Hendriksen, co-founder and US chief executive at Rensair. *"It's robust and packs a punch, with clean air delivery that belies its size. It's also nimble and stealthy, easily manoeuvrable and operating at just 32 dBA on the lowest setting. Future IoT upgrades will add agility, making it an even more powerful contender in the competitive air purifier market."*

Using a smart app, multiple Compact devices can be programmed to automatically adjust the fan setting according to prevailing particle concentrations, switch to the maximum setting between scheduled meetings, or start/stop working based on location and time. Real-time alerts can be set to manage maintenance schedules and to reset the filter monitor after the filter has been replaced.

*"The air purification market is unregulated and, as a result, is rife with performance overclaims",* said Matthew Johnson, Professor of Atmospheric Chemistry at the University of Copenhagen, and Chief Scientific Advisor at Rensair. *"That's why it's important to have independent certification. The Danish Technological Institute's tests on Compact resulted in 99.99% of particles removed from a 700 ft<sup>3</sup> room within 30 minutes."*

Rensair's range of air purifiers now extends from the mighty Max, a bespoke industrial unit capable of 590 CFM, to the miniature AirBubbl for vehicle occupants and personal spaces. Having completed a US\$7m



## Rensair's Compact air purifier for small spaces

Photograph: courtesy of Amtronix

Series A financing round in May, the company is intent on establishing clean air as a human right, protecting and enhancing lives through proven clean air technology. Key markets include offices, healthcare, nursing homes, schools, and transport.

# News from the SASOM National Office

**Claudina Nogueira:** Occupational health consultant/project manager, University of Pretoria, South Africa; SASOM ExCo member; ICOH Vice President: Scientific Committees (2018–2024); WHWB Board member

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## SASOM Annual Congress 2022: a virtual event in four sessions

The last session of the Annual Congress of the South African Society of Occupational Medicine (SASOM) was held, virtually, on 28 October 2022. The sub-theme and presentations are listed below:

Session 4 – ‘Updates on occupational health and medicine: Workplace legislation, ethics, and compensation’

- Dr Jonathan Davy (Rhodes University, South Africa) –

‘Understanding the health and safety effects of shift work: A case for adopting a systems approach’

- Dr Tim Laurens (Expert Lab Services (ELS), South Africa) – ‘Policy guidelines for drugs and alcohol regulation and testing in workers: A combination of ethics, law, and medical science’

- Dr Paul Schulte (Advanced Technologies and Laboratories International, Inc., USA and International Commission on Occupational Health (ICOH) Board member – ‘Furthering the occupational safety and health field to promote decent work’

Statistics, regarding participants for Sessions 3 and 4, are shown in Table 1.

**Table 1. Registrations, participants, and countries represented at Sessions 3 and 4 of the SASOM Annual Congress 2022**

No. registrations	No. participants (attendance rate)	Countries represented by participants and presenters
<i>Session 3 – Updates on ergonomics, musculoskeletal disorders, and psychosocial factors at work, 16 September 2022</i>		
113	81 (71%)	Australia, Belgium, Botswana, Kuwait, Mozambique, Namibia, Portugal, South Africa, The Netherlands, United Kingdom, United States, Zimbabwe
<i>Session 4 – Updates on occupational health and medicine: Workplace legislation, ethics, and compensation, 28 October 2022</i>		
127	79 (62%)	Afghanistan, Algeria, Botswana, Germany, Mozambique, Namibia, South Africa, United Kingdom, United States, Zambia, Zimbabwe

## SASOM annual general meeting – November 2022

The SASOM annual general meeting (AGM) was held in a fully virtual format on Friday, 25 November 2022. Feedback on the AGM will be published in the SASOM pages of the first issue of *Occupational Health Southern Africa* in 2023.

## NEWS FROM THE GLOBAL OCCUPATIONAL HEALTH ARENA

### ‘Ten Principles for Access to Multi-Disease Molecular Diagnostics’: a global call to action

In August 2022, the Treatment Action Group (TAG) and *Médecins Sans Frontières* (MSF) Access Campaign launched the ‘Ten Principles for Access to Multi-disease Molecular Diagnostics’,<sup>1</sup> which are intended to help governments, donors, and global health actors to work together to navigate the complex process of improving global, regional, and national systems for the procurement and implementation of essential molecular diagnostic tests. The Access Principles recognise that all people at risk of infectious diseases (e.g. TB, HIV, viral hepatitis, HPV, other STIs, and COVID-19) have a right to quality healthcare and diagnostic testing in accordance with World Health Organization (WHO) recommendations. The Access Principles articulate approaches and standards that governments, donors, and global health actors can collaboratively apply to promote competition, increase efficiency, reduce costs, improve the terms and provision of service and maintenance, and put in place measures to ensure that pricing of molecular diagnostics is transparent, fair, equitable, and based on evidence.

These Access Principles are based on discussions held between country programme representatives, donors, members of civil society, and global health actors at the ‘Roundtable on Access to Multi-disease Molecular Diagnostics’,<sup>2</sup> hosted by TAG and MSF on 2 June 2022, and attended by more than 100 participants.

### Kenya – first African winner of Global Healthy Workplaces

The Global Centre for Healthy Workplaces (GCHW) supports the advancement of workplace health and wellbeing through a series of initiatives designed to enhance shared learning, recognition, and replication. The GCHW seeks to create a healthier and more productive working experience for all employers and employees, irrespective of their size, location or circumstances. The 10th Global Healthy Workplace Summit was held, virtually, on 8 and 9 November 2022.

For its demonstrated policies, systems, structures, initiatives, and programmes that have been put in place over the years, Kenya’s African Population and Health Research Center (APHRC) won the Small and Medium Enterprises (SME) Global Healthy Workplace Award – the first African winner in any category during the 10 years of the prestigious awards programme. Wellness is a core element of the organisational culture, which places emphasis on work-life balance and attention to physical and mental health to ensure work practices that sustain a healthy workforce. Numerous wellness initiatives and programmes have been rolled out over the years and these are subject to continuous improvement to address the dynamic nature of wellness challenges and the needs of employees.

Electricity of Portugal (EDP – *Eletricidade de Portugal*), which generates 75% of its energy from renewable sources, was the 2022 winner in the Multinational category; the National University of Singapore (NUS), won the Large Company category. The Awards winners and finalist profiles can be viewed at: <https://www.globalhealthyworkplace.org/event/10th-global-healthy-workplace-summit-virtual-2022/>

The Global Centre for Healthy Workplace hosts the global standard for health and wellbeing programmes. Certification is granted for a period of two years (renewable). For more information, please access <https://www.globalhealthyworkplace.org/>

### ICOH and SASOM represented at the 2022 Portuguese International Forum on Occupational Health

Dr Jukka Takala, immediate Past President of ICOH and Claudina Nogueira, ICOH Vice President for Scientific Committees and SASOM ExCo member, were invited by Dr Jorge Barroso Dias, President of the Portuguese Society of Occupational Medicine (SPMT – *Sociedade Portuguesa de Medicina no Trabalho*, an ICOH affiliate member) to present at the 3rd Portuguese International Forum on Occupational Health (PIFOH), within the 16th National Forum on Occupational Medicine, 27–29 October 2022, in Lisbon. The overarching theme of the fora was *New challenges: Are we prepared?* Dr Takala presented ‘Occupational cancer: What is new?’ and Ms Nogueira presented, in Portuguese, ‘The challenges of international cooperation between scientific societies’ in the roundtable session on ‘Occupational health/medicine challenges in Portuguese-speaking countries’. The roundtable discussion was moderated by Dr Dias and included panellists from Angola and Mozambique. Both presentations were delivered virtually. As a reciprocal gesture and in the spirit of collaboration between two ICOH affiliate members, SASOM and SPMT, Dr Dias was invited by SASOM to be the international presenter in Session 3 of the SASOM Annual Congress 2022, held on 16 September 2022. Dr Dias delivered a virtual presentation titled ‘Alcohol, tobacco, obesity, and sleep in occupational health services: A perspective from Portugal’.

### ICOH activities

The second ICOH newsletter of the current triennium (2022–2024), Volume XX, Number 2, August 2022, has been published on the ICOH website and can be accessed at <https://www.icohweb.org/site/newsletter.asp>

Various ICOH Scientific Committees (SCs) hosted virtual and in-person events in September and October on various aspects of occupational health and safety.

- The ICOH SC on Mining Occupational Safety and Health (SC MinOSH) held the 3rd International MinOSH Conference in Kampala, Uganda, from 21 to 23 September 2022, in conjunction with the 2022 Joint Annual Scientific Health (JASH) Conference of Makerere University, the 28th Ugandan National Association of Community and Occupational Health (UNACOH) Conference, and the 20th Dr Mathew Lukwiya Memorial Lecture. SC MinOSH contributed the following to the scientific programme: a plenary session with four keynote presentations; two parallel sessions, one with a keynote presentation; a workshop on silicosis and the ILO classification system; and a virtual session for interested parties who were unable to attend the conference in person.
- SC MinOSH organised and hosted a webinar on 28 September 2022 on the topic ‘The promise and potential consequences of screening tests for early detection of silicosis and silico-tuberculosis’.
- The ICOH Scientific Committee on Accident Prevention (SC AP)

organised and hosted a webinar on 29 September 2022, where a panel of health and safety experts explored the topic ‘Applying safety investigation standards to occupational health incidents’.

- The ICOH Scientific Committee on Ageing and Work hosted a free joint webinar on 24 October 2022 on the topic ‘Understanding the transition from work to retirement: The concepts of retirement, healthy working life expectancy, and health’.
- The ICOH SC on Unemployment, Job Insecurity, and Health (SC UJIH) organised and hosted a virtual panel discussion on ‘The advantages and disadvantages of working from home and working from the office’ on 28 October 2022.



**‘ICOH-Procter & Gamble’ networking dinner in Melrose Arch, Johannesburg, South Africa – August 2022: ‘Discussion on the benefits of ICOH membership’**  
**L to R: Dr Bishwadeep Paul (Procter & Gamble, India); Dr Anurag Apte (Procter & Gamble, Singapore); Dr Adriaan Combrinck (Immediate Past Secretary of the ICOH Scientific Committee on Occupational Health in the Chemical Industry, and SASOM ExCo member); Claudina Nogueira (ICOH Vice President for Scientific Committees, 2018–2024, and SASOM ExCo member); and Akhona Adonis (Procter & Gamble, South Africa)**

*Photograph: Dr Bishwadeep Paul*

### ACOEM webinar – addiction in the workplace

The American College of Occupational and Environmental Medicine (ACOEM), an ICOH affiliate member, presented a free webinar on 20 October 2022, titled ‘Addiction in the Workplace’. The webinar aimed to start the conversation about addiction in the workplace; outline which questions should be asked during the care of employees; decrease the stigma surrounding these cases; and contrast the different specialties needed for addiction care and the unique role that occupational health plays in orchestrating return-to-work efforts. Returning people to work is often more challenging when addiction may be driving mental health issues or preventing long-term recovery from an injury or illness. There are also considerations about work capacity, notably in safety-sensitive work. The invited occupational health experts presented a brief scope of the problem; an outline of evidence-based treatment options; mental health considerations; and case studies.

### Season's greetings

The SASOM National Office will close for the end-of-year festive season on Thursday, 15 December 2022, and re-open on Monday 9 January 2023.

'Tis the season to be not only merry, but also grateful, mindful, hopeful, and reflective of the past year. SASOM wishes all its members, their families and friends, and their communities a peaceful, healthy, and safe end-of-year festive season filled with many blessings. May the New Year 2023 bring us all peace of mind, kind hearts, contented spirits, and many successes and rewards in all facets of life. SASOM will continue supporting its members in 'all-things-occupational-health-and-medicine' and is pleased to continue supporting the *Occupational Health Southern Africa* journal, which it considers to be a rich regional resource in occupational health.

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# Social responsibility 2022 – shoe project

**Melanie Pillay:** KZN Coastal Region  
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The South African Society of Occupational Health Nursing Practitioners (SASOHN) KwaZulu-Natal (KZN) Coastal Region public relations office (PRO)/social responsibility team was tasked to fulfil one of the SASOHN objectives: to identify needy communities/organisations and lend a helping hand. The SASOHN KZN Coastal Region identified the children of Kingsburgh Primary School, which is situated at Illovo, south of Durban.

The shoe project has been running for four years but, due to COVID-19, the project was put on hold for two years. In 2022 the PRO/social responsibility team challenged all KZN members to donate a pair of shoes for the 70 children at the school.

The donation was made successful by the contribution of individual regional members and sponsors, and was facilitated through the Adopt a Child Campaign. A poster was designed and distributed to members and service providers. We requested members to pledge either a pair of shoes or cash.

We successfully collected money from individual members and sponsors. A big thank you goes to:

- Ningi Mashoba (SASOHN member): donated 13 pairs shoes
- Universal Pathology Laboratory (SASOHN service provider): donated R4 000
- Stanyer Electroserve (SASOHN service provider): donated R1 000

The aim was to align this project with Mandela Day but, due to school holidays, it was held on 22 July, which was within Mandela week. The SASOHN KZN Coastal team visited the Kingsburgh Primary School and handed the shoes over to the identified needy and disadvantaged 47 boys and 33 girls. We donated 80 pairs of shoes and 80 pairs of socks.

The day of handover was a great success, as can be seen from the photographs.

Sincere thanks go to SASOHN KZN Coastal members and sponsors who met the challenge and made it possible to hand over the shoes in Mandela week.



**SASOHN members with kids**



**Happy recipient**



**SASOHN KZN Region Committee members**



**SASOHN KZN Region Chairperson and one recipient** Photographs: Fiona Ward (SASOHN member)

# SASOHN Pretoria Region social responsibility project

**Bella Sepalameo:** SASOHN Pretoria Region  
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The South African Society of Occupational Health Nursing Practitioners (SASOHN) Pretoria Region adopted the Deafability School in Pretoria West as its social responsibility project more than six years ago. At the time, the school was known as the Transoranje School for the Deaf. In August every year, members of SASOHN visit the school, where they get an opportunity to engage with the teachers and the learners. The Society collects donations from its members, ranging from clothes, toiletries and food to educational materials and equipment that can assist the school's health clinic. On 22 July 2022, the SASOHN Pretoria Region Committee visited Deafability to deliver all donations collected in the current year.

Deafability is entirely reliant on donations and fundraising to assist children with hearing disabilities. The school believes that children with deafness deserve the best possible education to become successful, independent adults.

SASOHN Pretoria Region has a proud history of supporting Deafability through donations from regional members and these members' workplaces, assisting the learners with their education, training, and general wellbeing.

A big thank you goes to all members of the SASOHN Pretoria Region for their contributions and support in ensuring the success of this project.



**The SASOHN President joined Pretoria Region Committee members in their tour around the school**  
 Photograph: courtesy of SASOHN



**SASOHN Pretoria Region presenting donations to Deafability School staff members**  
 Photograph: courtesy of SASOHN

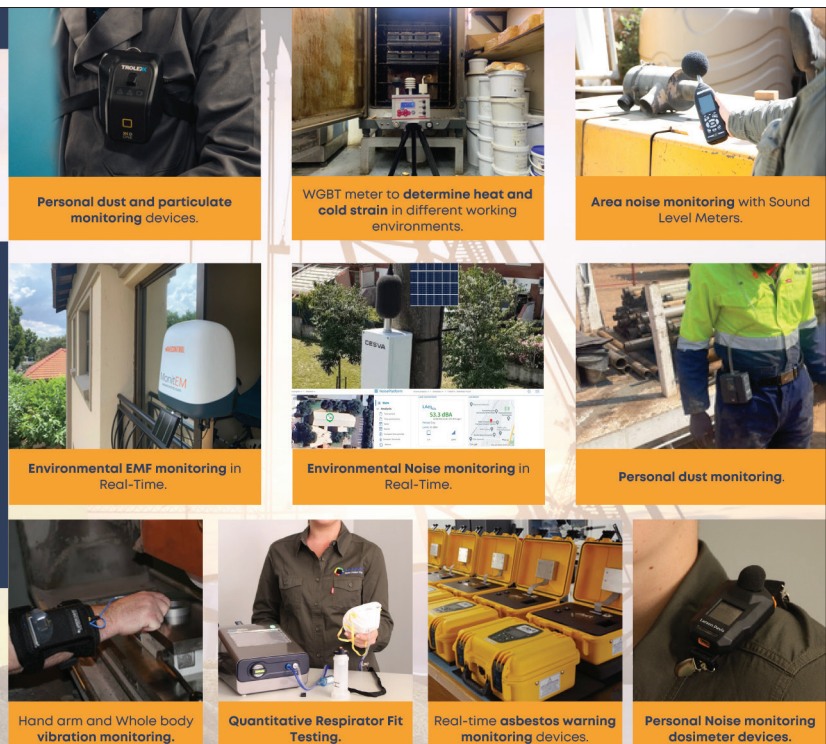
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- Real-time asbestos warning monitoring devices.
- Personal Noise monitoring dosimeter devices.

# SAIOH newsletter

## SAIOH PRESIDENT'S ADDRESS

**Hennie van der Westhuizen:** SAIOH outgoing President  
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*As part of our service to members, in this newsletter we provide feedback on the latest developments within the Southern African Institute for Occupational Hygiene (SAIOH). SAIOH exists due to, and for, its members and is reliant on them to continue to ethically serve this noble profession. Therefore, we invite your inputs and feedback on any matters communicated herewith.*

The time for the changing of the helmsman is fast approaching. With the music of Richard Wagner playing softly in the background, I wish to pay my respect to those wonderful people who stood by my side during my two years at the helm. Only after starting my term did I come to fully appreciate the great work that is done by our administrative team and National Council members. Each is selflessly dedicated to attaining the goals of SAIOH. Their personal strengths were interwoven into a synergy for success long before my term started, which made it a pleasure to climb on board. It is this momentum, maintained by the attitude and zest of the administrative team and councillors, that will ensure the future success of SAIOH.

As outgoing President, I have no doubt that SAIOH will be in good hands under the leadership of the incoming President, Naadiya Mundy. I am sure that her drive, dedication, keen mind, interpersonal skills, and ingenuity will contribute towards furthering the SAIOH cause. I am further sure that Naadiya will be ably supported by the new Vice-President, Karen du Preez, who has actively contributed towards SAIOH's cause over the past years. I am humbled and honoured to have served, and been part of, such a winning team.

## INTRODUCTION TO OUR NEW PRESIDENT AND VICE PRESIDENT

Dr Hennie van der Westhuizen's term as SAIOH president comes to an end on 31 December 2022. He will, effective 1 January 2023, take on the role of Immediate Past President of SAIOH. Thank you for a super two years, Hennie!

Naadiya Mundy, the current Vice President, will become the new SAIOH President on 1 January 2023. Welcome Naadiya – please be assured of full support in your new role!

During the Council meeting on 25 October 2022, the SAIOH Council voted for a new Vice President, effective 1 January 2023. We welcome Karen du Preez in her new role!

### Naadiya Mundy, SAIOH incoming President

As a registered occupational hygienist with SAIOH and Managing Director for Nexam (Pty) Ltd, Naadiya Mundy is both diligent in, and committed to, the occupational hygiene profession. Naadiya has a master's degree from the University of KwaZulu-Natal and has close to 11 years of professional experience within the occupational hygiene industry, where she has independently demonstrated strong



**Naadiya Mundy**

*Photograph: courtesy of SAIOH*

knowledge and completed a variety of projects. She currently fosters the idea of dual commitment in her current role, and is dedicated to bringing optimal solutions to clients by protecting the health and wellbeing of workers and the environment.

Naadiya is passionate about education and helping others. Her ideas resonate with a statement by Johann Wolfgang von Goethe: "Knowing is not enough, we must apply. Willing is not enough, we must do." By doing, she currently volunteers her time to the SAIOH National Council where she sits on the Management Board. She has also been awarded approved training provider (ATP) status by the Occupational Hygiene Training Association (OHTA) to teach OHTA modules leading to international qualifications, with the intention of upskilling SAIOH members.

### Karen du Preez

Karen du Preez has been registered with SAIOH at the occupational hygienist level since 2009. She has been a member of the Professional Certification Committee (PCC) since 2014, served as Chairperson of the PCC from 2020 to 2021, and been involved with the Occupational Hygiene Skills Forum (OHSF) since 2020. Karen has a BSc Physiology degree from North-West University, a certificate in Occupational Hygiene from Tshwane University of Technology, an intermediate certificate in Mine Environmental Control from the Chamber of Mines, and is currently finalising her studies towards a Master of Public Health (MPH) degree at the University of Pretoria.

Karen worked at occupational hygiene approved inspection authorities (AIAs) for 12 years, gaining extensive experience in the implementation and maintenance of occupational hygiene programmes at various industries and opencast mining operations. She has been registered with the South African National Accreditation System (SANAS) as a technical assessor for inspection bodies (ISO/IEC 17020) since 2019.



**Karen du Preez**

*Photograph: courtesy of SAIOH*

Karen has been employed as an occupational hygienist and technical signatory in the Occupational Hygiene Section of the National Institute for Occupational Health (NIOH), a division of the National Health Laboratory Service (NHLS), since 2017, and currently holds the position of Technical Manager.

*"I am passionate about occupational hygiene and the difference it can make in the lives of workers. My aim in serving SAIOH is to contribute towards a professional body that nurtures and values all members, and to encourage and grow this passion to protect worker health amongst its members."*

## NATIONAL COUNCIL FEEDBACK

**Hennie van der Westhuizen:** SAIOH outgoing President

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## Strategic plan

The current SAIOH strategy (five-year plan) is steered by Jaco Pieterse. The strategy is discussed and progress thereof evaluated at each monthly SAIOH Management Board meeting, and at the quarterly Council meetings. Several objectives/targets have already been met. The five-year plan will be finalised at a special strategy meeting on 10 February 2023; it will be circulated to all SAIOH members and launched at a special meeting early in 2023.

## Ethics

SAIOH entered into an agreement with well-known legal advisors, NGO Law, to advise the Institute when required. The first task was to develop a memorandum of incorporation (Moi) to replace our current Constitution. We have received the second draft of the Moi and are preparing our comments. This will be circulated to all SAIOH members and approved at a special meeting in 2023.

Our legal advisor's next task is to review the SAIOH ethics policy and procedure(s), which will enable the Ethics Committee to start its work in earnest. The ethics plan forms an important part of the SAIOH strategy.

From January 2023, all SAIOH-certified members will be required to provide proof that they have completed an acceptable occupational hygiene ethics training course.

A one-year phase-in period was allowed during 2022. The recording of the ethics webinar, presented by Terry McDonald of the British Occupational Hygiene Society (BOHS) during the virtual 2021 SAIOH Annual Conference, was sent to all attendees and those who purchased this recording.

During the 2022 SAIOH Annual Conference, Terry McDonald presented a hybrid Professional Development Course (PDC) on ethics in the occupational hygiene environment. A multiple-choice question (MCQ) assessment/test was developed, based on the 2021 webinar. This is in a format similar to the Survey Monkeys that SAIOH uses. There will be a time limit of 30 minutes, and only those members who qualify will receive a passcode and access to complete the test. The system will automatically mark the paper and notify the candidate of his/her result. Everyone will have three opportunities to pass the test, at weekly intervals. The required pass rate is 60%. We will develop a similar MCQ assessment for the 2022 ethics PDC; the same rules will apply. During 2023 there will be ethics sessions at branch workshops.

## SAIOH branch activities

Virtual meetings and workshops present numerous opportunities to SAIOH members. All SAIOH members are automatically invited and may attend any SAIOH branch meeting (or event), regardless of their branch affiliations. We encourage all our members to support their branches, and to participate in branch activities and earn Continuing Professional Development (CPD) points. Members can submit topics for discussion to the various Branch Chairs for consideration for future webinars, meetings and/or workshops.

The Western Cape Branch hosted their third in-person meeting on 16 September 2022 at the well-known Blue Peter Hotel in Bloubergstrand. A presentation was given on teamwork between occupational hygiene practitioners and occupational health practitioners during hazardous chemical agent (HCA) surveys. Some 45 occupational hygiene practitioners attended.

The Gauteng Branch(es) held a third successful virtual meeting, also on 16 September 2022. Dr N Ndaba provided a very informative presentation on biological exposure indices (BEIs) for HCAs. Some 70 occupational hygiene practitioners attended.

An online meeting took place between members of the SAIOH Council and the newly registered Botswana Occupational Hygiene Association (BOHA) – previously the SAIOH Botswana Branch – on 13 September 2022. The discussions revolved around assistance from SAIOH in BOHA's development as a national occupational hygiene association. Further meetings are planned.

Another round of branch meetings is scheduled for November and December 2022.

SAIOH would like to revive stagnant branches, starting with the Mpumalanga and Namibian Branches. Members who would like to assist with, or contribute ideas towards, this initiative are requested to contact Moses Mokone (SAIOH Branch Co-ordinator) at [Mokonemoses2@gmail.com](mailto:Mokonemoses2@gmail.com)

### OHTA and IOHA feedback

The Occupational Hygiene Training Association (OHTA) and the International Occupational Hygiene Association (IOHA) continue to publish their individual newsletters. SAIOH e-mails the links to all its members and posts them on the SAIOH website: [www.saioh.co.za](http://www.saioh.co.za)

Please note OHTA's new website: [www.ohtatraining.org](http://www.ohtatraining.org)

Garth Hunter, SAIOH's representative on the International Occupational Hygiene Association (IOHA) Board and its National Accreditation Recognition Committee (NARC), continues to be very active. This provides SAIOH and the PCC with valuable feedback from the IOHA and IOHA NARC meetings.

The IOHA newsletter, *Global Exposure Manager*, was published in the September/October issue of *Occupational Health Southern Africa*, as it is in every issue.

### SAIOH Technical Committee feedback

The SAIOH Technical Committee's research on welding fumes, i.e. the measurement and analyses thereof, is ongoing. We anticipate completing this and producing SAIOH technical and position papers in 2023.

Another Technical Committee has started developing technical procedures and a SAIOH position paper on heat stress management. The first meeting, assisted by Schu Schutte, took place on 21 September 2022. This committee will continue conducting research on heat stress. The focus is two-fold, i.e. to develop a technical paper, and to enable SAIOH to provide comments on the recently released draft Physical Agents Regulations (the old Environmental Regulations for Workplaces) by January 2023.

SAIOH will also provide comments on the newly released Noise-Induced Hearing Loss (NIHL) Regulations by 21 January 2023.

The Council technical co-ordinator is drafting a position paper on real-time monitoring. A thank you goes to Wessel van Wyk in this regard.

### Annual SAIOH Scientific Conference

The 2022 SAIOH Annual Scientific Conference took place during 26–28 October 2022 at the Birchwood Hotel and Conference Centre in Gauteng. The conference was a successful hybrid event, i.e. face-to-face and via live-streaming, hosted by the Gauteng Branch(es). The conference theme, *Occupational hygiene controlling the future*, was well received.

SAIOH received a large financial donation from one of its stakeholders, Biograde Laboratory. Apex Environmental pledged a sponsorship to pay the fees for a worthy registered occupational hygiene assistant or registered occupational hygiene technologist to attend the OHTA core modules and write the OHTA exams, up to the International Certificate in Occupational Hygiene qualification – a life-changing opportunity! Huge appreciations go to Willem Wepener and Sean Chester, respectively.

SAIOH developed a dedicated webpage for the conference on the website – a comprehensive conference notification flyer/Mailchimp with registration, sponsorship, exhibitor invitation details and links – to ease administration and registration. The Conference Technical Sub-committee finalised the 2022 SAIOH Scientific Conference programme, which was circulated before the start of the event. It is believed that the large number of last-minute registrations was due to the quality of this programme.

An abstract book was also published, forwarded to all online attendees, and printed and placed in the conference bags. This abstract book contained messages from the SAIOH President (Dr Hennie van der Westhuizen) and the 2022 Conference Organising Committee Chair (Lene Niemand, who is also the Gauteng Branch Chair), the logos of all the sponsors/exhibitors, the final conference programme, all the abstracts, and the biosketches of the presenters.

The five PDCs were a huge success; 78 people attended in person, and an additional 45 attended the two online PDCs (ethics and ventilation). Total PDC attendance was, thus, 123 persons. It is envisaged that more PDCs will be presented at future conferences, and that all will be live-streamed.

The conference sessions were attended in person by around 142 persons per day, with another 66 persons attending online – a total of 416 attendees over the 1½ days. The hybrid model is deemed to be a success and will continue to be explored and improved. In total, almost 540 persons attended the PDCs and 2022 conference.

SAIOH made a decision to present annual awards for the preceding three COVID-19 years, i.e. 2019, 2020, and 2021: a total of 27 awards. A new award was introduced for the best branch of the year; the Western Cape (2021) and Gauteng (2022) Branches were the first winners. Every award included a framed certificate and a monetary prize.

The SAIOH 2022 annual general meeting (AGM) took place at the conference, on the afternoon of 27 October 2022. All reports were provided, and financials were discussed. One hundred and sixty-three people attended the AGM in person, and 74 attended online – 237 SAIOH members in total. This forms a key part of SAIOH's Strategic Portfolio #06 – good corporate governance.

### New SAIOH website

SAIOH engaged website developers to overhaul the website – specially to allow integration with our current member management system (MySAIOH). The SAIOH administration teams are progressing well with the implementation and population of the new website. This will be finalised shortly and launched at a special meeting in 2023.

### Communications

SAIOH publishes its newsletter and President's page in two electronic media, namely *Occupational Health Southern Africa* journal and the *African OS&H* magazine (A-OS&H). These publications are issued every two months (with the most recent issues of the journal and magazine published in October 2022). The links are sent to all members via Mailchimp and posted on the website. Five issues of these two publications have already been sent to all SAIOH members this year.

Jabu Mhlophe from the Department of Employment and Labour (DoEL) published an article on the new Hazardous Biological Agents Regulations in the September/October 2022 issue of *Occupational Health Southern Africa*.

The international Occupational Hygiene Training Association (OHTA)'s *Global Link* newsletter was again published in September 2022 with a video insert by Naadiya Mundy – well done, Naadiya. The newsletter was posted on the SAIOH website and sent to all members by Mailchimp.

SAIOH communicates daily with its stakeholders via e-mails, phone calls, and virtual meetings, regarding important news, technical information, legislation changes, new Standards, and webinars, etc.

Several online events and webinars were recently hosted by our stakeholders and attended by SAIOH management, members, and staff:

- The Occupational Hygiene Approved Inspection Authority Association (OH AIA Ass.) held a virtual meeting on 16 September 2022; 32 persons attended. A presentation about collaboration in occupational hygiene was given by the Chair, Phillip van Dyk.
- SAIOH nominated members to the DoEL Technical Committees for Hazardous Biological Agents and Ergonomics, respectively, on 17 September 2022.
- Workplace Health Without Borders (WHWB) held two occupational health-related webinars during the past two months.
- The DoEL provided a virtual feedback session/webinar on the occupational hygiene AIA statistical reports for 2020/1 and 2021/2, on 14 October 2022.

The University of KwaZulu-Natal is organising the International Commission on Occupational Health (ICOH) 7th International Conference on the History of Occupational and Environmental Health, to take place in Durban in mid-Nov 2023. They have asked SAIOH to assist and to be part of the organising committee. The SAIOH Council will consider the request and respond.

## FROM THE PROFESSIONAL CERTIFICATION COMMITTEE (PCC)

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**Nico Potgieter:** Co-opted member

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## Certification assessments

A summary of results from assessments, as of 30 September 2022, is provided in Table 1.

The third and final round of PCC written assessments took place on 23 September 2022; 56 candidates participated (results are included in Table 1). The final oral assessment round started on 21 October 2022, the results of which will be published during November 2022.

## Oral assessment improvements

The PCC technical teams continue to revise the PCC oral assessment format and questions in line with the occupational hygiene self-assessment tool.

Two PCC technical teams are working in parallel to 1) update the SAIOH self-assessment tool and revise the PCC oral assessment format, and 2) develop questions and the required answers. The first sub-committee, chaired by Garth Hunter, has been meeting virtually every two weeks (five meetings were held in the past two months alone). The second sub-committee, chaired by Nico Potgieter, has had their inaugural meeting (with a number of volunteers attending).

Improvements in the assessment format are to ensure that the growing field of occupational hygiene is covered and that the assessment format and tools continue to remain relevant and current.

## Occupational Hygiene Skills Forum

The SAIOH Occupational Hygiene Skills Forum (OHSF) was initiated to coordinate all aspects related to the recognition of occupational hygiene training materials (e.g. the asbestos training courses, occupational hygiene training providers and institutions, evaluation of the Occupational Hygiene Training Association's approved training providers (OHTA ATPs), and the development and management of assessment and examination systems, where required.

Another function of the OHSF is to evaluate applications from tertiary institutions for recognition of their occupational hygiene-related qualifications. The OHSF is progressing well with these accreditations. The developed matrix is used to evaluate the occupational hygiene content in line with the 50% requirement.

The new bulk asbestos training course is almost finalised. Thanks go to Julie Hills, Karen du Preez, and Celia Keet for all their hard work in this regard!

North-West University's and the Tshwane University of Technology's four-year bachelor's degrees were recognised by the OHSF as meeting the qualification criteria at the registered occupational hygienist (ROH) level. The OHSF is currently hard at work, evaluating the University of the Witwatersrand's (Wits) and the Cape Peninsula University of Technology's programmes. The OHSF organised a virtual meeting with the Wits School of Public Health with regard to their MSc Medicine in Exposure Science degree.

All tertiary institutions that offer occupational hygiene qualifications are encouraged to contact the PCC Administrator for information regarding application for recognition ([lee@saioh.co.za](mailto:lee@saioh.co.za)).

Details of recognised training providers and recognised qualifications will soon be available on the SAIOH website ([www.saioh.co.za](http://www.saioh.co.za)). This will make it easier for students and certification candidates to select suitable occupational hygiene training programmes that meet SAIOH and IOHA requirements.

**Table 1. SAIOH PCC certification assessment results (30 September 2022)**

Certification category	Written assessments				Oral assessments			
	Assessed n	Passed n	Failed n	Pass rate %	Assessed n	Passed n	Failed n	Pass rate %
OH assistant	117	101	16	86.3	117	101	16	86.3
OH technologist	48	32	16	66.7	28	20	8	71.4
Occupational hygienist	48	21	27	43.8	20	13	7	65.0
<b>Total</b>	<b>213</b>	<b>154</b>	<b>59</b>	<b>72.3</b>	<b>165</b>	<b>134</b>	<b>31</b>	<b>81.2</b>

# Guidance note on medico-legal investigations of mine deaths

**Dipalesa Mokoboto:** Medical Inspector, Department of Mineral Resources and Energy; MMPA President

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## BACKGROUND

The mining industry has experienced several challenges in handling investigations pertaining to fatalities of mine employees. The increasing number of sudden deaths, which were not associated with accidents, caused uncertainty in terms of classification. Other areas of concern were related to mine employees who had chronic diseases and died in hospital after being involved in mine accidents, but whose deaths were attributed to the chronic disease only.

There were further uncertainties regarding the roles and responsibilities of stakeholders in the event of death. It was established that a significant proportion of deaths in the mining industry are complex, and specialist skills were required when performing medico-legal post-mortem examinations. The state pathologists did not provide post-mortem examination reports timeously to assist in the conclusion of Mine Health and Safety Inspectorate (MHSI) investigations. Mine owners were inclined to use private pathologists; however, the families and the State believed that the private post-mortem examination reports were subjective and skewed in favour of the mine.

Based on these concerns, it was necessary for guidance to be given to the industry in terms of the process to be followed when a mine death occurs. Such a guidance note needed to be based on legislation governing deaths in South Africa. Engagements took place between the Medical Inspector, representing the Department of Mineral Resources and Energy (DMRE); the Head of Forensic Pathology Services (FPS) with a few regional pathologists; a representative from the South African Police Services (SAPS); representatives of the Forensic Pathology Department from the University of Pretoria; and the Head of Health from the Minerals Council South Africa. The guidance note on medico-legal investigations of mine deaths was promulgated in the *Government Gazette* on 10 May 2019.<sup>1</sup>

The guidance note is a result of the collective efforts of different stakeholders and originates from the need to provide clarity on the process that must be followed for deaths that require medico-legal autopsies. It is designed to guide and assist all stakeholders in their roles and responsibilities in handling natural, unnatural, and uncertain mine deaths. The guidance note sets out good practice in handling mine deaths and must be read and interpreted within the existing legal framework of medico-legal investigations. The guidance note will further assist in determining whether the cause of death of an employee was due to mining-related activities or not.

## OBJECTIVES

The objectives of the guidance note are:

- to improve the understanding of the legal obligations that relate to medico-legal autopsies, and
- to clarify the roles and responsibilities associated with the handling of deaths that occur in the mining industry.

## DEFINITIONS

**Medico-legal investigation of death** means the investigation into the circumstances, manner and possible causes of death that are or may have been due to unnatural causes as defined.

**Medical inspectorate** means the Medical Inspector and mine occupational medicine inspectors.

**Natural death** means deaths that are entirely due to natural diseases and are not precipitated by any other event.

**Unnatural death** for the purposes of the medico-legal investigation of death, includes any death:

- due to physical or chemical influence, direct or indirect, or related complications;
- that may have been the result of an act, or omission of an act, and may be criminal in nature;
- as contemplated in section 48 of the Health Professions Amendment Act 29 of 2007.<sup>2</sup> This may be death of a person undergoing, or because of, a procedure of a therapeutic, diagnostic, or palliative nature;
- where the death is sudden and unexpected, or unexplained, or where the cause of death is not obvious.

## ROLES AND RESPONSIBILITIES OF STAKEHOLDERS

Roles and responsibilities of different stakeholders were determined to ensure that the process of handling mine deaths is simplified and standardised. The role players were identified as follows:

- the mine employer who should report the mine deaths to the MHSI
- the medical practitioner who certifies the deaths
- the occupational medicine practitioner (OMP) who provides details of the working environment of the deceased
- the Chief Inspector of Mines, who may instruct that an inquiry on the death be held
- the principal inspector who ensures that an in-loco investigation takes place
- the Medical Inspector and occupational medicine inspectors who communicate with the OMP to gather medical information that may be considered important for the medico-legal investigation
- the SAPS, which should refer all unnatural deaths to the FPS for autopsy
- the FPS, which is responsible for conducting post-mortem investigations and drafting the post-mortem examination report with findings

## PROCEDURE TO FOLLOW WHEN THERE IS A DEATH OF AN EMPLOYEE

Death of an employee can occur in the mine premises or in a hospital, after an incident that had occurred at the mine premises.

### Death at a mine

Whenever there is a mine death, the employer must report it to the MHSI. Any accident or occurrence at a mine that results in the death of a person must be investigated in line with section 60 (1) of the MHSA.<sup>3</sup> The employer is also required to get the medical practitioner to certify the death.

The medical practitioner should consider the circumstances surrounding the death, and the occupational and medical histories of the deceased person. This will assist in determining whether the death was due to natural, unnatural, or uncertain causes.

Where the medical practitioner determines the death to be unnatural or uncertain, he/she should notify the SAPS who will open a docket and notify the FPS. Sometimes, the SAPS refuses to notify the FPS, especially when there is a sudden death. In such instances, the medical practitioner should inform the FPS, the regional DMRE inspectors and the Chief Specialist Forensic Pathologist. A record of this non-referral must be kept for future reference, and the FPS is required to respond to the matter in writing.

Post-mortem examinations of all unnatural deaths are conducted only by authorised persons from the FPS, who will then provide the examination report to the SAPS investigating officer to enable completion of the investigation. The SAPS investigating officer must give a copy of the post-mortem examination report to the Medical Inspectorate of the DMRE for the purposes of completing the section 60 (1) investigation.

### Death in a hospital

A medical practitioner must determine if the death is natural, unnatural or uncertain, even if the death occurs in hospital. The medical and occupational histories of the deceased person are important for consideration in reaching this decision. If the death is due to natural causes, the medical practitioner must complete a notification of death certificate.

If a death occurs in a hospital and is deemed to be due to unnatural causes, i.e. as a result of or due to complications that developed following a mine accident, then the medical doctor should follow the procedure for unnatural causes of death.

## CAUSES OF DEATH

In deciding whether the death was natural or unnatural, different causes need to be considered.

**Primary cause:** This is described as the disease or injury that initiated the train of morbid events leading directly or indirectly to death.

**Contributing cause or condition:** A condition that contributed to the death being earlier than otherwise expected. Here, causation is relevant, e.g. diabetes mellitus, coronary arteriosclerosis.

**Predisposing causes or conditions:** These are usually underlying conditions or causes that may lead to a particular event, e.g. an epileptic fit or psychological condition, or other underlying conditions that may cause an accident in which the subject is fatally injured. Even if these conditions cannot be determined during a post-mortem examination, they must be determined through the medical history provided.

**Precipitating causes or conditions:** These are conditions that cause something to happen immediately or cause the immediate development of a particular illness.

**Terminal cause of death:** The terminal cause of death is usually the result of a complication that occurs. A person with a head injury (the primary medical cause) often develops bronchopneumonia (the terminal cause) that may lead to death.

**Exclusive (sole) cause of death:** The exclusive or sole cause of death is a cause where no contributing or other factors play a role. This cause is the primary medical cause of death where, for instance, a person receives a stab wound into the aorta and dies. In this case, there can be no doubt as to the cause of death.

## CONCLUSION

In the mining industry, a fatality tarnishes the record of the mining company. Thus, it is in the company's best interests to avoid deaths of employees, especially if a mine-related cause is established. Mines might resort to incorrect classifications of deaths to preserve a good safety record. This may be seen when only the terminal cause of death is considered, and the primary cause is ignored. This might be the case where an employee is injured at the mine and is admitted for treatment. The employee might develop medical complications and die from complications. This cannot be classified as a natural death.

A contributing cause of death, e.g. the compromised immune status of an employee, cannot be regarded as an automatic cause of death after an employee is hospitalised following a mine accident. All deaths following a mine injury should be investigated, irrespective of the immune status of the deceased.

Sudden deaths are regarded as uncertain; all unnatural or uncertain deaths must go through the process of medico-legal investigation, as described above, and referred for post-mortem examination by an authorised FPS official.

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