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South African Society of Occupational Health Nursing Practitioners (SASOHN)

Southern African Institute for Occupational Hygiene (SAIOH)

Mine Medical Professionals Association (MMPA)

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Volume 29, Issue 1, 2023

Contents

Editorial 1

The South African Society of Occupational Medicine (SASOM) Annual Author Prize 2

Reviewers of manuscripts in 2022 3

Obituary
Tributes to Brendan Vaughan Girdler-Brown, 19 April 1949 – 1 January 2023 4

Original Research
Effectiveness of retrofitted diesel particulate filters on diesel particulate emissions: a small-scale intervention study
L Lebaka, A Manyike-Modau, D Brouwer 6

Occupational health and safety challenges among artisanal and small-scale diamond miners in Kimberley, South Africa
A Rose, J Allen-Spies 13

Case Report
Work-related adult-onset atopic dermatitis: two illustrative case reports
H Carman, A Fourie 21

Issues in Occupational Health
Renewed focus on re-emerging occupational biohazards
MH Ross, T Singh 28

Occupational lung diseases in South African miners at autopsy: 2020 surveillance report
LN Mhlongo, KS Wilson, ZB Ngcobo, D Fassom, J Murray, D Govind Lakhoo 31

Reports
Continuous development of the occupational hygiene profession in southern Africa using a multi-organisational collaboration: true and meaningful collaboration
AUDA-NEPAD 36

Global Exposure Manager
IOHA 41

Review of the palliative care service of the Asbestos Relief Trust and Kgalagadi Relief Trust, 2007-2022
Asbestos Relief Trust 43

Sponsored Article
An insight into RMA's Prevention Programme
RMA 45

Press Release
Tshiamiso Trust pays out first billion rands in silicosis and TB compensation
Tshiamiso Trust 47

Sponsored Article
Choosing the correct workmen's compensation specialist
Euttopia Consulting 48

Position Statement
Strengthening occupational health systems in the post-COVID-19 and the State of Disaster era in South Africa: strategies for the road ahead
PHASA 49

Society Newsletters
SASOM 51
SASOHN 53
SAIOH 55
MMPA 59

From the Editor . . .



Gill Nelson,
Editor-in-Chief

Welcome to the first issue of *Occupational Health Southern Africa* (OHSA). You will notice that this issue is 'thicker' than usual. This is because, from 2023, we are moving to four, rather than six issues a year. We will publish a similar number of scientific papers each year as in previous years, which means that each issue will now have more content than those published in previous years.

Much of the content in this issue is related to mining, including a research paper on reducing workers' exposure to diesel particulate matter (DPM) from equipment used in underground mines (Lebaka et al. from the University of the Witwatersrand); a research paper on artisanal diamond miners ('zama-zamas') in the Kimberley region, which includes some excellent photographs depicting occupational health and safety hazards, by Andre Rose (SA Medical Research Council) and Janine Allen-Spies (University of the Free State); and a report on post-mortem examinations conducted at the National Institute for Occupational Health (NIOH) on deceased miners in 2019 and 2020.

Additionally, Hilary Carman, a dermatologist in private practice, in collaboration with Anna Fourie from the NIOH, has described two cases of work-related adult-onset atopic dermatitis. Mary Ross and Tanusha Singh draw our attention to the development of the International Commission on Occupational Health's (ICOH's) Technical Guidelines on Biological Hazards, and the Scientific Committee for Biohazards and Occupational Health (SC BOH), spurred by biohazards in the workplace.

Sadly, we have also published some tributes to Prof. Brendan Girdler-Brown, who passed away on 1 January of this year. He was a great proponent, in theory and practice, of public health, including occupational health. Many of our readers will have fond memories of him – as a colleague, a teacher and/or a friend. Both Zodwa Ndlovu, the Assistant Editor of the Journal, and I were fortunate to have co-authored manuscripts with him.

On a happier note, we announce our winners of the South African Society of Occupational Medicine (SASOM) Annual Author Prize for 2020 and 2021. To encourage researchers working in the field of occupational health in Africa to publish their research findings, SASOM generously awards a cash prize every year to a researcher who is the first author of the best eligible paper published in OHSA in a calendar year, as judged by the Journal's Editorial Advisory Panel. Eligibility for the prize is limited to researchers who have not previously published a paper in *Occupational Health Southern Africa,* or any other accredited academic journal. Membership of SASOM is not a criterion. COVID-19 is largely responsible for the delay in awarding these prizes in the past two years. The 2022 winner will be announced in the next issue of *Occupational Health Southern Africa.*

All papers that are published in the Journal undergo a rigorous review process by numerous people, including peer reviewers, one or more editors, and a member of the Editorial Advisory Panel. Many of you have experienced this process. The purpose of the intensive and laborious process after peer-review is two-fold. The first reason is to promote good writing skills for those who are relatively inexperienced writers of scientific articles. The second, no less important reason, is to maintain the high publishing standard of the Journal.

I was recently alerted to an article, published in an accredited journal, under the umbrella of a well-known publishing 'house', where several errors appeared in the second sentence of the introduction. These errors should not have been in the paper from the beginning, as it is the responsibility of the authors to edit and fact check their work. However, the assigned editor also has a responsibility to ensure that the quality of every paper is of a high standard – a process that often takes many hours and a lot of patience from both the authors and the editors. The text that I refer to read, *"In 2018, new cases of cancer cases totalled 18 billion"* (intentionally not referenced, for anonymity). The initial problems with this sentence are obvious – there are 8 billion people in the world, and the second *"cases"* is superfluous. An additional problem is that the article cited was published in 2014, four years prior to 2018. The appropriate citation was an article published in 2018, which stated that the number of cases was 18.1 million: much more believable than 18 billion. These errors should have been quickly identified and highlighted by the editor, but they were not, and the paper is now in the public domain. This also highlights a mistake that many novice authors make, viz. citing an article or manuscript in which the original source of the information is cited (perhaps incorrectly), rather than citing the original source itself.

I hope that this encourages, rather than disheartens, novice authors (and experienced ones) to submit their manuscripts to *Occupational Health Southern Africa* and to understand the need for many revisions before a manuscript can be published. We look forward to reading about your latest research in the Journal this year.



SASOM CEU points

An application for an increase in the number of CEU points awarded to SASOM members who complete the questionnaire in each issue of *Occupational Health Southern Africa* was declined by the South African Medical Association, as the maximum number of points allocated to an issue of a journal is three. With the reduction in the number of issues of the Journal in a year, the annual number of potential CEU points will also decrease, from 18 to 12. However, the scope of the questions will expand, in keeping with the increase in the number of articles published in each issue of the Journal.

The South African Society of Occupational Medicine (SASOM) Annual Author Prize

On behalf of *Occupational Health Southern Africa*, the South African Society of Occupational Medicine (SASOM) encourages researchers working in the field of occupational health in Africa to publish their research findings. SASOM provides a cash award to a novice author who is the first author of the best paper published in *Occupational Health Southern Africa* in a calendar year, as judged by the Journal's Editorial Advisory Panel. Eligibility for the prize is limited to researchers who have not previously published a paper in *Occupational Health Southern Africa,* or any other accredited academic journal. Membership of SASOM is not a criterion.

We are pleased to announce that Dr Solomon Mthombeni and Dr Kayla Liedemann were winners of this award in 2020 and 2021, respectively.

Dr Mthombeni published the following paper in the May/June 2020 issue of the Journal:

***Mthombeni SK**, Coopoo Y, Noorbhai H. Fitness levels of rural emergency medical and rescue service providers in the North West province, South Africa. Occup Health Southern Afr. 2020; 26(3):111-116.* https://www.occhealth.co.za/_assets/articles/332/2063.pdf

Solomon Mthombeni is a content advisor on education, technology, sports, arts, and culture at the Parliament of the Republic of South Africa. He provides strategic oversight support to various portfolios. He began his career as a biokineticist at the Sports Science Institute of South Africa. He moved on to work in the public sector for the Department of Health for six years, where he was responsible for monitoring the health and fitness status of Emergency Medical and Rescue Services personnel in the North West province. He also served as the Chair of the Employee Health and Wellness programme, as well as the North West province Move for Health Day programme. In 2019, he joined the National Assembly as a researcher on sport and recreation, until moving into his current role in 2022. Dr Mthombeni holds a Master's degree in Biokinetics (in which he completed his research that was published in *Occupational Health Southern Africa*), and a PhD in Health Sciences (Sports Science) – both from the University of Johannesburg. He has now published several papers, focusing on the physical health status of emergency care personnel, as well as elite sport policy, and has presented his work at various international conferences. Solomon is an avid runner who competes frequently in cross-country, trail, and road running.

Dr Liedemann published the following paper in the March/April 2021 issue of the Journal:

***Liedemann KP**, Dramowski A. A 'nice to have' or a 'non-negotiable': South African healthcare workers' knowledge, attitudes, practices and perceptions of vaccination. Occup Health Southern Afr. 2021; 27(2):38-45.* https://www.occhealth.co.za/_assets/articles/337/2179.pdf

Kayla Liedemann recently completed her duties as a community service medical officer at Kleinvlei Clinic and Eerste River Hospital, in Cape Town. She graduated from Stellenbosch University in 2019 and obtained her Bachelor of Medicine and Bachelor of Surgery (MBChB) degrees, cum laude. Her main objective, as a medical practitioner, is to help members of her community, whilst ensuring service of the highest quality and standard. She is motivated by self-growth and improvement and enjoys finding and implementing solutions to complex problems, and ensuring that tasks are efficiently and thoroughly completed. Kayla's passion for research and evidence-based literature led to her conducting an undergraduate research project, which was published in *Occupational Health Southern Africa*. She enjoys acquiring new knowledge and skills that she can apply in her everyday work duties. She also enjoys sharing her knowledge and skills and sees herself affiliated with a university as a lecturer one day. She also looks forward to pursuing more research in the near future. When not working, Kayla enjoys hiking, experiencing new restaurants, and exploring her beautiful country. She also has a strong interest in personal finance, real estate, and interior design, and hopes to indulge these passions further one day.

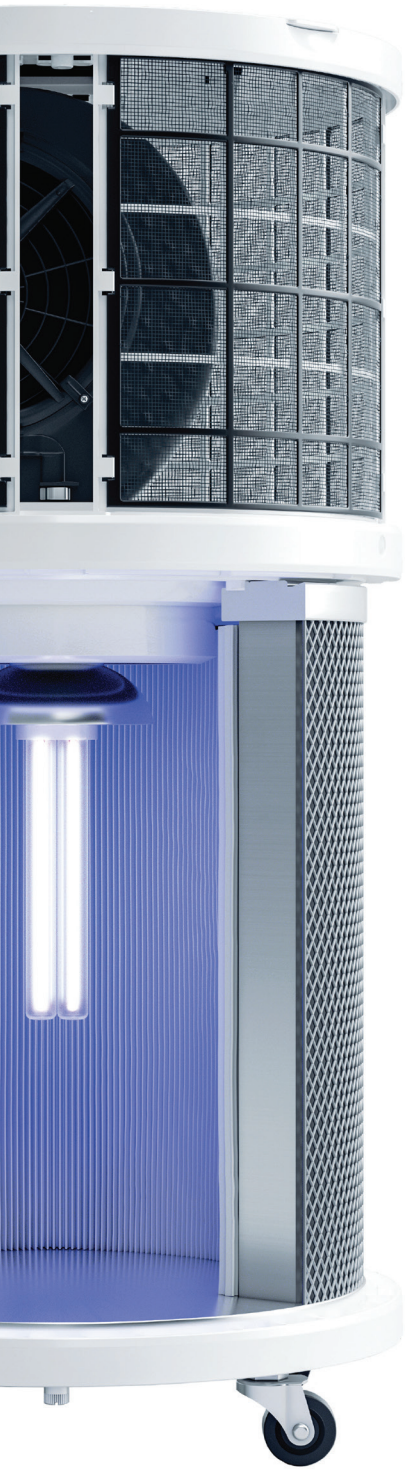


Dr Solomon Mthombeni *Photograph: courtesy of Solomon Mthombeni*



Dr Kayla Liedemann *Photograph: courtesy of Kayla Liedemann*

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We are grateful to all our reviewers for their guidance and evaluation of manuscripts submitted to the Journal.

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Satellite Workshop

Health effects of silica dust exposure - what do we need to do?

Despite global and national programmes to eliminate silicosis in workplaces, workers in the mining and non-mining industries in many countries continue to be exposed to unsafe levels of crystalline silica dust. This workshop will include presentations from international and local occupational health and hygiene experts who will provide overviews of silica exposure health-related outcomes, their social consequences, and current prevention strategies. These presentations will set the scene to discuss primary and secondary prevention strategies to reduce the risk for silica dust related diseases.

WORKSHOP THEMES

- What are the silica dust related diseases and why are they important?
- Silicosis elimination programmes
- Occupational exposure limits for silica dust
- Detection and monitoring of silica dust related diseases

Date: Tuesday 28 March 2023
Time: 09h00 – 15h00

HYBRID EVENT

Physical attendance venue: Resource Centre, Wits School of Public Health, Wits Education Campus, 27 St Andrews Road, Parktown, Johannesburg

Online attendance platform: Zoom

CLICK HERE TO REGISTER FOR IN-PERSON OR ONLINE ATTENDANCE

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100 1922 2022

Tributes to Brendan Vaughan Girdler-Brown, 19 April 1949 – 1 January 2023

Elize Webb, Kuku Vuyi, Musekiwa Alfred, Ayo-Yusuf Lekan

It is with great sadness that the School of Health Systems and Public Health (SHSPH), Faculty of Health Sciences, learned of the passing away of Prof. Brendan Vaughan Girdler-Brown on 1 January 2023. He was a staff member for more than 29 years at the University of Pretoria. He continued to serve the University as an Extraordinary Professor after his retirement.

Prof. Girdler-Brown held numerous degrees and/or fellowships from various South African and international institutions, including the University of Rhodesia (MBChB), the University of Natal (BSc Agriculture), University of Cape Town (both an MMed in Community Medicine and an MBA), UNISA (BComm Hons), Royal College of Physicians of Edinburgh, Royal College of Physicians and Surgeons of Glasgow, College of Medicine of South Africa, and the Royal College of Physicians, UK (retired status). He served as the President of the College of Public Health Medicine (South Africa) from 2002 to 2008.

Prof. Girdler-Brown taught several modules since the start of the University of Pretoria's SHSPH, including biostatistics and epidemiology. He was the supervisor or mentor for most of the current academic staff at the SHSPH. He also previously worked at the National Department of Health, Cape Provincial Administration, Natal Provincial Administration, Namibia, as well as the Zimbabwean National Army.

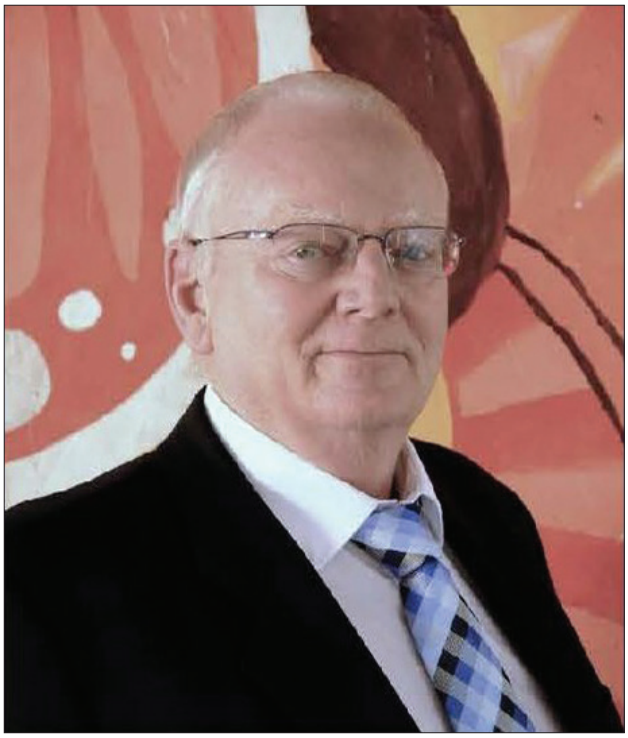
Prof. Girdler-Brown played a huge role in the management of the academic programmes at the SHSPH and was instrumental in setting up the epidemiology and biostatistics modules of the first and only fully online integrated course for the Postgraduate Diploma in Public Health (PGDipPH). During the COVID-19 pandemic, he was instrumental in providing the Faculty of Health Sciences management teams with weekly updates on the interpretation of the surveillance data shared by the National Institute for Communicable Diseases (NICD).

Prof. Brendan Girdler-Brown will be sorely missed by his family, colleagues, alumni, students, and the public health community at large.

Jonathan Levin

It is with great sadness that I learned of the passing of Brendan Girdler-Brown on the 1st of January 2023. I first met Brendan when I joined the Medical Research Council (MRC) in Pretoria in 1995 – at the time he was with the University of Pretoria and had offices on the second floor of the MRC building. I did some work with some of Brendan's students. At that time, there was no formal School of Public Health established in South Africa and cooperative efforts at developing public health training were coordinated through the Thusano 'School of Public Health' (TSPH) – a collaboration between a number of universities that wanted to set up schools of public health and associated Master's degrees. The TSPH coordinated a number of short courses in research methods and biostatistics. Brendan and I collaborated on a number of these short courses, some of which were run at the University of Pretoria and some at Wits.

So, in 2000, it was no surprise to me that Brendan asked me to give two biostatistics courses for an MSc in Epidemiology at Wits,



Extraordinary Professor Brendan Vaughan Girdler-Brown
Photograph: courtesy of the University of Pretoria

which had three students (one South African, one Zambian, and one Gambian) sponsored by the World Health Organization (Tropical Diseases Research, TDR); the contact person at TDR was Steve Wayling. I adapted my previous short courses and taught what was to become Biostatistics for Health Researchers I and Biostatistics for Health Researchers II. I am not aware of who was formally in charge of the course – whether it was Brendan or someone else – but, from my perspective, the first year of the MSc (Epidemiology) would not have happened without Brendan's input.

I always found Brendan to be extremely intelligent with a broad knowledge of biostatistics and epidemiology, and he was always keen to share ideas. It is important that we acknowledge the huge contribution that Brendan Girdler-Brown made towards the establishment of the MSc in Epidemiology in the Wits School of Public Health.

Mary Ross

"If your actions inspire others to dream more, learn more, do more and become more, you are a leader."
John Quincy Adams

New Year arrived with the sadly anticipated, but nevertheless profoundly distressing, news that my dear colleague and friend had passed away after a short but tumultuous period in ICU. We got to know each other in the 1990s as public health medicine specialists,

but during discussions about our common backgrounds, we realised that we had originally met, albeit transiently, in Bulawayo in the 1960s, when we were opponents in the final televised inter-school quiz. His team beat mine by one point! We had also studied medicine at the same university and shared anecdotes about the eccentric professors who taught us, although Brendan started the year after I left (since he had initially pursued a career in agriculture). Over the years, I came to marvel at his excellence in so many disparate fields, from clinical haematology to zoonoses, as a result of all his qualifications, knowledge, expertise, and experience gained in a wide variety of institutions and settings, internationally.

Although Brendan's reputation revolves mainly around his enormous contribution to public health medicine, he is just as well known in occupational health circles for his multiple capabilities pertinent to both disciplines. I particularly relished our communal projects, such as introducing project management and service costing to the Diploma in Health Service Management at Wits, and other activities in both the public and private sectors. Our first venture was an audit of the occupational health services at various mines for a large coal mining company, which brought us much satisfaction and hilarity. Before the days of the GPS, our trips took much longer than they should as we inevitably took wrong turnings, and once travelled for kilometres parallel to the motorway trying to find our way on to it. A more successful excursion was our return journey to Bloemfontein one year as examiners for the College of Medicine, when Brendan decided that it was both cheaper and equally time effective to drive there and back by car, than to fly and hire a car there for the day. The added bonus was having nine or ten extra hours to enjoy a wealth of his anecdotes and stories of working in southern Africa.

Soon afterwards, having submitted and been granted the application to the WHO Tropical Diseases Research (TDR) special programme for research and training in tropical diseases, for a three-year grant to establish a Master's in Tropical Epidemiology and Biostatistics at Wits, I sought Brendan's vast expertise to play the major part in planning, establishing, costing, reporting, preparing teaching materials for, and implementing the course. Thanks to his management, economics, epidemiological, and biostatistical prowess, we overachieved our targets, leading TDR to delay the funding for our second-year application. They could not believe what we had achieved compared with the two other universities that were requiring further funding to complete the first year! Our collaboration and his help with developing travel medicine epidemiology also enabled me to develop the optional MSc module on travel medicine, which then led to the formation of the South African Society for Travel Medicine and, 20 years later, still runs as a very successful short course for the School of Public Health.

Our collaboration continued when he managed occupational health research projects for the Mine Health and Safety Council, mainly on silicosis and tuberculosis, which was one of his lifelong interests. At the National Institute for Occupational Health (NIOH), Brendan's many talents extended from assisting with epidemiology to project management and costing services, all of which he continued to impart when I moved to the mining sector.

Above all, Brendan was an incredible teacher and mentor, and was very generous with his accumulated nuggets of wisdom. He had a phenomenal memory for facts and details relating to the theory and practice of medicine. So many people have attributed their knowledge and academic success to his selflessness, articulate presentations, and meticulous notes that made even complex biostatistics readily comprehensible. But Brendan's generosity and kindness extended well beyond the academic sphere. He was a go-to person for miscellaneous advice and assistance from getting his sister, Brigid, to solve the challenge of obtaining my sister's full birth certificate in Zimbabwe, to house- and cat-sitting for me.

Brendan bravely faced and managed the challenges of ill health in his last few years, without faltering in his dedication to teaching and helping others. It is some consolation that he thrived in his final home, close to his supportive family in the African bush that he so loved.

Steve Jobs' words, *"The only way to do great work is to love what you do",* epitomise Brendan's life and his leadership for so many of us. Rest in peace, Brendan, knowing we shall be eternally grateful and remember the impact that you had on our lives.

Gill Nelson

Brendan Girdler-Brown – teacher, colleague, and then friend... It was with immense sadness that I sat with him during his last days, hoping beyond hope that he would live another day to tell more stories about his life in Rhodesia (as it was then known), or Zambia, or the UK, or Cape Town, or one of the other many places where he had lived or worked. He had the most amazing memory, and his stories always included the protagonist's sister, or dog, or school teacher, or art collection. I never heard him repeat a story – he had an endless supply! Brendan loved to talk, but he also loved to learn and to teach.

I met Brendan when he was teaching a course on biostatistics at the National Institute for Occupational Health (NIOH). Later, he taught me project management at Wits. But it was when he helped me analyse data for my PhD that I really got to know him. I am honoured that he lists the paper we wrote together as one of his *"most important/influential publications"* amongst six, in his CV. I am not sure what sparked our friendship, but it spanned more than 10 years – shorter than many others who are mourning him, but very meaningful, nonetheless.

Brendan had a talent for teaching – others and himself. He had a love affair with data and was at his happiest when applying complex statistical methods to a new dataset. He never stopped learning. In addition to his many degrees and other qualifications related to public health (and sheep breeding!), he studied economics and also, more recently, taught himself R. He shared everything he knew – and it was a lot – and was a stickler for doing things the right way.

He was forever trying to impress upon his students the importance of post-regression tests such as BIC, AIC, and goodness of fit.

Brendan will be long-remembered by his many students. He was not your average teacher. He was wholeheartedly committed to imparting knowledge, the desire to learn, and a curiosity about the world in general. He excelled in all these things. He was keenly interested in COVID-19. He plotted complex weekly statistics that he shared with a privileged few, wrote articles and scientific papers on the subject, and bemoaned that fact that people were taking Ivermectin as prophylaxis – something that is used to treat river blindness in many African countries and beyond.

But his interests extended beyond these theoretical boundaries. He loved the bush, French food, and his family, and he loved living in Hoedspruit, having finally left Jo'burg in 2021, after threatening to do so for years.

Honourable, loyal, generous, funny, and simply irreplaceable. What a loss to academia and those he befriended on his life's journey.

Effectiveness of retrofitted diesel particulate filters on diesel particulate emissions: a small-scale intervention study

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ABSTRACT

Background: Exposure to diesel particulate matter (DPM) is a significant health hazard in the workplace, particularly in underground mining settings where diesel-powered machines are utilised. Decreasing DPM exposure relies widely on the ability of the industry to implement diesel emission control technologies; in particular, the use of diesel particulate filter (DPF) systems.

Objective: We explored the effectiveness of retrofitted DPFs in reducing tailpipe DPM emissions from a fleet of diesel-powered machines, and exposures to workers, in an underground platinum mine in Limpopo province, South Africa.

Methods: Using a size-selective particle monitor (Dekati ELPI®+), pre- and post-DPF system engine exhaust emissions from 10 trackless mobile machines (TMMs), fitted with wall-flow actively regenerating sintered metal DPFs, were measured. Using the device's built-in software, each measurement was analysed for particle number concentration, mass concentration, and particle size distribution. Personal DPM samples from 172 workers were analysed using Expostats to assess the effects of TMM DPF retrofitting on ambient elemental carbon (EC) exposures.

Results: DPF systems were effective in reducing DPM emissions. Total particle number and mass concentrations were reduced by an average of 96.8% and 83.7%, respectively. Mean personal exposure to elemental carbon was also significantly reduced after the installation of DPF systems, by 87.2%.

Conclusion: The use of DPFs was effective in reducing tailpipe DPM emissions and personal EC exposures. This technology will greatly benefit the South African mining industry (SAMI) by improving compliance with emission standards and preventing adverse health effects as a result of over-exposure of DPM to employees.

INTRODUCTION

Diesel-powered machines used in underground mining are powerful, robust, long-lasting, and consume less fuel than petrol/gasoline-powered machines. However, diesel exhaust emissions – the term used for what is released from a diesel-powered engine during combustion – contain a mixture of complex gases and particulate mattter[1] and are thus of concern regarding workers' health. The gases include, but are not limited to, carbon dioxide (CO_2), carbon monoxide (CO), sulphur dioxide (SO_2), hydrocarbons, and nitrogen and its various oxides, e.g. nitrogen monoxide (NO) and nitrogen dioxide (NO_2).[2,3] The particulate fraction results primarily from incomplete combustion of the hydrocarbons in the fuel and lubricating oil.[4] It comprises a solid elemental carbon (EC) core and semi-volatile and volatile hydrocarbons (organic carbon (OC)). The EC and OC fractions are reported to comprise 33–90%, and 7–49% of the particulate mass, respectively.[2,5]

Diesel particulate matter (DPM) consists mainly of fine particles < 2.5 µm in diameter, including a large subgroup of ultrafine particles with diameter < 0.1 µm.[6,7] Long-term exposure to combustion-related fine particulate air pollution is an important risk factor for cardiopulmonary and lung cancer mortality.[8] In 2012, the International Agency for Research on Cancer (IARC) classified diesel exhaust as a human carcinogen (Group 1), by inhalation.[9]

Exposures to DPM, as part of diesel exhaust emissions, are significantly higher for underground miners than for workers in any other occupation.[3] Studies conducted by the US Mine Safety and Health Administration (MSHA) from 2002 to 2005 showed that miners were exposed to DPM concentrations as high as 3 300 µg/mg.[3,10] In the South African mining industry (SAMI), DPM air concentrations were reported, in a Mine Health and Safety study published in 2002, to exceed 2 000 µg/m^3.[11]

Exposure to DPM underground may be eliminated, reduced, or controlled along the exposure pathway, using several interventions. The first approach is to replace diesel-powered machines with battery-powered machines. Ways to control combustion products from diesel-powered machines, before they are released from the tailpipe, include the substitution of high-emitting traditional (tier I–III) engines with low-emitting advanced engines (tier IV), engine maintenance, the use of reformulated fuels, and exhaust filtration.[12] Another approach is to ensure that sufficient air volumes are available for particulate dilution where people travel and work, and within ventilation districts (sections of the mine with independent intake and return airways). Yet another approach is to limit the number of diesel-powered machines within a given volume of ventilation air for effective dilution, and to implement a 'no idling' policy.[3,12] These interventions may require a multifaceted approach and optimisation to suit a mine's needs.

Diesel particulate filter (DPF) systems are endorsed as an effective technology for removing particulate matter from the exhausts of diesel-powered equipment.[13] These systems are highly efficient in capturing the solid fraction of diesel exhaust, including EC, allowing the exhaust gases to pass through the system. A complete DPF system consists of the filter and a process to regenerate the filter (restore it to its soot collection capacity). This can be achieved either continuously (passive regeneration) during normal operation of the engine, or periodically (active regeneration) after a pre-determined amount of soot has accumulated on the filter. Neither of these regeneration processes requires input from the vehicle operator; the process occurs automatically. The non-solid fraction of diesel exhaust, including the soluble organic fraction and sulphates, are captured at much lower efficiencies than is the solid fraction, or not at all.[14] However, the efficiency of a DPF in the removal of non-solids from the exhaust stream can be enhanced by adding a catalytic converter. Installations of a DPF system also require instrumentation to monitor the exhaust gas back pressure due to the build-up of soot.[3]

Bugarski et al. (2006) demonstrated that DPF systems with cordierite and silicon carbide wall-flow monolith filter elements can reduce DPM and EC concentrations in underground mine air by more than 70% and 90%, respectively.[15] In an industry-wide collaborative project within the SAMI, DPF systems were shown to reduce diesel particulate tailpipe emissions by 60–90%.[1]

In this study, we assessed the effectiveness of retrofitting diesel-powered mobile machinery with DPFs in an underground platinum mine in reducing DPM tailpipe emissions and, consequently, worker exposure.

METHODS

The study was conducted at an underground platinum mine in Limpopo province, South Africa, on 10 tier II trackless mobile machines (TMMs): six load, haul, and dump trucks (LHDs), two drill rigs, and two roof bolters, with highest allowed power input of 140 Kilowatt (kW) for the LHDs and 74 kW for the others. The tailpipe measurements were taken at the underground workshop where maintenance of the machines takes place.

The study design was quasi-experimental with an intervention component. All TMMs were retrofitted with wall-flow actively regenerating sintered metal DPFs as the intervention. The direct impacts of the filtration system, i.e. reduction of the engine tailpipe DPM emissions, was measured. The TMMs were not fitted with any form of particulate filtration prior to the study. Therefore, when retrofitting them with DPFs, no existing devices were removed.

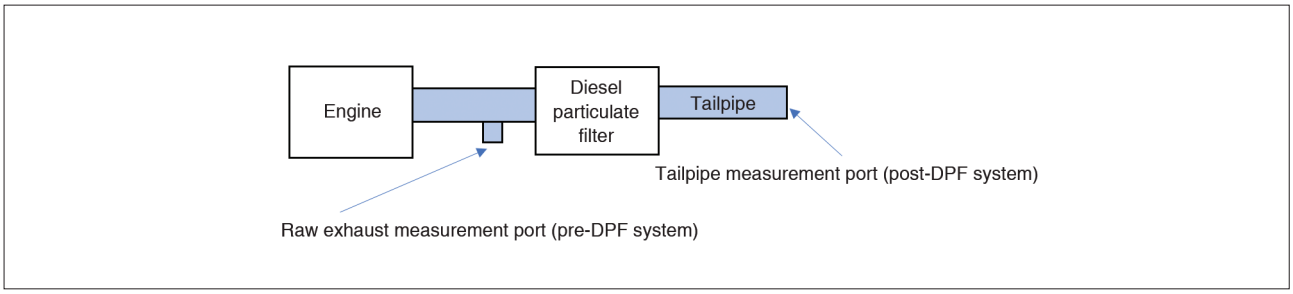
The TMMs' DPM emissions were characterised as the cumulative (five-minute) real-time particle number concentrations, separated according to their aerodynamic size over the 14 size bins (impactor stages or fractions) of the low-pressure particle impactor (Dekati ELPI®+), with no repetition of measurements and no chemical analysis of the composition of the particles. The impactor was assembled at the underground workshop, and was switched on 30 minutes before measurements were taken, to stabilise the electrometers. A leakage test was conducted to prevent changes in the sample airflow, operation pressures, and particle cut-off diameters in the impactor stages. As the last (smallest-size fractions) stages of the ELPI®+ impactor operate under low pressures, failure to conduct a leakage test causes errors in the measurement of the aerosol size distribution and concentrations. The pressure of the impactor was set at 40 mbar. Compressed air, at a pressure of 3 mbar, was connected to the unit (air conditioning system and double diluters) to achieve appropriate dilution. The zeroing of the electrometer was conducted with zero-air pump switched 'on' and the charger (used to give an electrical charge to incoming particles) switched 'off' for two minutes. Thereafter, the zero-air pump was switched 'off', the main vacuum pump was switched 'on', and the flow rate of the vacuum pump was set at 10 l/min. The impactor inlet was then connected to the desired measurement port in the TMM (Figure 1).

Each TMM engine was warmed up for 10–15 minutes prior to taking the measurements. Measurements for each TMM were conducted on low idle and snap acceleration (high transient revolutions per minute (rpm)) duty cycle modes. The two modes' emissions were combined, and evaluated pre-DPF system (raw exhaust) and post-DPF system (tailpipe), as shown in Figure 1.

The TMM fleet was retrofitted with the DPFs from 17 August to 8 October 2020. The TMMs were then operated for an average of 256 days (201–331 days) before DPM emissions were measured.

To confirm that the sulphur concentration in the diesel, in parts per million (ppm), was consistent throughout the data collection period, samples were taken from both the surface and underground diesel storage tanks, using 60 ml containers, prior to commencing the emission measurements. Sulphur content has a significant impact on diesel exhaust emissions. A study in the SAMI showed that the use of low-sulphur fuels promotes cleaner exhaust emissions, with 10% particulate matter emission reductions observed when switching from diesel containing 500 ppm sulphur to that containing either 50 or 10 ppm.[1] The samples were sent to an accredited South African National Accreditation System (SANAS) laboratory for analysis, using the ASTM method D4294. The results confirmed 10 ppm sulphur content of the diesel from both the surface and underground storage tanks. The effects of diesel sulphur content on engine exhaust emissions were, however, not evaluated in this study.

We also assessed whether DPFs had an effect on the levels of EC to which workers were exposed, by analysing personal exposure samples from 172 workers (54 pre-intervention: August 2019 to August 2020; and 118 post-intervention: August to December 2020), randomly collected by the mining company for different job occupations. The occupations comprised of LHD operators, roof bolter operators, drill rig operators, diesel mechanics, rock drill operators, and general and engineering workers. By December 2020, more than 70% of the fleet was fitted with DPFs. The personal samples were analysed for EC by a SANAS-approved



DPF: diesel particulate filter

Figure 1. TMM measurement positions

laboratory, using the National Institute for Occupational Safety and Health (NIOSH) Method 5040.[16]

Ethics clearance was obtained from the University of the Witwatersrand's Human Research Ethics Committee (clearance certificate no. M2010128).

Data analysis

The data were captured and analysed using Microsoft Excel. Expostats – a Bayesian form of inferential statistics – was used to analyse the personal EC exposure data. The particle number concentration generated by the impactor was based on particle numbers, normalised for bin width (dN/dlogDp, where dN = particle concentration and Dp = particle diameter) and processed by the device software to generate particle size distributions. The mass concentration was calculated from the particle number concentration, assuming the default effective density for aerosols of 1 mg/µl. The 'raw exhaust' and 'tailpipe' emissions (pre- and post-DPF system) from each TMM were compared, using the paired t-test. The effectiveness of the DPF system in reducing tailpipe emissions was calculated as:

$$Effectiveness = \frac{Pre\text{-}DPF\ system\ emission - Post\text{-}DPF\ system\ emission}{Pre\text{-}DPF\ system\ emission} X\ 100$$

As there is no legislation within the SAMI governing personal DPM exposure, we used the Australian conservative limit value (surrogate occupational exposure limit (OEL)) of 100 µg/m^3 for EC as the concentration against which we could test compliance.[17] Expostats tool 1 was used for compliance testing and Expostats tool 3 for comparison of the pre- and post-DPF intervention personal exposure data.[18]

RESULTS

Particle number concentrations

There was a statistically significant mean difference of 96.8% (± 4 standard deviation (SD)) in particle number concentrations measured pre- and post- the DPF system ($p < 0.003$), for the 10 TMMs. The effectiveness ranged from 87.0–99.9% (Figure 2).

Particle size distribution

Both the raw exhaust and tailpipe particles emitted (pre- and post-DPF system, respectively) were in the accumulation mode (> 0.05 µm), with the majority of the particles approximately 0.1 µm in diameter. No statistically significant differences were observed in the mean particle size distribution (Figure 3), based on the geometric mean (GM). The pre-DPF GM was 0.08 µm (± 1.50), while the post-DPF GM was 0.09 µm (± 1.66). However, the particle number concentrations in the 0.01 and 0.75 µm size bins, where the majority of the particles were concentrated, were substantially different pre- and post-DPF intervention.

Particle mass concentrations

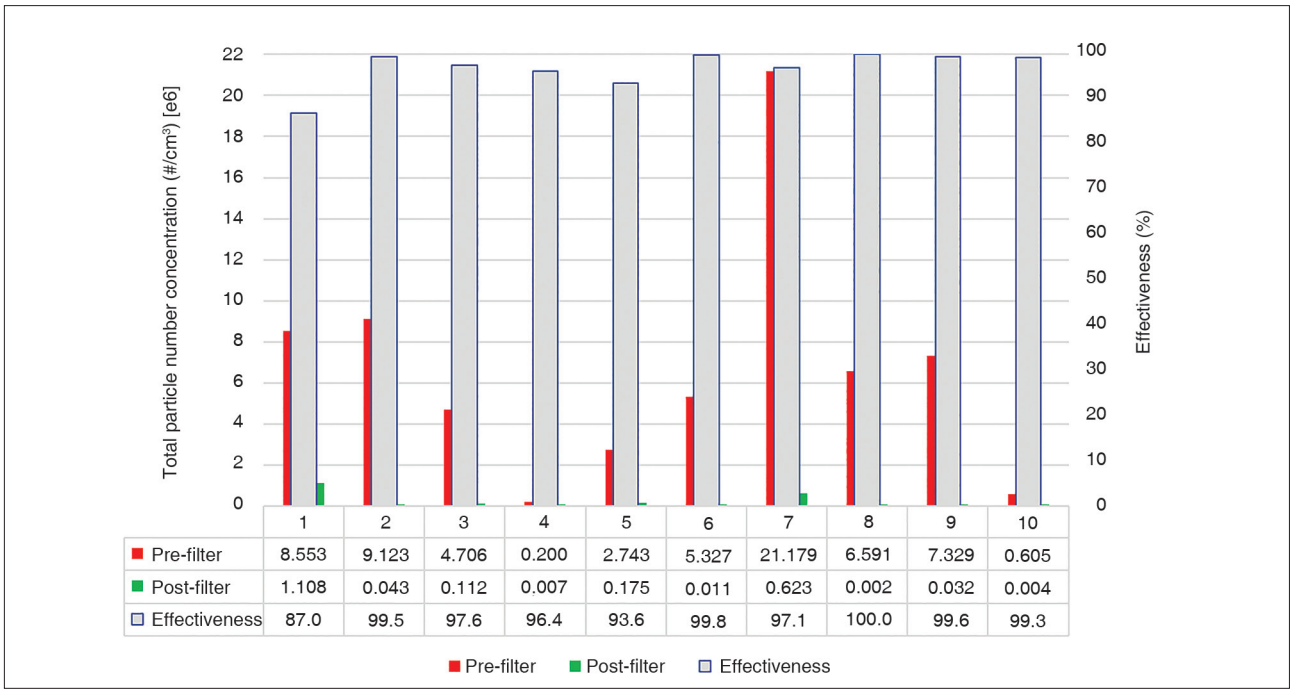
For both pre- and post-DPF system measurements, most particles were in the sub-micron size range (Figure 3). As mass concentration is governed by larger particles, it was expected that the reduction in mass concentration would be lower as a result of the low particle number concentrations observed in the size bins > 1 µm. The pre- and post-DPF system GM mass concentrations were significantly different, at 0.60 mg/m^3 and 0.03 mg/m^3, respectively ($p = 0.016$).

The DPF system achieved a mean filtration effectiveness of 83.7% (95% credible interval (CI) 69.1, 98.9), with a relatively large SD of 24%, which was attributed to the low pre-DPF mass concentrations observed in TMM 1, 4, 8, and 10 (Figure 4). Although mass concentrations were statistically significantly reduced, on average, the effectiveness was poorer than that based on the mean total particle number concentration (96.8%).

Personal DPM exposure

The results of the DPM personal exposure data analysis (expressed as EC concentrations) are presented in Table 1 and Figure 5. There was a significant difference between the arithmetic mean EC concentrations before and after the installation of the DPFs to the TMM fleet (190 µg/m^3 and 8.9 µg/m^3, respectively, $p < 0.001$).

The GM of the personal EC exposure (concentration) after the DPF installation (5.5 µg/m^3) was significantly lower than that before the installation (43.0 µg/m^3), with an effectiveness of 87.2%. The upper



	1	2	3	4	5	6	7	8	9	10
Pre-filter	8.553	9.123	4.706	0.200	2.743	5.327	21.179	6.591	7.329	0.605
Post-filter	1.108	0.043	0.112	0.007	0.175	0.011	0.623	0.002	0.032	0.004
Effectiveness	87.0	99.5	97.6	96.4	93.6	99.8	97.1	100.0	99.6	99.3

Figure 2. Pre- and post-DPF system total particle number concentrations and effectiveness of the 10 TMMs

limit of the 95% CI of the EC concentrations was lower after, than before, the intervention, viz. 6.4 µg/m^3 and 63.0 µg/m^3, respectively. Table 1 shows that a larger proportion of personal exposures to EC exceeded the surrogate OEL of 100 µg/m^3 pre-installation of the DPFs (exceedance of 31%) than post-installation (exceedance of 0.15%).

The box plots of the distributions of the EC concentrations before and after DPF installation, as depicted in Figure 5, also indicate that the DPF system was effective in reducing EC concentrations below the surrogate OEL.

DISCUSSION

The installation of the DPF systems in the 10 TMMs was effective in that it resulted in significant mean reductions of 83.7% and 96.8% of particle mass and particle number concentrations, respectively. The particle number concentration mean was close to the original equipment manufacturer's (OEM's) claim of an effectiveness of around 99%.

These findings are similar to those from a study conducted within the SAMI and published in 2016, using similar retrofitted DPFs, in which the authors concluded that DPFs reduce particulate matter concentrations by more than 98%.[1] The effectiveness of the DPF system in reducing mass concentrations was, however, lower than its effectiveness in reducing particle number concentrations. This may have been due to the low pre-DPF system mass concentrations observed in TMM 1, 4, 5, and 10, which diluted the mean effectiveness. The reductions in the mass concentrations for these TMMs were poor, possibly because there was 'less mass to reduce' compared to the other TMMs. In their study, Giechaskiel et al. (2014) concluded that the mass measurements of total (not only solid) particle number concentrations are unsuitable for monitoring the performance of DPF systems. This is due to the methodology used for collection/measurements (i.e. real-time measurement of particle number concentrations and the uncertainty regarding the conversion of these results into mass concentration).[19]

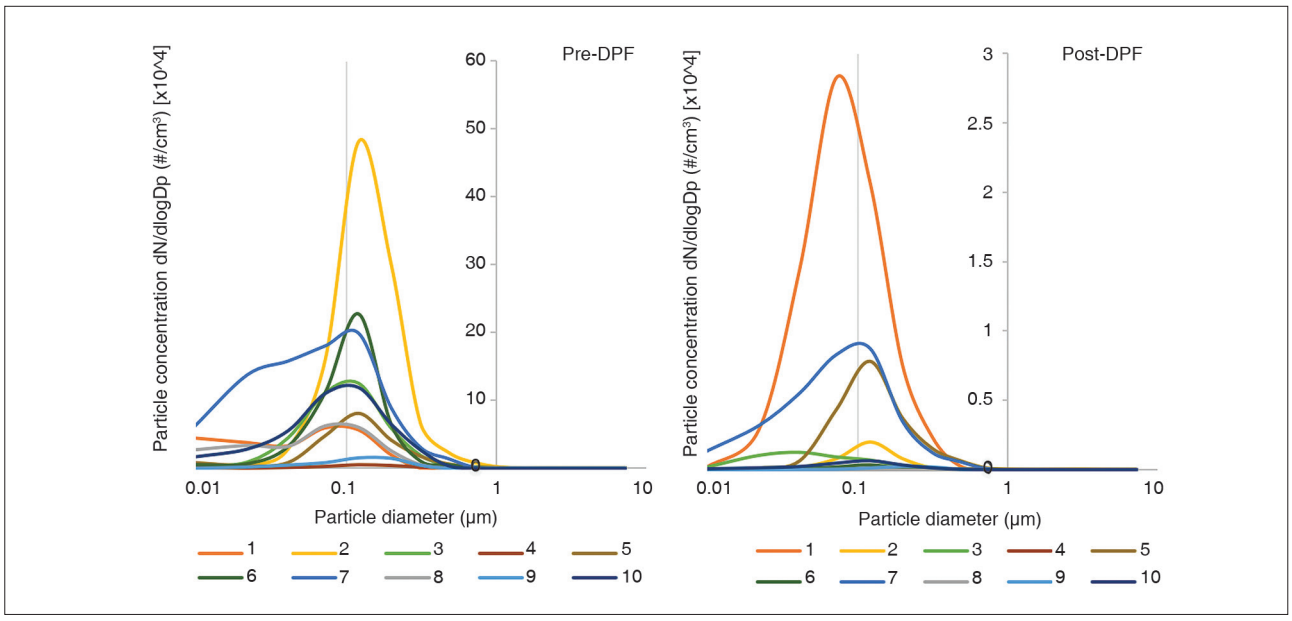
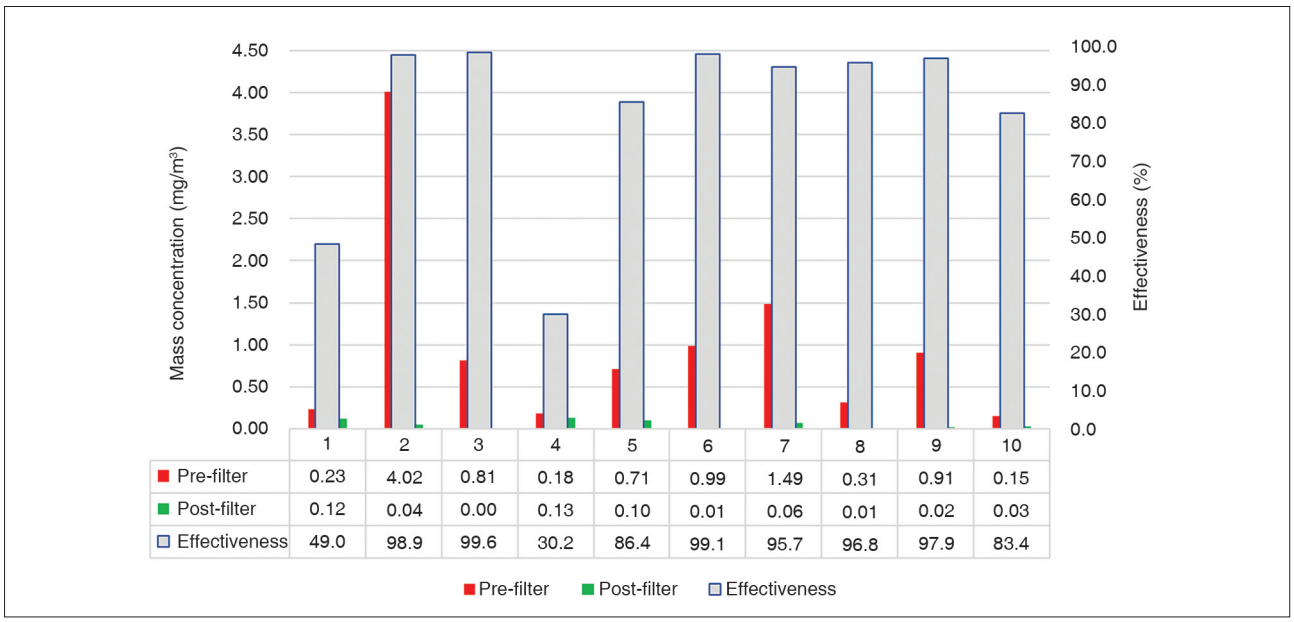


Figure 3. Particle size distributions for the 10 TMMs



	1	2	3	4	5	6	7	8	9	10
Pre-filter	0.23	4.02	0.81	0.18	0.71	0.99	1.49	0.31	0.91	0.15
Post-filter	0.12	0.04	0.00	0.13	0.10	0.01	0.06	0.01	0.02	0.03
Effectiveness	49.0	98.9	99.6	30.2	86.4	99.1	95.7	96.8	97.9	83.4

Figure 4. Pre- and post-DPF system total mass concentrations and effectiveness of the 10 TMMs

In terms of the size distribution, the majority of particles were around 0.1 µm in diameter in both the pre- and post-DPF system. Bugarski et al. (2009) and McGinn et al. (2002) demonstrated bimodal size distributions for engines retrofitted with DPFs, with a relatively large number of particles in the < 0.05 µm nucleation and ≥ 0.05 µm accumulation modes.[20,21] This is different from the unimodal size distribution we observed, viz. particles only in the > 0.05 µm accumulation mode. The reasons that we observed a unimodal distribution may be partly attributed to the different methodology applied. In previous studies, the measurement periods were longer, and different duty cycles and engine speeds in rpm were evaluated.

Although the difference in particle mass concentrations pre- and post-DPF system was statistically significant, with an effectiveness of 83.7%, relatively large numbers of particles less than 1 µm were emitted from the tailpipe. This could be related to the high temperatures of the emitted exhaust gases and particles, which affects the effectiveness of DPF filters in capturing the organic fraction and sulphate particles.[14] Additional research is essential to analyse the chemical composition of the particles and to understand how they behave, e.g. particle size changes due to agglomeration when released from the tailpipe, as well as the potential health risks from exposure to underground employees.

The difference in personal EC exposure concentrations before and after installing the DPFs was statistically significant. It is important to note that reduction in exposure may be affected by other factors, e.g. reduced occupancy of TMMs in underground activities, good ventilation rates or air volumes, movement of the wearer of the personal sampler, air direction, maintenance history of TMMs, etc. Bugarski et al. (2009) demonstrated that DPF systems significantly reduced the concentrations of airborne DPM dust (70%) and EC (90%).[20] McGinn et al. (2002) also reported efficiencies in removing EC particles, of about 98%.[21] This is consistent with our findings.

Our study had some limitations. First, the effectiveness of the TMMs was calculated from only one set of 'raw exhaust' and 'tailpipe' measurements per TMM. Multiple measurements per TMM would validate our results. Second, the comparison of mass concentrations is not recommended for measuring effectiveness as results can be biased by a few larger and relatively heavier particles. In addition, the conversion of particle number concentration to mass concentration assumes the default effective density for aerosols of 1 mg/µl.

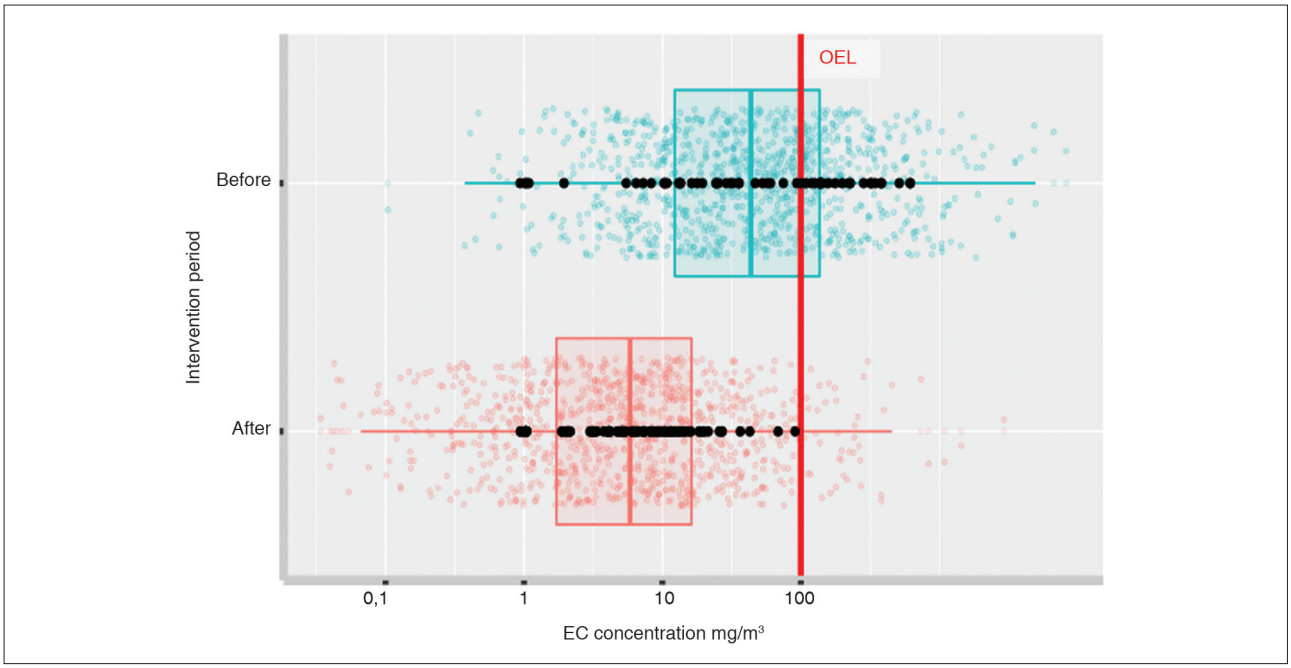
Furthermore, personal EC concentrations were used to evaluate the effectiveness of DPF systems in reducing exposures, rather than TC (combination of EC and OC). Although the mine's personal sampling programme for EC exposure was not designed to test the impact of retrofitting the TMMs, we used the data that were available, rather than collecting personal exposure measurements ourselves, due to limited resources.

Last, we did not measure OC or total carbon (TC) concentrations. It has been reported that EC and OC fractions vary from 33–90% and 7–49% of the particulate mass, respectively.[2,5] The concentration of

Table 1. EC personal air sampling results, before and after DPF retrofitting of TMMs

Parameter	Pre-intervention (n = 54)	Post-intervention (n = 118)
GM (95% CI), µg/m^3	43.0* (29.0–63.0)	5.6* (4.8–6.4)
GSD (95% CI), µg/m^3	5.6 (4.4–7.6)	2.6 (2.4–3)
Exceedance fraction (95% CI) (%)	31 (23–40)	0.15 (0.045–0.44)
Arithmetic mean (95% CI), µg/m^3	190* (110–390)	8.9* (7.6–11)
Effectiveness (based on GMs) (%)	87.2	

GM: geometric mean, GSD: geometric standard deviation, CI: credible interval
*p value < 0.001



EC: elemental carbon, OEL: occupational exposure limit

Figure 5. Box and whisker plot of personal DPM measurements, before and after DPF installation

OC is influenced by environmental factors, such as oil mist that results from poor hydraulic pipe management practices (e.g. oil leaks) in place. This is likely to increase the levels of OC detected in personal samples. It must be noted that, when measuring personal exposure, the OC concentrations may not be due entirely to emissions from TMMs. Therefore, taking direct tailpipe measurements and analysing OC may be more accurate and beneficial when quantifying TC concentrations.

One of the critical factors to consider when assessing the effectiveness of DPFs is their performance over time. It is assumed that the DPFs will deteriorate over time, and that particle filtration will be reduced. In our study, the measurements were taken, on average, 256 days after the installation of the DPFs. Good maintenance (i.e. cleaning of filters as per the OEM specifications, and adhering to the schedule and servicing of engines) will, however, ensure continued effectiveness.

Potential challenges that were identified during the study, regarding the introduction of DPF systems at the mine, should be considered by the SAMI when adopting this technology. 1) Retrofitting of DPF may require equipment modifications due to design differences between the DPF and TMM OEM design requirements. This may increase the installation costs and may also alter (reduce) the effectiveness of the DPF system. 2) Clogging of the DPF system by particles/non-combustible material may occur, causing increased resistance (engine back pressure), which may result in increased heat load or running temperatures, with a potential to damage the engine. It is therefore critical to ensure that the filters are scheduled for cleaning and maintenance as prescribed by the OEM to ensure that non-combustible materials are removed, and back pressure blockage is prevented at all times. 3) The filters are expensive, which may make it difficult for small mining companies to implement the system, especially taking into account that DPM exposure levels are currently not regulated in South Africa (i.e. there is no OEL).

CONCLUSION

Exposure to DPM in underground mining is an occupational health hazard. We assessed the effectiveness of retrofitted DPFs in reducing DPM emissions of diesel-powered trackless mobile machinery in an underground mine. The DPFs reduced total particle number and mass concentrations, and substantially contributed to the reduction of personal exposure to EC. The introduction of DPF systems across the SAMI would greatly contribute to reducing diesel exhaust emissions, and improving compliance with emission standards, thereby preventing adverse health effects as a result of over-exposures.

KEY MESSAGES

1. DPF systems significantly reduce DPM tailpipe emissions.
2. DPF systems mitigate against excessive personal exposures to underground airborne DPM.

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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AUTHOR CONTRIBUTIONS

Conception and design of the study: LL, DB
Data acquisition: LL, AM-M
Data analysis: LL
Interpretation of the data: LL, AM-M, DB
Drafting of the paper: LL, DB
Critical revision of the paper: LL, AM-M, DB

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Occupational health and safety challenges among artisanal and small-scale diamond miners in Kimberley, South Africa

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ABSTRACT

Background: Artisanal and small-scale mining (ASM) is a laborious process often executed with rudimentary low-technology mining equipment. It exposes miners to a myriad of occupational hazards, which may increase health and safety disparities between them and formally employed mine workers.

Objectives: The objectives of the study were to identify workplace hazards and the associated risks; and to assess the effects of mining activities on the health and environment of artisanal diamond miners in Kimberley, Northern Cape province.

Methods: This was an interdisciplinary observational ethnographic study. A workplace assessment was undertaken at seven sites in Kimberley. Participants were conveniently selected; snowballing was used to recruit additional participants. Field notes were recorded from observations. Interview questions included those about the duration of artisanal mining, and the risks faced in the workplace. Data collection included photographic documentation. An inductive and deductive process was used to analyse the data and thematic analysis was conducted.

Results: The observed occupational hazards included physical (ultraviolet radiation exposure, injuries due to trauma), respiratory (silica dust exposure), biomechanical (heavy lifting, repetitive movement), and psychological (work-related stress, anxiety) hazards. There was a paucity of access to, and use of, personal protective equipment (PPE). Workers improvised ways to protect themselves, e.g. by using cloths as masks. There was no recourse to formal occupational health services and social safety networks.

Conclusion: Occupational health and safety challenges included physical, biomechanical, respiratory, and psychosocial hazards. The mining activities had a detrimental impact on the environment.

INTRODUCTION

Kimberley is an historic diamond mining town located in the Northern Cape province of South Africa. The first diamond discovered in South Africa, named Eureka, was found in 1867 near Hopetown, 125 km from Kimberley. Mining activities over the years in Kimberley resulted in mine tailings being dumped throughout the city. An improvement in metallurgical processes resulted in the reprocessing of these tailings.[1] Running parallel to this, an 'illegal' artisanal small-scale mining (ASM) industry emerged. Large-scale mining (LSM) refers to formal highly industrialised mining, usually undertaken by large mining companies. Small- scale mining (SSM) refers to mining that combines mechanised and artisanal processing and is conducted by individuals or small companies. Artisanal small-scale mining refers to mining that is done by hand with rudimentary equipment, mainly by subsistence miners.

The mining and metallurgical processes and the rudimentary equipment used in small-scale mining predispose the miners to several hazards. The impact on the health of ASM communities is broad and complex.[2] Health issues such as sexually transmitted infections (including HIV), skin conditions, parasitic infections, tuberculosis, sinusitis, allergies, malnutrition, and heat stroke are not uncommon.[3,4] Silica dust exposure is toxic to the lungs and may predispose to pulmonary and respiratory disorders such as tuberculosis, aggravation of upper airway problems, e.g. sinusitis, and have latent effects including lung cancer.[5,6] Repetitive movements due to sieving and hauling heavy buckets of sand, and other activities, predispose the miners to biomechanical injuries.[5] ASM also exposes miners to psychological stressors.[5]

Social issues such as poverty, job insecurity, food insecurity, poor housing, lack of water and sanitation amenities, drug- and alcohol-associated health problems, and criminality further contribute to the burden of disease in these communities.[7] Women in these communities often experience gender-based violence, commercial sex exploitation, and the added burden of mining and attending to domestic responsibilities.[5] Child labour is common in ASM and poses a risk to the health and social development of children.[8]

The control of degradation and rehabilitation of the environment in the ASM sector is complicated by the lack of enforcement of regulatory and legal policies, e.g. issuing licences to artisanal miners so they can mine certain areas legally.[9] Destruction to the environment also poses an occupational hazard, resulting in risk of injuries.[10]

The study presented here forms part of a larger project, called *Eureka*, the main aim of which was to explore the public health and social impact of artisanal mining in Kimberley. *Eureka* was a transdisciplinary study, drawing on the disciplines of fine art, public health, and occupational health. The objectives of the study reported here were to identify workplace hazards and the associated risks; and to assess the effects of mining activities on the health

and environment of artisanal diamond miners in Kimberley. *Eureka* was undertaken by researchers who are both artists and academics, with experience in community art-based projects and public health medicine, respectively.

METHODS

The study comprised two parts, viz. an observational ethnographic study design with community participation, and a workplace hazard and risk assessment. This design was chosen because we wanted to conduct an exploratory study to understand the occupational context of the artisanal miners in an inductive and holistic way.[11] It was important for us to allow the mining community to be part of the process. This we achieved by having consultations with the mining community, followed by visits to speak to people that they identified for us.

The study was undertaken in Kimberley in the Northern Cape province of South Africa. A scouting visit was conducted in 2015 to identify potential study sites, after which we met with mining community members. We focused on three areas where artisanal mining activities were taking place, namely Samaria, Beefmaster, and Colville – the largest and longest-standing sites. Samaria and Beefmaster are the names given by the miners to the areas in which they were mining. They lie adjacent to each other and are separated by (fast-disappearing) mine dumps. These two areas rapidly developed into informal mining settlements from 2015 onwards. They are characterised by makeshift informal housing, no roads, water or sanitation infrastructure, and no health services. The Colville mining site is located in the immediate vicinity of a formal low-socioeconomic housing neighbourhood. All three areas are characterised by mine tailings that have been dumped in the area from formal mining activities, over decades. We visited four other areas where artisanal mining was being conducted, viz. Green Point, Floors, Square Hill Park, and Gum Tree. The seven study sites were purposively selected because they were the main sites where artisanal mining was taking place. Figure 1 illustrates where the mining areas are located within the municipality limits of Kimberley.

The study population comprised artisanal miners at the mining sites, community leaders, and people living in the mining community who were not directly involved with mining, e.g. spouses, and included both South African citizens and undocumented foreign nationals. The miners are highly mobile. Some have been part of the mining community for several years but, in general, during the study period, people had worked there for no more than two to four years. Miners came to prospect and later left, either because they did not gain the anticipated wealth, or because they found other employment opportunities.

In 2015, there were 100 to 200 people mining at the seven sites combined. This number steadily increased over the years and, by March 2022, the estimated number of people living in Beefmaster and Samaria was 2 000–3 000, of which at least a quarter were engaged in mining.

These communities are largely 'invisible', difficult to reach, and covert. Study participants were conveniently selected when a site was visited, and we used snowballing to recruit additional participants. We included miners who were South African, undocumented miners, and people living at the sites who were not actively mining. We interviewed participants until we reached data saturation.

Data collection

We collected data from participants, using an interview guide (Supplementary Appendix A). We asked where they came from, how long they had been working there, why they were working there, the perception of the risks to their health and safety, and how they thought their workplace safety could be improved.

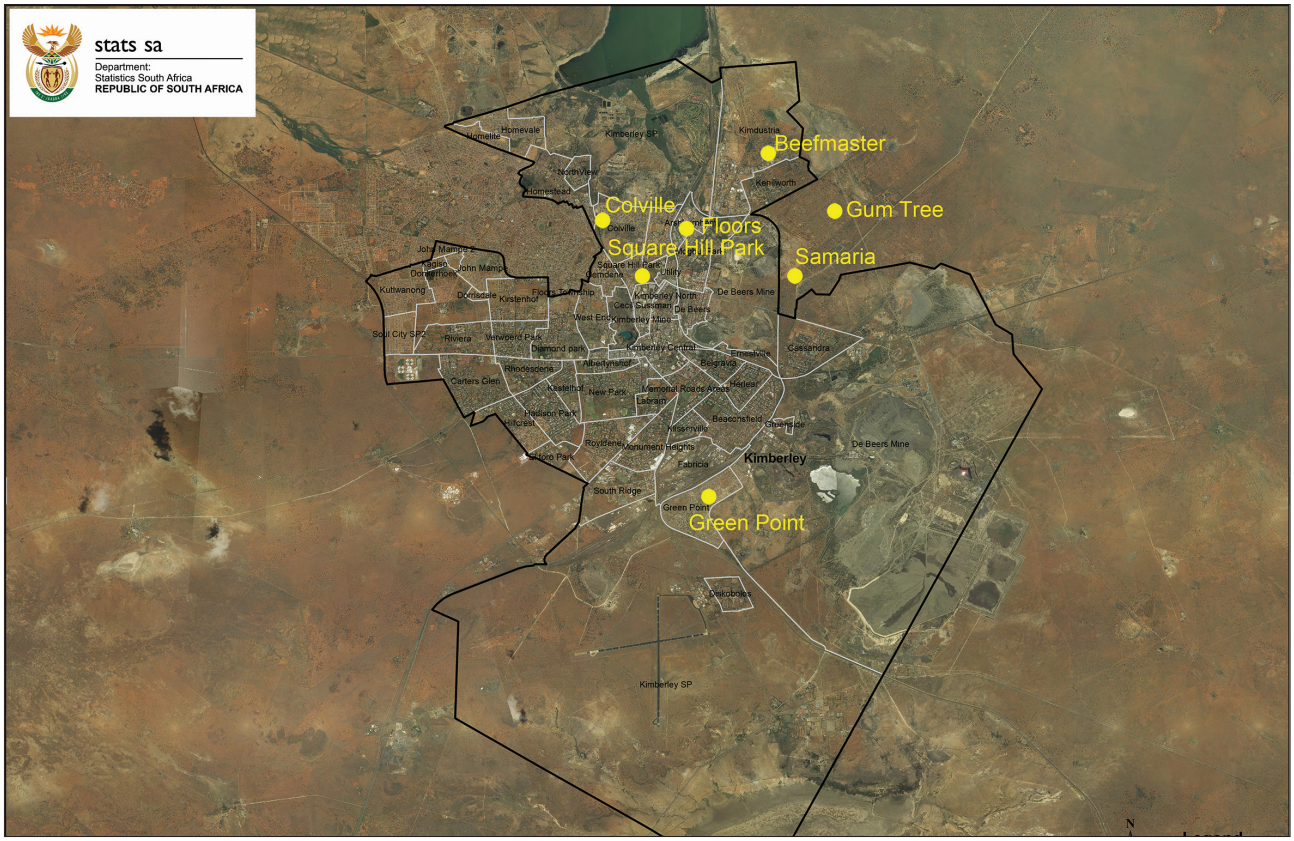


Figure 1. Map of Kimberley, indicating artisanal mining areas
(Source: Statistics South Africa)

We conducted a workplace hazard and risk assessment using a modified tool from the National Institute for Occupational Health (NIOH)[12] and the the UK Health and Safety Executive's (HSE's) 5-Step Risk Assessment.[13] Although these tools were developed for a formal industrialised work process, the hazards and risks in artisanal mining are similar. This modified tool allowed us to assess what physical, chemical, respiratory, and/or psychological hazards were present in the workplace, and to quantify the health and safety risks.

Data were collected from 2015 to 2022 during 10 site visits. We restricted visits from early 2020 to late 2021 due to the COVID-19 pandemic lockdown restrictions. During the initial visits we spoke to people in the mining community, getting to know who they were and what they were doing, identifying the community leaders, and observing the miners at the mining sites. The workplace assessments and interviews were conducted at different times – in 2016 and 2017, and between 2015 and 2022, respectively.

Community leaders held meetings and obtained permission for us to work in the mining community. As we developed rapport with the community members, they started sharing their experiences and challenges. We conducted individual in-depth conversations and group discussions with two to three people who were working together at a claim. Most of the interviews were conducted at Beefmaster and Samaria because these were the larger sites. In total, we interviewed 30 people over a seven-year period. We spoke mainly to the miners, but also to people in the mining community who were not actively mining.

We recorded our findings in field notes and with photographs. We triangulated our data, using media to further inform us of what was happening in this community. The community leaders periodically contacted us to share information about what was happening in the community.

We conducted workplace assessments on two occasions, in 2016 and 2017, using the modified tool described above.

We also did a 'walkabout' at three sites, using a tick sheet as a guide. These three sites were the largest of the seven, as mentioned. Additionally, the Green Point and Square Hill Park sites were no longer operational, and the others were not yet established, at the time of the assessments in 2016 and 2017.

The study was approved by the Health Sciences Research Ethics Committee of the University of the Free State (HSREC121/2015). All participants were repeatedly informed that this was a research project; the nature of the project was explained to them, and verbal consent was given by them to include their experiences and images in the study.

Data analysis

A thematic analysis was done using deductive and inductive approaches. We decided on the themes based on the literature (deductive approach) and allowed themes to emerge from the data (inductive approach). We worked together to refine the themes and to agree on which ones should be included.[14] Risks were quantified as severe (fatal or severe disability), moderate (recovery within 14 days), and negligible ('near miss' or unlikely to happen). The exposure was quantified as unlikely, possible, or likely. The risk was calculated as the product of the consequence of the risk and the likelihood of exposure.

RESULTS

Interviews

The participants reflected on a variety of issues, which we grouped into themes, such as hope and dreaming, impact on the environment, and health and safety. Hoping and dreaming for a better future emerged strongly among all the participants.

"I want to build a house and I want to open a shop, a big shop like a supermarket." P5, Beefmaster

The majority of participants reflected that the work they were doing was very difficult and labour intensive, but they felt they had few other options. They stated that they felt compelled to be working there because of high unemployment rates.

"There are no jobs. I have to feed my family and I don't want to steal to feed them." P8, Samaria

The participants did not think that they were destroying the environment by their mining activities.

"We don't destroy the veld, it's the big mining companies that destroy the environment. They have big machines, and they destroy it [the environment] *we use spades to dig up the soil and everything* [the veld] *grows back again."* P11, Beefmaster

Women reported high levels of stress related to gender-based violence and fear that they would not be able to provide for their children.

"I am afraid they will attack me at night. It's very dark here, there are no lights. The men get very drunk, it's not safe." P4, Samaria

A major theme that emerged was the poor use of personal equipment.

"I have gloves. I use the gloves because the work is 'rof' [rough]. *The rocks hurt your hands. But you can see the gloves are broken. I can't buy new gloves every time."* P3, Beefmaster

"We don't use masks. There is a lot of dust but where must we get the masks from?" P7, Samaria

"I used to work in the mines and I have this mask but you can see the dust is already thick." P12, Gum Tree

Another theme was occupational hazards.

"This is not easy work but you don't get injured and I don't use anything to protect me. I don't think it's necessary." P4, Samaria

"I have never seen anyone trip and fall into these holes. I don't think it happens a lot. Me, I have not seen anyone get hurt here." P11, Samaria

"The main problem here is the heat. It gets very hot but what can you do you have to work." P9, Beefmaster

"The work is so stressful. You hope you will find something, maybe just to eat. The work is hard and people they make too much noise at night, and it is hot in the house and you cannot sleep properly. It is just too much." P3, Samaria

Workplace assessment

The findings from the workplace assessments were similar in 2016 and 2017. There was a medium risk of trauma from the mining as all activates were on the surface, and the holes dug were generally not deep enough to pose an imminent risk to the workers

Table 1. Workplace hazard and risk assessment across three mining sites (Samaria, Beefmaster, and Colville) in Kimberley, 2016 and 2017

Risk matrix		**Likelihood of exposure (L)**		
		Unlikely: Highly improbable	**Possible:** May be experienced once a year by an individual	**Likely:** May be experienced once or twice a year by an individual
Consequence of exposure (C)	**Severe:** Fatal or permanent disability	**Medium**	**High**	**Very high**
	Moderate: Recovery within 14 days	**Low**	**Medium**	**High**
	Negligible: Near miss or unlikely to happen	**Very low**	**Low**	**Medium**

Risk Assessment								
Hazard	Task/activity	Health effect	Final risk level (R)*					
			Very low	Low	Medium	High	Very high	
Physical/biomechanical								
Trauma	Crushing agglomerate, falling into holes and trenches	Ocular injury, soft tissue injury, fractures						
Repetitive movements	Sieving, hauling	Joint and soft tissue inflammation						
Heavy lifting	Hauling extract	Back pain						
UV radiation	Sun exposure	Sunburn, skin cancer (long term)						
Heat exhaustion	Exposure to the environment	Fatigue, electrolyte disturbances						
Respiratory								
Silica dust exposure	Dust generated by sieving	Sinusitis, respiratory diseases, silicosis, lung cancer (long-term)						
Psychological								
Work-related stress	General mining activities	Anxiety, fatigue, sleep disorders, decreased concentration, work injuries, interpersonal relationships, conflict, substance and alcohol misuse and abuse, gender-based violence						
Anxiety								
Burnout								

*C x L (consequence of exposure x likelihood of exposure)

(Table 1). There was the potential for trauma because of the use of rocks for crushing conglomerate, and resultant flying objects that could cause ocular trauma. The repetitive movements of digging, hauling, and sifting resulted in shoulder girdle muscular pain and tension. The exposure to ultraviolet (UV) radiation and excessive heat meant that the workers are at high risk of heat exhaustion. The risk of poor mental health was rated high because of activities related to living and working conditions.

Observations

The study sites comprised dry surface diggings; no underground mining was observed. The mining was done mainly by men. A few women performed labour directly related to mining but were primarily involved in domestic activities at the mining settlements. We did not observe any children directly involved in the mining process. There were many migrant workers: miners included South African citizens from across the country (North West, Western Cape, Eastern Cape, and Free State provinces), and workers from Malawi, Lesotho, Mozambique, and Zimbabwe. Mining activities resulted in soil excavation resulting in soil erosion, and destruction of the natural vegetation. There was no evidence of environmental rehabilitation by the artisanal miners. There was no access to reliable water sources, sanitation, or health services (including occupational health services).

The extractive process at the Kimberley mining sites entails excavating individual mining claims, which are usually no more than 2 m^2 (Figure 2). The excavated soil is hauled to an adjacent site for sieving, breaking up bulky conglomerates using hammers or rocks, and then sorting the extracted ore by hand (Figures 3 and 4). The extractive process at these sites was conducted primarily using hand shovels and pickaxes, rough wooden frames for sieving, and large (usually 20 litre) plastic buckets for hauling sand (Figure 5). The equipment was rudimentary and handmade, with no mechanisation. Some tools were either handmade or were improvisations. For example, rocks or bricks were used to crush agglomerate (Figure 6).

There was a dearth of protective clothing and other personal protective equipment (PPE) such as gloves, eye protection, and dust masks. The majority of 'zama zamas' (artisinal mine workers) did not wear any respiratory protection (Figure 4). The was a paucity of individual and collective protection against hazards, e.g. there were many open holes and trenches that had been dug out (and that filled up with water when it rained) (Figures 7 and 8). In the case where dust masks were worn, they were either makeshift masks made from cloth or were inappropriate and ill-fitting masks, covered with a thick layer of dust, and most likely ineffective against respirable dust.

The photographs we collected illustrate major occupational health and workplace challenges. In Figures 3 and 4, exposure to dust is illustrated; no respiratory PPE is used. Figures 2 and 5 illustrate the low-technology equipment used. Figure 6 shows the use of gloves, and a brick to crush the agglomerate. Figures 7 and 8 illustrate the safety hazard that open ditches and pits posed to workers, children, and others in the communities.



Figure 2. Low-technology mining equipment (2018) (Square Hill Park) *Photograph: André Rose*



Figure 3. Dust exposure from sieving (2018) (Square Hill Park)
Photograph: André Rose



Figure 4. Dust exposure from sieving, lack of respiratory PPE (2018) (Square Hill Park) *Photograph: André Rose*



Figure 5. Buckets used for hauling (2018) (Square Hill Park)
Photograph: André Rose



Figure 6. Gloves used as PPE; brick to crush agglomerate (2018) (Square Hill Park) *Photograph: André Rose*

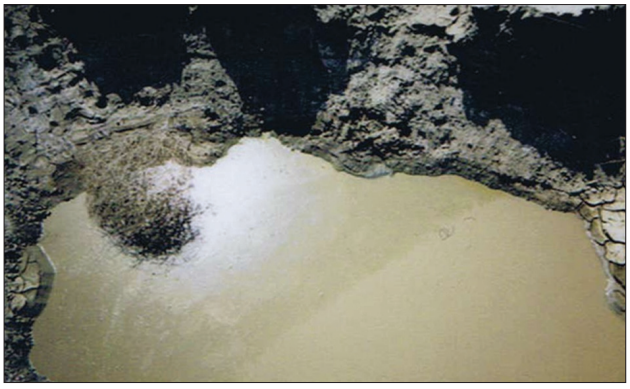


Figure 7. Water-filled ditches posing hazard for injury (2022) (Beefmaster) *Photograph: Janine Allen-Spies*



Figure 8. Deep open pits posing a hazard for injury (2022) (Colville)
Photograph: Janine Allen-Spies

DISCUSSION

Artisanal and small-scale mining is plagued by a myriad of challenges, including geology (poor access to quality-ore bodies), technology factors (no access to safe or mechanised equipment), human resources (unskilled labour force), finances (little or no access to formal capital investment), and absent marketing (lack of access to formal markets).[10,15] These mining communities often lack structured organisations to guide and monitor mining activities, which may be fractured within the communities when they do exist.[10] Furthermore, ASM communities are exposed to exploitation by highly organised (criminal) syndicates.[16] Similar to Ledwaba (2017),[15] we observed all of these challenges in the mining communities we studied.

Mining activities are often conducted under precarious circumstances and the hazards may pose low to high risks, and may even be fatal.[17] These risks may be mitigated through a hierarchy of control measures, which range, in decreasing effectiveness, from elimination, substitution, engineering controls, and administrative controls, with the least effective being the use of PPE.[18] The risks may be exacerbated in ASM operations because of a lack of access to mitigating resources. The mining communities had minimal protective measures in place and had few or no resources that could ensure safer workplaces.

Substitution, engineering, and administrative controls could be effected if the 'zama zamas' had access to knowledge from large-scale mining (LSM) and Government structures, such as the Department of Mineral Resources and Energy (DMRE) and the Department of Employment and Labour (DEL).[10] Large-scale mining companies could play an important role in improving mining health and safety in ASM operations by granting these miners access to their services through, for example, corporate social responsibility initiatives.[19] There were, however, no opportunities created for the ASM and LSM parties to engage with each other to facilitate such debate. This may be a consideration for negotiation between the two entities.

The psychological risk in the ASM communities was assessed as high. The lifestyle and occupational stressors of ASM interact, resulting in psychological stress, anxiety, depression, and sleep disorders.[4] The psychological impact on health may also manifest physically.[10] Large-scale mining companies often have well-established employer wellness services and there may be an opportunity for them to extend these services and programmes to ASM communities.

Our workplace risk assessment rated physical trauma and biomechanical injuries as a medium risk. The artisanal miners were only engaged in surface operations, which significantly reduced their occupational safety risks. This risk could, however, be further reduced with simple control measures, such as availing LSM engineers to help the ASM miners re-engineer their equipment, the mechanisation of some processes, and availing micro-financing to purchase safer equipment.[3] Hauling heavy bucket loads of sand, for example, could be improved by introducing pulley systems. Training in ergonomics could reduce repetitive movements injuries.[20] Although there was a medium risk for trauma, the risk could be further mitigated by formalised staking of claim sites, to avoid slips and trips into holes and trenches.

PPE utilisation is the least effective way to mitigate risk, but it offers an opportunity to reduce health and safety risks in these workplaces. The inaccessibility to protective eye wear, dust masks, gloves, and safety boots potentiates the likelihood of injury among these miners. Accessibility is, however, not the only factor to be considered, as poor PPE compliance is often a bigger hurdle.[3] Access, cost, and education on the use of PPE is a roadblock to improving health and safety in ASM communities.[3] It would be prudent if the DEL and the DMRE conducted a cost benefit analysis on how financing the hierarchy of controls[18] in ASM communities could alleviate the burden of disease and be cost saving to the health system.

Respirable crystalline silica (RCS) dust particles may cause pulmonary disease (bronchiolitis, obstructive lung disease, and silicosis), kidney disease, and lung cancer as RCS is a recognised carcinogen.[21] These diseases often have long latency periods and may only present years after the 'zama zamas' have stopped mining. Silica dust exposure may result from inhalation of dust from digging and sieving processes. Exposure to RCS was assessed as a very high risk and steps need to be taken to reduce this.

Silicosis and other occupationally related diseases and injuries are compensable in South Africa.[21,22] The 'zama zamas', however, have little recourse for compensation as they are regarded as illegal workers and, in most cases, they do not have an employer contributing to the Compensation Fund. Miners from outside South Africa may return to their home countries, thereby transferring the health burden.[23] Occupational diseases, injuries, and fatalities may push people further into poverty because they have to pay for health services, and are not able to work with the added burden of disease. This further widens the health equity gap.

Artisanal and small-scale mining is a complex adaptive ecosystem, which is impacted by a myriad of complex interactions such the social determinants of health, environmental factors, demographic shifts, and economic paradigms, which interact in a non-linear fashion.[5,24] The transformation needed to reform the ASM sector must consider the complex ecology of the sector. The United Nations (UN) Sustainable Development Goal 8 (SDG 8) focuses on three issues: economic growth, productive employment, and decent work.[25] Artisanal and small-scale mining presents an opportunity to assist in meeting the objective of alleviating poverty by increasing employment opportunities.[8] It can also reduce rural-urban migration movement by offering communities sustainable opportunities in rural areas. The social consequences of ASM are probably the most devastating impact on these mining communities.[7] Developing the contribution that this sector can make to economic growth could help reduce the impact of the social determinants of health on these communities.[1] Synergy between ASM and LSM has the potential to transform the ASM sector, and help alleviate unemployment and improve the socioeconomic status of ASM communities. This can have positive ripple effects on these community members' health. The complex interactions identified in the study included the interaction between the need to work and the roadblocks that the 'zama zamas' experienced in creating a safe workplace.

The trustworthiness of the study was supported by fact that the findings are congruent with what is reported in the literature, and that the researchers are experienced in community-based research. Furthermore, one of the researchers is a public health medicine specialist with experience in occupational health and workplace assessments. The researchers developed rapport with specific miners and community leaders over the study period, and connected with them when they conducted repeat visits, adding weight to the credibility of the findings.

The views expressed by the participants are unique to them and, therefore, the findings might not be generalisable to other artisanal miners. There are no validated tools for assessing hazards in informal mining and so we adapted a tool used for formal industrial processes, which is another limitation of this study. However, a strength of the study is the transdisciplinary approach, which offered a multifaceted

perspective on this complex issue. There is a paucity of data on diamond ASM communities, to which this study contributes.

Future research should consider a mixed-methods approach, using qualitative methods to further explore the challenges that ASM communities face, and quantitative methods to assess the impact that occupational activities have on the miners' physical and mental wellbeing. Future studies should also extend to at-risk populations within these communities, e.g. women, children, and undocumented miners. Regulatory and legal frameworks need to be reformed to protect artisanal miners.

CONCLUSION

The 'zama zamas' in Kimberley face occupational health and safety challenges, which include physical and biomechanical, respiratory, and psychosocial hazards. They were at risk of joint and soft tissue injuries due to repetitive motions; dust exposure placed them at risk for upper respiratory diseases, and silicosis. The work environment resulted in high levels of stress and anxiety, which can affect mental wellbeing. There were also risks of trips and falls. Mining activities had a detrimental impact on the environment. The complexity of artisanal mining, and the various factors that are deterministic to health and safety in these communities, requires a multipronged intervention.

KEY MESSAGES

1. ASM is a complex ecosystem in which workplace hazards and risks can have detrimental consequences on the immediate and long-term burden of disease of these communities.
2. There are several hazards faced by artisanal miners in the Kimberley area, including physical, respiratory, and psychological hazards.
3. The occupational health and safety challenges in ASM are similar to those in LSM.

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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AUTHOR CONTRIBUTIONS

Conception and design of the study: AR, JA-S
Data acquisition: AR, JA-S
Data analysis: AR, JA-S
Interpretation of the data: AR, JA-S
Drafting of paper: AR
Critical revision of the paper: AR, JA-S

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Work-related adult-onset atopic dermatitis: two illustrative case reports

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ABSTRACT

Atopic dermatitis, a chronic recurrent inflammatory skin disease, typically occurs in childhood, but also affects 1–3% of adults. Adult-onset atopic dermatitis has been described and accepted as an entity, and does not necessarily conform to the criteria tabled in the various guidelines published in the literature. Workers with occupational dermatitis in Gauteng are referred to the National Institute for Occupational Health. Of those diagnosed with contact dermatitis, many are also deemed to have atopic dermatitis. We present two cases that were initially diagnosed as occupational contact dermatitis but were then shown to have adult-onset atopic dermatitis. In these patients, the condition was chronic, recurrent, and persisted after removal from the workplace. They did not have pre-existing atopic eczema and the eczema seemed to be precipitated by factors in the work environment. The condition forced both patients to stop working. Both were resistant to normal treatment with topical emollients and steroid creams; one was also resistant to immunosuppressive drugs. Newer biological drugs are registered in South Africa for the treatment of atopic dermatitis but are not affordable for the majority of patients. These patients illustrate the problem with adhering strictly to the literature guidelines when diagnosing atopic eczema in day-to-day practice. They also illustrate the possibility of adult-onset atopic eczema in an occupational setting. In both our patients, work factors seemed to precipitate its development, and they were initially diagnosed with occupational contact dermatitis.

INTRODUCTION

Patients presenting with dermatitis to the dermatology clinic at the National Institute for Occupational Health (NIOH) are routinely tested with patch tests for contact dermatitis, and with skin-prick tests. Immunoglobulin E (IgE) and Phadiotop™ screening are considered as alternative tests to indicate atopy.[1]

Of 327 patients with hand dermatitis referred to the NIOH, 94 (28.2%) were thought to be atopic on the basis of their clinical presentation and positive skin-prick tests and/or raised IgE and radioallergosorbent (RAST) mixed inhalant allergy screen (Phadiotop™) (unpublished data). There was often no clear history of previous personal or family atopy. The eczema (or dermatitis) was bilateral and symmetrical but not necessarily flexural. The condition was often chronic, in that it continued after removal from the workplace, was recurrent, and the skin-prick tests remained positive.

Atopic dermatitis is a chronic recurrent inflammatory skin disease, typically occurring in childhood, and affecting 15–20% of children and 1–3% of adults.[2] Although children tend to outgrow it, it may persist into adulthood. In 2000, Banister and Freeman coined the term 'adult-onset atopic dermatitis',[3] after reviewing patients attending a contact dermatitis clinic and discovering that 9% had developed atopic dermatitis for the first time after the age of 20 years. A systematic review and meta-analysis published in 2019 concluded that approximately one in four adults with atopic dermatitis report adult-onset disease,[4] which is associated with different morphologic and historical characteristics than those exhibited in childhood-onset atopic dermatitis.

The diagnosis of atopic dermatitis for epidemiological and drug studies has been guided by several sets of criteria. In this paper, seven of these guidelines are discussed. The most-often cited criteria are those of Hanifin and Rajka (1980), [5] listed in Table 1. This guideline comprises four major criteria, three of which are necessary for the diagnosis of atopic dermatitis, and 23 minor criteria, an additional three of which are required for the diagnosis.

Over the years, there have been several modifications to these criteria (Tables 2–6). The United Kingdom (UK) Working Party criteria are recommended in the South African atopic dermatitis management guidelines of 2008.[8]

In summary, all guidelines list pruritus and an eczematous eruption as essential features for the diagnosis of atopic eczema. All mention a chronic and relapsing course. The distribution, i.e. flexural eczema in adults, is a major or essential criterion in the guidelines of Hanifin and Rajka 1980 (Table 1),[5] Hanifin 2001 (Table 2),[6] the UK Working Party 1994 (Table 3),[7] and the American Academy of Dermatology 2014 (Table 3),[9] but it is not listed in the Japanese 2020 (Table 5)[10] or Chinese 2016 (Table 6)[11] criteria.

Early onset (childhood) is a minor criterion in the Hanifin and Rajka guideline,[5] an important but not essential criterion in the Hanifin guideline,[6] a major criterion in the UK Working Party guideline,[7] and an important but not essential criterion in both the American Academy of Dermatology guidelines[9] and the Japanese criteria.[10] It is not mentioned in the Chinese criteria, however.[11] If this criterion is strictly adhered to it, may be impossible to diagnose atopic eczema in adults.

Table 1. Hanifin and Rajka diagnostic features of atopic dermatitis (1980)[5]

Major criteria (≥ 3 required for diagnosis)	
1	Pruritus
2	Typical morphology and distribution • Flexural lichenification in adults • Facial and extensor involvement in infancy
3	Chronic or chronically relapsing dermatitis
4	Personal or family history of atopic disease (asthma, allergic rhinitis, atopic dermatitis)
Minor criteria (+ ≥ 3 required for diagnosis)	
1	Xerosis
2	Ichthyosis/palmar hyperlinearity/keratosis pilaris
3	Perifollicular accentuation
4	Cheilitis
5	Immediate (type 1) skin test reactivity
6	Elevated serum IgE
7	Early age of onset
8	Tendency to cutaneous infections (especially *Staphylococcus aureus*) and Herpes simplex/impaired cell mediated immunity
9	Tendency towards non-specific hand and foot dermatitis
10	Nipple eczema
11	Pruritus with sweating
12	Anterior subcapsular cataracts, keratoconus
13	Recurrent conjunctivitis
14	Perifollicular accentuation
15	Infraorbital and anterior neck folds
16	Orbital darkening
17	Pityriasis alba
18	Facial pallor or erythema
19	White dermographism/delayed blanch to cholinergic agent
20	Intolerance to wool and lipid solvents
21	Food intolerance
22	Course influenced by environmental and emotional factors
23	Food sensitivity

Table 3. The United Kingdom Working Party's diagnostic criteria for atopic dermatitis (1994)[7]

For the diagnosis to be made, an individual must have an itchy skin eruption, or parental report of scratching or rubbing in a child, together with:	
1	History of flexural involvement (elbow folds, behind the knees, front of ankles, around the neck, and the cheeks in a child younger than 10 years)
2	Personal history of hay fever or asthma (or history of atopy in a relative) in a child younger than 10 years
3	History of generalised dry skin in last year
4	Visible flexural eczema – or on the cheeks, forehead, and outer limbs in children younger than four years
5	Onset before the age of two years

Table 5. Japanese guidelines for atopic dermatitis (2020)[10]

1	A pruritic eczematous dermatitis, which fluctuates with remissions and relapses
2	Starts in childhood and may persist into adulthood
3	Personal or family history of atopy and/or total IgE level and allergen-specific IgE antibody levels are raised; IgE tends to increase with disease severity

Table 2. Hanifin's simplified inclusive and internationally applicable clinical criteria for atopic dermatitis complex (2001)[6]

Essential features	
1	Pruritus
2	Eczematous changes: a) typical and age specific patterns (see 'features' below) b) chronic relapsing course
Features that must be present and, if complete, are sufficient for the diagnosis	
1	Facial neck and extensor involvement in infants and children
2	Current or prior flexural lesions – adults and children
3	Sparing of groin and axillary regions
Important features (seen in most cases)	
1	Early age of onset
2	Atopy (IgE reactivity)
3	Xerosis
Associated features (clinical associations)*	
1	Atypical vascular response
2	Keratosis/hyperlinearity/ichthyosis
3	Ocular and periocular changes
4	Perifollicular changes
Exclusions	
	Other conditions, e.g. psoriasis, seborrheic dermatitis, and allergic contact dermatitis should be excluded before a firm diagnosis of atopic dermatitis can be made

* These features suggest the diagnosis but are too non-specific to define or detect atopic dermatitis for research and epidemiological studies

Table 4. American Academy of Dermatology guideline (2014)[9]

Essential features	
1	Pruritus
2	Eczema (acute, subacute, chronic) • Typical morphology and age-specific patterns* • Chronic or relapsing history
Patterns* include:	
1	Facial neck and extensor involvement in infants and children
2	Current or previous flexural lesions in any age group
3	Sparing of the groin and axillary regions
Important features	
1	Early age of onset
2	Atopy – personal and/or family history
3	Immunoglobulin E reactivity
4	Xerosis
Associated clinical features*	
1	Atypical vascular responses (facial pallor, white dermatographism)
2	Keratosis pilaris/pityriasis alba/hyperlinear palms/ichthyosis
3	Ocular periorbital changes
4	Perifollicular accentuation/lichenification/prurigo lesions
Exclusionary conditions**	
1	Seborrheic dermatitis
2	Contact dermatitis
3	Cutaneous T cell lymphoma
4	Psoriasis
5	Scabies

* Help to suggest the diagnosis of atopic dermatitis but are too nonspecific to be used for defining or detecting atopic dermatitis for research and epidemiologic studies

** Not exhaustive

Table 6. Chinese criteria for atopic dermatitis (2016)[11]

1	Symmetrical eczema for more than six months (mandatory)
2	Personal or family history (for up to three generations) of atopic disease and/or elevated serum levels of total IgE and/or allergen-specific IgE and/or eosinophilia

A personal or family history of atopic disease (asthma, allergic rhinitis, atopic dermatitis) is an essential criterion in both the Hanifin and Rajka[5] and the UK guidelines,[7] and an important criterion in the Hanifin[6] and the American Academy of Dermatology guidelines.[9] It is also listed in the Japanese[10] and Chinese[11] guidelines.

IgE reactivity is a minor criterion in the Hanifin and Rajka guidelines,[5] and is regarded as important in the Hanifin[6] and the American Academy of Dermatology guidelines.[9] It is not mentioned by the UK Working Party,[7] but is stressed in the Japanese and Chinese guidelines,[10,11] where it is of equal importance to a personal or family history of atopy.

Several systems for scoring the severity of atopic dermatitis have been developed. The three systems that are now regarded as having good validity for treatment assessment studies are: 1) the Eczema Area and Severity Index (EASI) (1998), 2) the SCORing Atopic Dermatitis (SCORAD) system (extent, area of involvement, and intensity of six clinical signs) (1993), and the Patient-Oriented Eczema Measure (POEM) (2004), as cited in Ricci et al. (2009).[12]

In a review article, published in 2017, Salvador et al. stressed that adult-onset atopic dermatitis does not fit the diagnostic criteria that were developed for children.[13] The authors stated that *"the diagnostic power of an experienced clinician is superior to all available diagnostic criteria, although standardized criteria are needed for epidemiological research and for clinical trials"*.[13] The same is true for the severity scoring.

Ethics clearance to publish this paper was obtained from the University of the Witwatersrand's Human Research Ethics Committee (clearance certificate no. 2111167). Informed consent to publish the case reports was obtained from the two patients.

CASE REPORTS

Case 1: Dr KL

Dr KL, aged 39 years, presented with dermatitis on his fingers, palms, and dorsa of both hands, which started in 2018, one year prior to his consultation. He graduated from university in 2005 and had worked as a dentist since then. He had always worn gloves – latex gloves at first and then accelerator-free nitrile gloves. He sweated heavily under the gloves and even thin cotton liners quickly became soaked with sweat. New gloves were donned for each patient. The wearing of gloves was considered to be an absolute necessity for dental work, especially in the context of the HIV epidemic. He complained of intolerable itching and discomfort, which made his working life a misery. He had no direct contact with dental materials. He was atopic as he suffered from seasonal asthma and hay fever. He had not, prior to 2018, suffered from eczema of any kind. Examination showed severe vesicular dermatitis of the palms and scaly eczema on the dorsa of his fingers and palms (Figure 1). A biopsy showed spongiotic dermatitis and irregular psoriasiform hyperplasia, consistent with irritant dermatitis.

On skin-prick testing, he reacted to two allergens, viz. house dust mite and plane tree pollen. His IgE was raised to 143 IU/ml (normal 0–100 IU/ml). He was patch tested with the rubber series as well as the dental series; the tests were negative. The default diagnosis was irritant contact dermatitis from wearing gloves and sweating.

Attempts were made to control the sweating, using Dry Chlor and tap water iontophoresis, but these treatments were not effective. The use of Botox® would have been prohibitively expensive. Sympathectomy was considered but rejected by the patient.

On stopping work temporarily for three months, his hands recovered, but he experienced a relapse on his return to work. He completed the POEM questionnaire, which consists of eight questions with emphasis on the symptoms, distress, and discomfort caused by the disease. He scored 26 points out of a possible 28. He stopped working and claimed, with success, permanent disability insurance.

After four months of not wearing gloves and using mometasone furoate cream under occlusion for two weeks, followed by maintenance with tacrolimus cream, his hands recovered to a large extent and his POEM score reduced to 3/28. However, the dermatitis, at the time of writing, although much improved, had not cleared completely.

The diagnosis, on the basis of the chronic recurrent nature of the hand dermatitis, his personal history of asthma and hay fever, and the fact that allergic contact dermatitis had been excluded by negative patch tests to the dental series, was adult-onset atopic dermatitis, precipitated by the irritation of the sweat and moisture accumulation under the gloves he had to wear for his work. He had never had flexural eczema. The topical steroids were partially effective, but he relapsed as soon as he resumed wearing protective gloves and was therefore unable to continue in his profession. He successfully applied for permanent disability and was able to find alternative employment that did not require the use of gloves.

Case 2: Mr DG

Mr DG, aged 48 years, presented in July 2016, complaining of having had skin irritation on his legs for the previous eight years. It had recently spread further on his body. He was a motor mechanic and wore overalls but no gloves. He stated that his hands were always covered with oils and greases, as were his overalls. There was no personal or family history of childhood eczema, asthma, or hay fever, and he had started to experience skin problems at the age of 40 years. He stated that his skin cleared when he went on holiday to Durban, on the coast of KwaZulu-Natal province. He had no history of taking any medication. He was otherwise well and had no symptoms or signs of arthritis or any systemic illness.



Figure 1. Left hand of Dr KL, showing vesicular dermatitis of the palms and scaly eczema of the fingers
Photograph: Hillary Carman

Examination showed extensive subacute eczema on both legs, arms, and his back. In many areas, the skin was thickened and lichenified. The skin of his hands was thickened and cracked, with the diesel oil impregnating the folds. He did not have frank eczema on the hands, and his face and front of his neck were not affected; nor were the groin and axillae. Conditions such as psoriasis and seborrheic dermatitis were considered but the clinical distribution did not favour these diagnoses.

It was suspected that he had occupational dermatitis, either irritant or allergic, because of his contact with oils and greases, and because the problem had cleared when he went on holiday. The eczema was too extensive to do patch tests. He was told to stop working and was prescribed topical and oral steroids as well as an antibiotic and copious emollients.

He was lost to follow-up but presented himself again in June 2019. He was diagnosed with erythroderma (Figure 2); the eczema covered about 90% of his body, and further tests were performed. The skin biopsy showed features of chronic dermatitis with psoriasiform epidermal changes, spongiosis, parakeratosis, neutrophil micro-abscesses, and a chronic dermal inflammatory infiltrate. The pathologist diagnosed dermatitis rather than psoriasis on the findings. No fungal elements were detected. Full blood count, urea and electrolytes, and lung function tests were normal. HIV and and rapid plasma reagin (RPR) tests were negative. No Sézary cells were detected. The IgE was raised to 1 041 IU/ml (normal 0–100 IU/ml) and the Phadiotop™ screening was 14.59 kU/l (normal 0–3.5 kU/l).

He was unable to continue to work; in 2019, he applied for and was granted temporary disability leave. Subsequently, he has not been in contact with the oils and greases of a mechanic's workshop. Notably, the eczema has persisted with some remissions and exacerbations. Of interest is that he has considerable relief when he goes to the coast.

He was treated with emollients and topical steroids as well as narrow-band ultraviolet light, but required systemic treatment and was prescribed methotrexate 20 mg weekly, folate 5 mg daily, and prednisone 20 mg in decreasing doses over one month. After six months on topical treatments and methotrexate, the eczema covered more than 50% of his body. He had extensive and severe erythema, and the skin was thickened in areas and lichenified. He had intense papularity on the thighs (Figure 3).

The itch kept him awake at night. His symptoms worsened during the day when he sweated, as the sweat aggravated the itch. According to the POEM questionnaire, he scored 26 out of a possible 28. His EASI score, which measures the extent and the severity of the disease (redness, thickness/papulation/oedema, lichenification, excoriation) was 40 out of 72, which denotes severe atopic disease. He was unable to continue to work and therefore had no contact with work chemicals after June 2019. He applied to be boarded from work and finally, after four years, this was arranged. He received temporary disability payments for four years.

Since methotrexate was ineffective, use of the alternative immunosuppressant, Cyclosporine A – recommended for eczema – was motivated for as a treatment. Permission was given by his medical insurance company for a six-month course, which ended in December 2022. This hardly worked and he still demanded short courses of oral prednisone to give him relief from the intolerable itch.

Dupilumab, the newly registered biological drug indicated for the treatment of atopic eczema, was motivated for as a treatment. The request was rejected by the medical insurance company and the patient, a motor mechanic, is unable to afford it.



Figure 2. Mr DG: erythroderma, covering 90% of the body
Photograph: Hillary Carman



Figure 3. Mr DG: papularity on the thighs
Photograph: Hillary Carman

DISCUSSION

Both patients were initially diagnosed with occupational dermatitis and, subsequently, atopic dermatitis. Their dermatitis was symmetrically distributed, chronic and relapsing. In both cases, the severity was such that they were forced to stop working. Dr KL was patch tested and no allergen sensitivity was established. Mr DG was not patch tested because his eczema was too extensive to enable this.

Neither patient had the typical distribution suggested in the various guidelines for the diagnosis of atopic dermatitis. Neither had childhood eczema nor flexural eczema. Dr KL had a history of asthma and hay fever and slightly raised IgE; Mr DG had no history of atopy but had very high IgE and Phadiotop™ levels.

Both were deemed to have adult-onset atopic dermatitis – clearly precipitated by the work gloves in the dentist's case and possibly by the oils and greases in the mechanic's case. The diagnosis was based on:

1. The chronicity and relapsing nature of their dermatitis, even after removal from their workplaces. The fact that Mr G's eczema clears when he goes to the KwaZulu-Natal coast is attributable to a different climate and environment
2. The symmetrical distribution of the eczema
3. The history of asthma in Dr KL and his raised IgE, and Mr DG's raised IgE and Phadiotop™ levels

Dermatitis (also called eczema) is the most common diagnosis made in any dermatology clinic.[14] It is a morphological diagnosis and needs to be further classified, according to the type of eczema and the cause. The exogenous types are caused by external agents such as irritants and allergens, and the endogenous types are due to inherent abnormalities (Table 7).

The terms dermatitis and eczema are used interchangeably in the literature. The word eczema is derived from ancient Greek and means 'to boil or break out'. Dermatitis is a Latin word meaning inflammation of the skin.

In a 1994 review article, the authors stated that *"atopic dermatitis is a hereditary disorder frequently associated with allergic rhinitis and bronchial asthma, and influenced by many triggering factors such as irritants, aero-allergens, microbial organisms, stress factors, sweating, and climatological factors. True contact allergy is a complicating factor."*[15]

Adult-onset atopic dermatitis is a recently introduced subgroup of atopic dermatitis and does not necessarily conform to the guidelines in the introduction of this paper.

In 2005, Ozkaya published the results of the analysis of 63 patients judged to have adult-onset atopic eczema,[16] and compared the findings with the Hanifin and Rajka (1980)[5] and the UK (1994)[7] criteria. The symptoms conformed to the Hanifin and Rajka criteria but not to the UK criteria. Salvador et al.[13] noted that, in adult-onset eczema, only 10% of cases were purely flexural but, in 10% of cases, the flexures were not affected at all. Other areas affected were the head and neck, the hands, and even the groin, axillae, and scalp (a seborrheic-like distribution). They also noted that the eczema may generalise, and erythroderma may develop.

Table 7. Classification of eczema/dermatitis

Endogenous eczema/dermatitis	Exogenous eczema/dermatitis
Atopic eczema/dermatitis	Contact dermatitis – irritant
Seborrheic dermatitis	Phototoxic dermatitis
Varicose eczema	Contact dermatitis – true allergic
Dyshidrotic eczema	Photo allergic contact dermatitis
Nummular eczema	

Apart from the typical clinical manifestations of acute, subacute, or chronic dermatitis, it may be psoriasiform, nummular, lichenified, or pruriginous, with the presentation of nodular prurigo.

Hello et al. (2016)[17] proposed three clinical patterns of atopic dermatitis in adults.

1. The chronic persistent form describes the 20–30% of cases of childhood eczema that persist into adult life, and is well recognised. The eczema is diffuse, symmetrical, and affects the flexures. Alopecia areata may occur in severely affected individuals.
2. The relapsing form occurs in 12.2% of cases with childhood eczema, which resolves, only to relapse in adulthood. Many of these patients develop hand dermatitis, especially in an occupational setting, and are diagnosed with irritant contact dermatitis. Exposures to water, dust, heat, and contaminants are causative. Williams et al. (2007) discussed auto-eczematisation, such as occurs with disseminating stasis dermatitis.[18] He described six workers with occupational contact dermatitis of the hands, which became recurrent and persistent, and sometimes generalised. It was impossible to distinguish between atopic dermatitis and irritant contact dermatitis in these cases, clinically, and the work relatedness of their condition was not necessarily recognised.
3. Adult-onset atopic dermatitis is the most difficult of the three patterns to diagnose and may be a disease diagnosed by exclusion. It is estimated that 18.5% of all cases of atopic dermatitis first appear in adulthood.[17] The eczema may present with lichenification, nummular lesions, or prurigo nodules.[17]

The authors of a systematic review and meta-analysis of the prevalence and phenotype of adult-onset atopic dermatitis concluded that it is not only a disease of childhood.[4] About one in four adults with atopic dermatitis report symptom onset in adulthood. There are distinct characteristics with lower rates of flexural eczema, and lower rates of the other multiple signs and symptoms of atopic dermatitis. Patch testing is essential and biopsies are done to rule out other conditions.

Diagnosis of atopic dermatitis in an adult

A careful history needs to be taken, and previous atopic disease in the patient and/or his/her family members must be noted. All the guidelines list the chronic and relapsing nature of the disease as a criterion for diagnosis, and its symmetrical nature and itch. Most of the guidelines emphasise the distribution of the eczema, that it started in childhood, and the family history. Raised IgE and allergen specific IgE (skin-prick testing and Phadiotop™) are stressed in the Japanese[10] and Chinese[11] criteria, and are regarded as an alternative to a family history of atopy.

The diagnosis of eczema is clinical, and biopsies are not indicated unless another disease such as psoriasis, mycosis fungoides, or a fungal infection is suspected and needs to be excluded. The diagnosis of adult-onset atopic dermatitis is simpler in patients with a personal or family history of atopy, especially if they had flexural eczema as children.

Patch tests to exclude allergic contact dermatitis are needed, and either skin-prick tests or measurements of IgE and Phadiotop™ inhalant tests are required to support the diagnosis of an atopic diathesis. It should be noted that atopic dermatitis predisposes to the development of allergic contact dermatitis and the two conditions often coexist.[19]

While the published criteria for the diagnosis of atopic dermatitis are useful in children, they have not been formulated clearly for adults. Thus, the diagnosis may need to be made by exclusion.[13]

The clinical presentation of these two patients best conformed to the Chinese 2016 criteria,[11] which are the simplest of all the criteria.

New effective drugs for the treatment of atopic dermatitis, which may be life changing, are becoming available, the main one being Dupilumab.[20] This is a biological drug registered for the treatment in adults of moderate to severe atopic eczema that has not responded to topical treatment. It is now registered for this indication in South Africa. However, it is considered unaffordable by medical insurance companies, and certainly by the vast majority of patients who would benefit from using it.

CONCLUSION

Both patients were initially diagnosed with occupational dermatitis but, even after removal from their workplaces, their eczema persisted. Since neither had eczema in childhood, they were diagnosed with adult-onset atopic dermatitis on the basis of the itch and chronic relapsing nature of the disease, and the presence of asthma with raised IgE (Dr KL) and raised IgE and Phadiotop™ (Mr DG). Neither conformed to the majority of the criteria for the diagnosis of atopic dermatitis in the published guidelines. In both cases, the disease has adversely affected their quality of life and caused them to stop working.

Dr KL has responded to topical steroids under occlusion to some extent, but the disease has not cleared completely. He has found satisfactory alternative employment and does not want systemic treatment. Mr DG has partially responded to topical steroids, light therapy, oral methotrexate, and Cyclsporin A. He is a candidate for Dupilumab. Unfortunately, his medical insurance company will not pay for this, and he is unable to afford the drug himself, being an unemployed motor mechanic.

This diagnosis of atopic dermatitis in adults is important, not only for management, but also because it may be precipitated by occupational factors, leading to permanent disability, as illustrated in the two cases presented in this paper.

KEY MESSAGES

1. Medical and nursing practitioners, as well as dermatologists, should be aware of eczema in the workplace and the possibility of adult-onset atopic eczema.
2. Irritant and allergic contact dermatitis need to be considered and excluded.
3. It is necessary to take personal and family histories of previous eczema, asthma, and hay fever.
4. Patients should be patch tested to diagnose allergic contact dermatitis. Skin-prick testing or blood tests for IgE and inhalants (Phadiotop™) should be performed as these point to atopy.

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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AUTHOR CONTRIBUTIONS

Conception and design of the study: HC
Data acquisition: AF
Data analysis: AF
Interpretation of the data: AF, HC
Drafting of the paper: HC
Critical revision of the paper: HC

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Renewed focus on re-emerging occupational biohazards

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BACKGROUND

Although occupational infectious diseases and outbreaks have long been known, the COVID-19 pandemic brought a renewed focus on preventing biohazards in the workplace.[1] In addition, the importance of non-infectious biological hazards is becoming increasingly apparent in both the workplace and the community.[2]

Prior to the COVID-19 pandemic, this century had already experienced pandemics of new infectious diseases such as SARS, H1N1 influenza, and MERS as well as the re-emergence of Ebola, Zika, dengue, and yellow fever. Subsequently, the toll of SARS-CoV-2 has highlighted the community-workplace interface as a significant risk for work-related infections in most working environments. These events have indicated the importance of collaboration between public and occupational health; and of investment in research for prevention, outbreak control, and sharing of infectious disease data globally; along with the need to pursue strategies within the 'One Health' approach that recognises that the health of humans, animals, and ecosystems are interconnected.[1] The differentiation of community from occupational exposure to biological hazards has been identified as a global problem, being a major reason for the underestimation of occupational diseases caused by biological agents.[3] The rapid spread of SARS-CoV-2 has evoked global attention to infectious diseases occurring in the workplace, and COVID-19 has been recognised as an occupational disease in many occupational categories in addition to health workers.

Commonly found biological agents in the workplace include microorganisms (e.g. bacteria, fungi, parasites and viruses), the by-products of microorganisms (e.g. endotoxins and mycotoxins), including those that have been genetically modified, and allergens of biological origin (e.g. allergenic fungi and animal dander), excluding dust of organic origin such as pollen, flour dust, and wood dust.[4] All biological agents affecting humans can potentially cause occupational disease. While biological hazards in the work environment generally pose no risk, some workplaces and conditions provide an ideal environment for the generation and transmission of biological agents, putting a sizeable portion of the working population at risk of exposure.

Emerging issues include the increasing numbers of existing infectious and non-infectious diseases, new organisms or new groups of workers being exposed to biological agents, and a variety of precipitating factors that may be responsible for, and increase the risk of, exposure to biological hazards.[5-7] Global climate changes, overuse of antimicrobials in medicine, more intensified farm settings, and closer interactions with animals have been identified as factors facilitating the emergence or re-emergence of zoonotic bacterial infections that affect the workplace and community.[3]

In 2015, the World Health Organization (WHO) estimated that, of the burden of disease globally attributable to occupation from death and disability, 8% was attributable to infectious diseases, and that low- and middle-income countries were disproportionately affected by occupational death and disease.[8] The Sixth European Working Conditions Survey reported a trend of growing exposures to biological risks, with women being more exposed than men to direct contact with materials that can be infectious (15% and 12%, respectively); and that, in the health sector, 50% of workers handled, or were in indirect contact with, infectious materials.[9] Pre-COVID-19, using data collected until May 2018, it was estimated that about 10% and 18% of workers in the United States were employed in occupations where exposure to disease or infection occurred at least once per week or month, respectively.[10]

Biological hazards have largely been recognised to affect only a selection of worker groups with obvious exposures and, likewise, the definitions of diseases caused by biological hazards have been limited. While some organisms and specific categories of workers (such as health workers) have been identified, globally, as occupational health priorities, attention to biological hazards has lagged behind that of physical and chemical hazards.[11] The number of occupational infectious diseases reported through public health notification systems annually exceeds that reported by occupational health practitioners, and may be restricted to diseases that are notifiable.[6] Bioaerosols are increasingly being recognised as an important health problem for workers in as disparate fields as agriculture, production

of biofuel, and the metallurgical industry, through to libraries and art conservation.[12] However, even in workplaces with occupational health services, biological hazards have been neglected, while risk assessment and interventions have not kept abreast of the rapid developments in fields such as prevention of the spread of organisms, or production of sensitisers, immunisation, and prophylaxis.[13]

The identification of occupational hazards related to infectious biological agents in the workplace is difficult. It necessitates global guidance and collaboration between authorities and institutions responsible for occupational health and safety, public health, environmental health, animal health protection, and food safety. The technical progress, from molecular medicine to implementing successful multidisciplinary approaches towards eliminating or eradicating biological threats, is conducive to promoting improved surveillance, reporting, prevention, and management of biological hazards in the workplace.

There have been significant advances in the knowledge about biological hazards, their prevention, and the treatment of diseases they cause since the International Labour Organization (ILO) issued the 1919 recommendation on the prevention of anthrax spore transmission in wool.[14] However, a century later, the European Agency for Safety and Health at Work highlighted the persistent *"lack of knowledge and awareness of exposures to biological agents and related health problems and the lack of a systematic approach to workplace prevention of these risk factors"*.[6] The WHO had also observed that *"there is no ILO Convention for biological agents or global guidance that covers all biological agents. Therefore, we recommend that a comprehensive international guidance is required. This standard should also consider aspects of pandemic preparedness outside health-care institutions, with particular consideration given to (re)emerging diseases – like SARS (severe acute respiratory syndrome) and viral haemorrhagic fevers – and their impact on the workplace at local and international level"*.[4] Until recently, there were no comprehensive global policies and guidelines to prevent and control biohazards in the workplace.

DEVELOPMENT OF THE TECHNICAL GUIDELINES ON BIOLOGICAL HAZARDS AND THE SCIENTIFIC COMMITTEE FOR OCCUPATIONAL BIOHAZARDS

With the realisation that occupational infections affect a variety of workers, the International Commission on Occupational Health (ICOH) established a Working Group on Occupational Infectious Agents (WGOIA) in 2003 to complement the Scientific Committee on Occupational Health of Health Workers.

In 2017, the WGOIA conducted a survey on occupational infectious agents and diseases through the 53 ICOH National Secretaries, from whom there was a 74% response rate. It indicated that even developed countries lack reliable statistics, and some do not record occupational infections as occupational diseases (unpublished data). Although the questionnaire included the recognition, notification, compensation, and variety of infections and workers, and potentially covered 2.3 billion (66%) of the global 3.5 billion workforce, statistics of variable quality were available for only 0.37 billion (10%) of the estimated global workforce. Over 85% of responding countries recognised infections as occupational diseases, and some countries had lists of recognised occupational infections, with an estimate of 3.6% of all occupational diseases reported being occupational infectious diseases.

The most commonly affected groups were reported to be health workers, followed by agriculture or forestry workers, miners or construction workers, and veterinarians or livestock workers. Others included sanitary waste workers, teachers, police, child minders, fishing and marine, abattoir, dairy, meat and fish packing, transport, public service, and factory workers – some of whom were even exposed to rabid dogs. On the basis of the survey, the WGOIA resolved that the first priority was to produce a position paper on occupational infectious agents, occupations, and significant interventions.

In 2018, after extensive discussion between the members to broaden the remit, the WGOIA applied to ICOH for conversion to a scientific committee (SC) on occupational biological agents, after having served ICOH on infectious diseases for five triennia. However, in spite of the achievements of the WGOIA, the request was rejected on the basis of rationalising the number of SCs and their overlapping remits. Subsequently, a collaboration was forged between WGOIA and the ILO to develop a technical guidance document on biohazards at work as a basis for formulating ILO technical guidelines on occupational exposures to biological hazards. This opportunity enabled interested WGOIA members to contribute to the ILO-appointed task group for global guidelines, covering both communicable and non-communicable conditions in the workplace, in both the public and occupational health contexts (Figure 1). In addition, other WGOIA members embarked on a systematic review of global infectious disease risks associated with occupational exposures among non-healthcare workers.[5]

Following the COVID-19 epidemic, ICOH reconsidered and approved the conversion of the WGOIA to the Scientific Committee for Biohazards and Occupational Health (SC BOH).



Figure 1. Members of the ILO Task Group on Biohazards at work in Geneva during the 2019 ILO centenary; L–R: Dr Tanusha Singh (South Africa), Prof. Jorge Wallach (Argentina), Prof. Mary Ross (South Africa), Prof. Stefano Porru (Italy), and Dr Remko Houba (Netherlands)

Photograph: Tanusha Singh

In 2022, there were exciting international developments in the broader field of occupational biological hazards with which the authors were both involved, namely the ILO's Technical Guidelines on Biological Hazards[15] and the formation of the ICOH Scientific Committee for Biohazards and Occupational Health. Interested ICOH members can access information on Scientific Committees on the ICOH website (www.icohweb.org).

COLLABORATION WITH *OCCUPATIONAL HEALTH SOUTHERN AFRICA*

There is a longstanding collaboration between the WGOIA members and *Occupational Health Southern Africa* (OHSA) with regard to research publications and short reports on biohazards and occupational health of both health and non-health workers.[1,12,16-24] In 2022, during the transition from the WGOIA to the SC BOH, we initiated a more permanent relationship with the Journal through the publication of a paper on Q fever – an underappreciated occupational disease in South Africa.[25] In 2023, the SC BOH, in conjunction with clinical experts experienced in biohazards and occupational health, will submit regular contributions, covering case studies and the epidemiology, prevention, and management of occupational diseases relevant to southern Africa. In an arrangement with the OHSA Editor, these articles will be made available through the SC BOH members and ICOH National Secretaries for potential translation and wider use by ICOH.

DECLARATION

The authors declare that they are Chair and Secretary of the Scientific Committee for Biohazards and Occupational Health, and were members of the Task Group on Biological Hazards, ILO. All sources used in this article have been duly acknowledged, and there are no conflicts of interest.

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Occupational lung diseases in South African miners at autopsy: 2020 surveillance report

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ABSTRACT

The Pathology Division at the National Institute for Occupational Health (NIOH) provides autopsy services for deceased workers who worked in controlled mines or works under the provisions of the South African Occupational Diseases in Mines and Works Act, 1973 (Act No. 78 of 1973). This report describes the ages, commodities, employment durations, and occupational cardio-respiratory diseases in miners whose organs were submitted for autopsies in 2019 and 2020. Data were exported from the PATHAUT database into STATA for analysis. Differences in the proportions of disease (expressed per 1 000) were calculated using the Pearson's chi-square test; significance was set at $p \leq 0.05$. There were 759 and 557 records of deceased miners and ex-miners in 2019 and 2020, respectively. Pulmonary tuberculosis decreased from 192/1 000 in 2019 to 153/1 000 autopsies in 2020, and silicosis decreased from 246/1 000 to 223/1 000. However, neither decrease was significant. There was a significant increase in the rate of asbestosis from 50/1 000 in 2019 to 79/1 000 in 2020. Pulmonary tuberculosis (TB), emphysema, and silicosis were the most frequent diseases, with high rates. There was a non-significant decrease in occupational respiratory disease rates in 2020 from 2019, but these remain higher than the rates seen in the early 1990s. The NIOH continues to conduct autopsy surveillance on miners to support compensation for families, and the development of policy and intervention programmes in the mining industry.

BACKGROUND

Mining has been recognised as a determinant of respiratory diseases for hundreds of years.[1] The National Institute for Occupational Health (NIOH) undertakes autopsy examinations on the cardio-respiratory organs of deceased miners and ex-miners who worked in controlled mines and works (diggings, quarries, and brickworks) for compensation purposes, in terms of the Occupational Diseases in Mines and Works Act (ODMWA).[2] Autopsies are performed at no charge to miners, with consent from the next of kin, and regardless of the clinical cause of death.[3] For persons dying distant from Johannesburg, the organs are removed locally, preserved in formalin, and sent to the NIOH for examination.[4] Demographic information, clinical cause of death, and occupational histories are submitted to the NIOH, together with the organs.[4,5] Clerical staff follow up with families, employers, and the Medical Bureau for Occupational Diseases (MBOD) to obtain missing information. Since 1975, all information, and detailed autopsy findings, have been recorded on an electronic database called the Pathology Automation (PATHAUT) system.[5] The PATHAUT database, which comprised 114 793 records by 2020, is used for surveillance and research. Detailed annual surveillance reports are available on the NIOH website.[6]

A detailed report of each case is sent to the (MBOD)[3,5] for certification of disease by a panel of doctors. Cases with compensable diseases are submitted to the Compensation Commissioner for Occupational Diseases office, which manages payments to the deceased's family.[3]

In this report, we present an overview of findings published in the 2020 annual pathology surveillance report, the first to be written during the COVID era. The findings for 2019 are also described to highlight changes in the rates of occupational lung diseases in 2020.

METHODS

All records for 2019 and 2020 were exported from the PATHAUT database into SAS Enterprise Guide version 7.1 for data management, and then into STATA (version 16) for analysis. The rates of disease were expressed as proportions per 1 000 autopsies per year. Basic descriptive analyses were performed, summarising continuous data variables as means and standard deviations, and categorical data variables as numbers and percentages. Pearson's chi-square analysis was conducted to describe the exposure and disease findings, and to compare findings for 2019 and 2020.

Ethical clearance to analyse the data was provided by the University of the Witwatersrand (certificate number: M220564). Permission to access the PATHAUT data was obtained from the Academic Affairs Research and Quality Assurance Department of the National Health Laboratory Service.

RESULTS AND DISCUSSION

Demographic characteristics

There were 557 autopsy examinations conducted during 2020, compared to 759 in 2019: a 26% decrease. Demographic characteristics from 2019 and 2020 are presented in Table 1.

The distribution of the demographic data from 2019 and 2020 was similar. There were no significant differences in proportions of miners by sex, race, commodity, or employment status between the two years. Although the overall mean age at autopsy was two years greater in 2020, the difference was not significant.

Table 1. Demographic characteristics of miners whose organs were examined at the NIOH in 2019 and 2020

Characteristic	2019 n = 759		2020 n = 557	
	Mean	SD	Mean	SD
Age (years)				
All	61.4	14.0	62.4	14.3
Black	54.5	13.6	54.9	13.9
White	68.2	11.7	69.9	9.8
Duration of employment (years)				
All	20.5	10.8	19.1	11.1
Black	15.0	10.0	15.3	10.4
White	22.9	10.3	23.7	9.8
	n	%	n	%
Sex				
Female	26	3.4	29	5.2
Male	731	96.3	528	94.8
Unknown	2	0.3	-	-
Race				
Black	445	58.6	304	54.6
White	307	40.5	251	45.1
Other	7	0.9	2	0.4
Province				
North West	241	31.8	155	27.8
Gauteng	195	25.7	153	27.5
Free State	145	19.1	94	16.9
Northern Cape	94	12.4	93	16.7
Mpumalanga	36	4.7	32	5.8
Eastern Cape	6	0.8	7	1.3
KwaZulu-Natal	8	1.1	6	1.1
Limpopo	3	0.4	10	1.8
Western Cape	3	0.4	6	1.1
Other Countries	28	3.7	1	0.2
Commodity*				
Gold	464	61.1	335	60.1
Platinum	127	16.7	82	14.7
Asbestos	59	7.8	69	12.4
Coal	34	4.5	27	4.9
Other†	63	8.3	37	6.6
Unknown or not stated	12	1.6	7	1.3
Employment status				
Current	263	34.7	187	33.6
Ex-miner	481	63.4	348	62.5
Unknown or environmental	15	2.0	22	4.0

*Workers often have mixed service and are classified according to the commodity in which they had the longest service

†Chrome, diamond, environmental asbestos, Eskom, iron, lead, lime, silica, works, quarry, steel, SA railways, cement

Pathological findings

The overall rates of occupational lung diseases diagnosed at autopsy in 2019 and 2020 are shown in Figure 1. Pulmonary tuberculosis (PTB), emphysema, and silicosis were the most frequently occurring diseases. No cases of coal workers' pneumoconiosis or mixed dust pneumoconiosis were diagnosed in 2020 and 2019.

The only statistically significant difference in rates in 2019 and 2020 was for asbestosis (p = 0.0319). The differences in rates of other lung diseases between the two years were not statistically significant, with p values that ranged from 0.0611 to 0.7539.

Active pulmonary tuberculosis

Active pulmonary TB (PTB) was diagnosed in 15.3% (n = 85) of all autopsies in 2020. Most cases were from the gold (n = 57, 67.1%) and platinum (n = 14, 14.7%) mining industries. The majority of miners with PTB were black (n = 55, 64.7%). The overall rate of PTB in all autopsied miners decreased from 192/1 000 in 2019 to 153/1 000 in 2020 (Figure 1); however, this was not statistically significant (p = 0.0611). Figure 2 shows PTB in black miners over time. Pulmonary tuberculosis at autopsy has declined since peaking at 368/1 000 in 2007, to 181/1000 in 2020.

Although PTB rates were still high compared to the 1980s and early 1990s, there has been an annual decline since 2007. The reasons for the this are multifactorial and include a decline in silica dust exposure, improved living conditions, and the roll-out of antiretroviral treatment.[6]

Silicosis

In 2020, silicotic nodules were found in the lungs of 124 miners. Most miners (n = 108, 87.1%) had their predominant exposure in the gold mining industry. In 2019, 187 miners had silicotic nodules in the lungs, with the majority (n = 108, 57.8%) also having had exposure in the gold mining industry. The overall rate of silicosis decreased from 246/1 000 in 2019 to 223/1 000 in 2020 (Figure 1), but this difference was not statistically significant (p = 0.3162).

The rates of silicosis in black gold miners from 1975–2020 are presented in Figure 3. The rate decreased from 369/1 000 in 2019 to 316/1000 in 2020.

Massive fibrosis

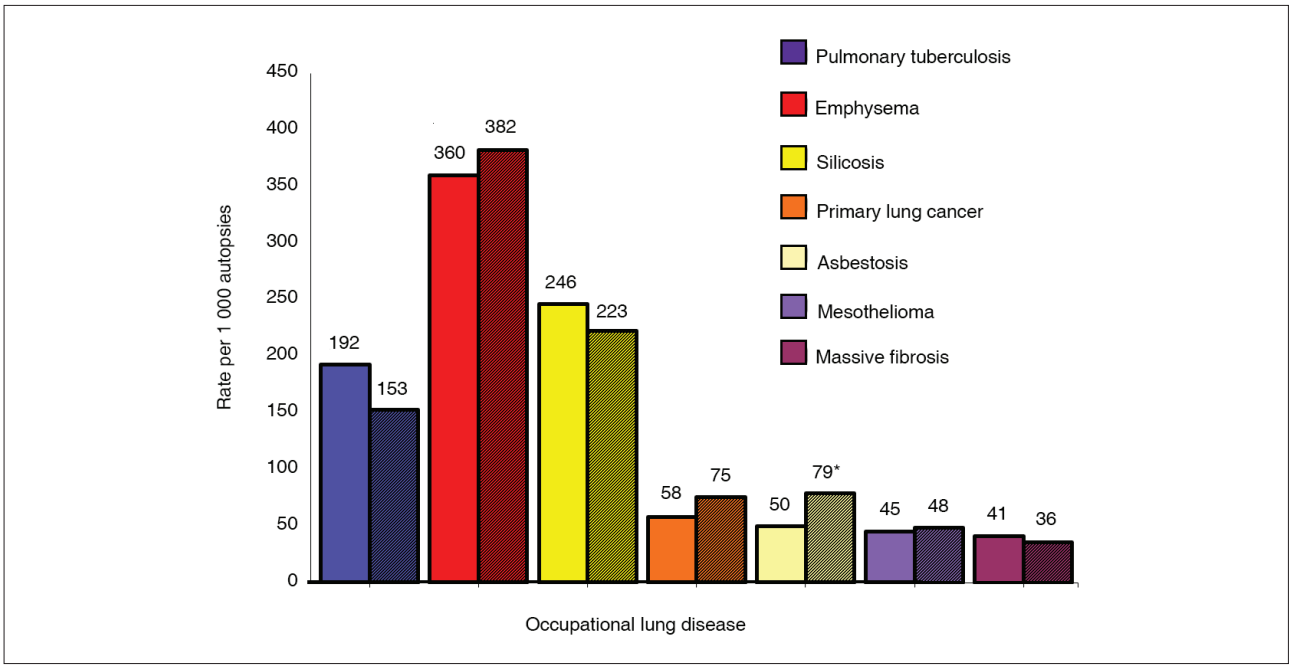
The rate of massive fibrosis in 2020 (36/1 000) was similar to that in 2019 (41/1 000) (p = 0.6466). In 2020, of the 20 (3.6%) miners with massive fibrosis, 18 (90.0%) were gold miners. In 2019, 31 (4.1%) of all autopsied miners had massive fibrosis, of which 27 (87.1%) were from the gold mining industry.

Emphysema

Emphysema remains a commonly diagnosed respiratory disease at autopsy (Figure 1). In 2020, emphysema was diagnosed in 213 miners, the extent of which was mild in 82.2% (n = 175), moderate in 15.5% (n = 35), and marked in 1.4% (n = 3). In 2020, the rate of emphysema increased to 382/1 000 compared to 360/1 000 in 2019, but the difference was not statistically significant (p = 0.3988). The high rates of emphysema have been attributed to the continued use of tobacco products and exposure of miners to harmful occupational dust.[7]

Asbestos-related diseases

There were 44 cases of asbestosis in 2020. Of these, 36.4% (n = 16) had slight, 43.2% (n = 19) had moderate, and 20.5% (n = 9) had marked fibrosis. Thirty-six (81.8%) of those with asbestosis had worked in the asbestos mining industry, and three (7.0%) had



Note: plain bars show data for 2019; scored bars show data for 2020
*Statistically significantly different at p ≤ 0.05

Figure 1. Overall disease rates for 2019 and 2020

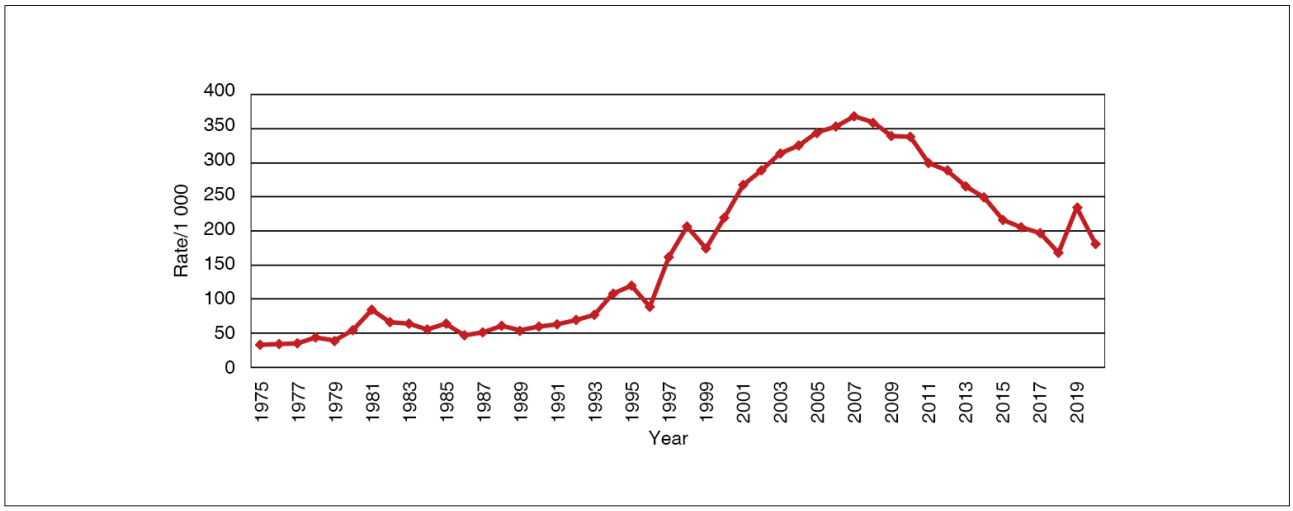


Figure 2. Active PTB rates in black miners at autopsy (1975–2020)

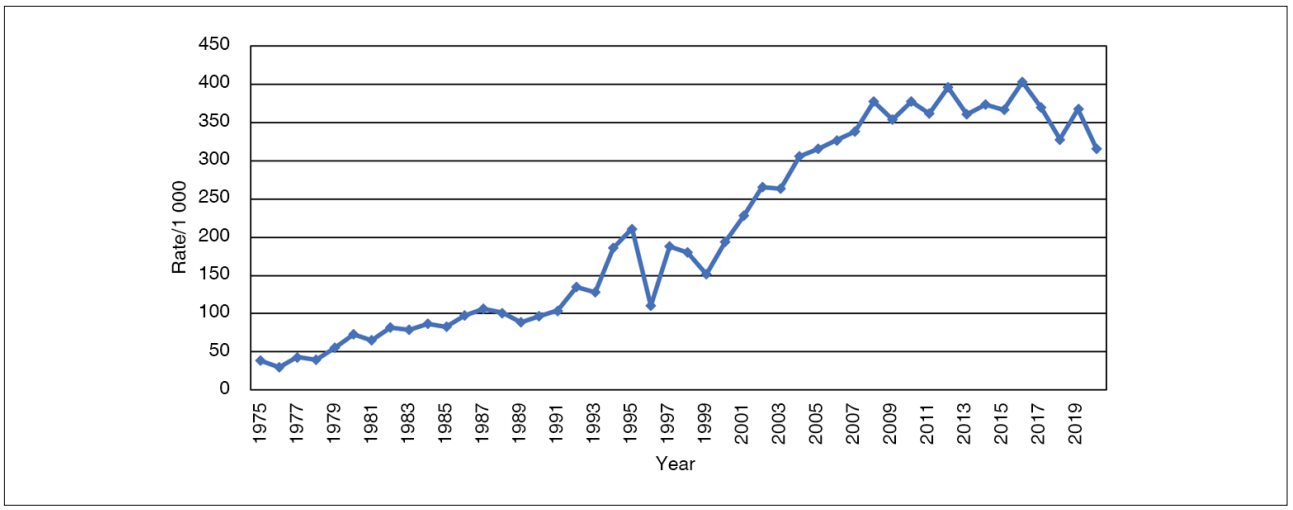


Figure 3. Silicosis in black gold miners at autopsy (1975–2020)

environmental asbestos exposure. There were 27 cases of mesothelioma. Nineteen (70.4%) of those with mesothelioma had worked in asbestos mines, two (7.4%) in gold mines, and two (7.4%) in formal works; three (11.1%) had environmental exposures, and exposure was unknown for the remaining individual (3.7%). The rates of asbestosis increased significantly from 50/1 000 in 2019 to 79/1 000 in 2020 (p = 0.0319). The proportions of workers with mesothelioma were similar in 2019 (45/1 000) and 2020 (48/1 000) (p = 0.7539).

Primary lung cancer

In 2020, primary lung cancer was diagnosed in 42 miners. Seventeen (40.5%) were in black and 25 (59.5%) were in white miners. Most of the cancers were adenocarcinoma (n = 20, 47.6%), followed by squamous cell carcinoma (n = 14, 33.3%), small cell carcinoma (n = 5, 11.9%), and large cell carcinoma (n = 3, 7.2%). Most of the miners with lung cancer came from the gold mining industry (n = 28, 66.7%), although the highest rate was seen in the asbestos miners (116/1 000). The rates of lung cancer were similar in 2019 and 2020 (58/1 000 and 75/1 000, respectively) (p = 0.2061). Adenocarcinoma was the most common subtype in both years.

Autopsy findings in women

The organs of 26 and 29 women were submitted for autopsy in 2019 and 2020, respectively. In 2020, 86.2% (n = 25) of the women had a history of occupational exposure, with most having worked in the asbestos mining industry (n = 16, 55.2%), followed by 13.8% (n = 4) in the gold mining industry, and 17.2% (n = 5) in other commodities; 13.8% (n = 4) had environmental asbestos exposure. The women who had autopsies in 2019 had similar work exposures to those in 2020.

Fifteen women (51.7%) had diseases related to asbestos exposure in 2020, and five in 2019. Seven had asbestosis (24.1%) compared to three (11.5%) in 2019, while eight had mesothelioma (27.6%) in 2020 compared to two (7.7%) in 2019. Neither of the differences in proportions between the two years were significantly different (p = 0.2261 and p = 0.0561, respectively). Pulmonary TB was diagnosed in 10.0% of women in 2020 and 19.2% in 2019. Asbestosis, mesothelioma, and PTB were the most common occupational diseases in women in both 2019 and 2020.

Clinical cause of death

The clinical cause of death is not determined by pathologists at the NIOH. It is stated in the accompanying documents submitted with the cardio-respiratory organs. Respiratory system diseases were the most common specified cause of death in both 2019 (n = 119 ,15.7%) and 2020 (n = 84,15%). Miscellaneous causes (natural causes, not specified) accounted for the largest proportion of deaths: 46.9% (n = 356) in 2019 and a significantly higher proportion (n = 334, 60.0%) in 2020 (p < 0.0001). The increase in the proportion of miners recorded to have miscellaneous causes of death in 2020 may have been driven by a drop in the proportion of cases where the cause of death was not stated, from 20.3% (n = 154) in 2019 to 8.1% (n = 45) in 2020.

Clinico-pathological findings in miners with COVID

In 2020, clinically, six miners were stated to have had COVID-19-related deaths; one was recorded as a possible COVID-19-related death. All were male, with ages ranging from 41 to 85 years. Five of the seven men died during the first wave of the COVID-19 pandemic (7 June 2020 to 22 August 2020), and two died in the second wave (15 November 2020 to 6 February 2021). Five were current miners, and two were ex-miners. The men had worked in gold (n = 4), platinum (n = 2), and manganese (n = 1) mines.

The pathological findings in the seven cases were diffuse alveolar damage, pneumonia, coronary artery disease, myocarditis, and pulmonary thromboembolism. There were no cases of PTB, although there were two cases of silicosis.

CONCLUSION

There has been a steady annual decrease in the number of organs submitted to the NIOH since 1995.[8] In 2020, there was a 26% decrease in the number of autopsies received compared to 2019. The decrease in cases could be due to the contracting employment in the country's mining sector, from approximately 344 000 mineworkers in 1994 to 94 399 in 2020.[9] Furthermore, the COVID-19 lockdowns may have caused logistical challenges, such as lack of access to facilities where autopsies are performed, and transportation of organs to the NIOH. This was due to the fact that most non-essential services were not operational, and mines, and provincial and national borders, were closed during the lockdowns. Hence, many families could have missed the opportunity to have the organs of their deceased members submitted to the NIOH and to receive compensation for any occupational lung disease diagnosed at autopsy.

Except for asbestosis, for which an increase was observed, there were no significant differences in the rates of occupational lung diseases in 2020 and 2019. This demonstrates that, although asbestos mining has ceased, asbestos-related diseases are prevalent.

In the cases with COVID-19 listed as a cause of death, diffuse alveolar damage and pneumonia were noted at autopsy, similar to findings in an international systematic review conducted by Deshmukh et al.[10]

High rates of preventable occupational diseases in South African miners are still a subject of concern. The 2020 report shows that the rates of PTB and silicosis in black miners remain high. This is despite progress that has been made in improving working conditions in South African mines.[11] The NIOH continues to conduct autopsies for the diagnosis of occupational respiratory diseases in miners to support compensation for families. This information that is generated is used for disease surveillance, and the development of occupational health policy and intervention programmes in the mining industry.

Note: The annual Pathology Division reports based on the PATHAUT data from 1975 to 2020 are available on the NIOH website: www.nioh.ac.za/pathology-division-surveillance-reports/

KEY MESSAGES

1. The continued decline in numbers of organs submitted to the NIOH for autopsy is of concern, with a 26% decrease from 2019 to 2020.
2. The rates of autopsy-diagnosed silicosis and PTB in South African miners remain high.
3. With the exception of asbestosis, the proportions of miners with occupational diseases were similar in 2019 and 2020.

DECLARATION

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

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AUTHOR CONTRIBUTIONS

Conception and design of the study: JM, DGL, LNM, KSW
Data acquisition: LNM, ZBN, DF
Data analysis: LNM, KSW
Interpretation of the data: LNM, ZBN, KSW, JM, DF, DGL
Drafting of the paper: LNM
Critical revision of the paper: ZBN, KSW, DF, DGL, JM

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Continuous development of the occupational hygiene profession in southern Africa using a multi-organisational collaboration: true and meaningful collaboration

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INTRODUCTION

Globally, approximately 2.78 million workers die annually from occupational accidents and work-related illnesses.[1] Additionally, there are 374 million non-fatal work-related injuries and illnesses each year,[1] many of which result in extended absences from work, and mental health issues for workers and family members. In 2017, the Workplace Safety and Health Institute estimated the economic burden of poor occupational safety and health practices to be 3.9% of the annual global gross domestic product (GDP).[1] These deaths and injuries take a toll on developing countries where workers are engaged in hazardous activities in mining and non-mining industries, mostly in the informal economy. Typically, this sector is unregistered and unregulated,[2] leaving workers vulnerable to precarious employment and without access to basic employment rights and protection against illness and injury. Current (under-reported) figures indicate that Asia accounts for more than 60% of estimated deaths, while Africa, America, and Europe contribute approximately 12% each, with young people having a 40% higher mortality risk than older workers.[3]

Poor and unsafe working conditions in mining environments include prolonged exposure to respirable dust, poor ventilation, and inadequate control of chemical (including dusts, fumes and gases) and physical hazards. These limit the economic benefits of the jobs created in the mining and non-mining sectors and can result in a heavy burden of tuberculosis. The situation is exacerbated by the limited number of skilled occupational hygienists to measure exposures to hazards such as silica dust, and to recommend appropriate control measures. Africa has only one International Occupational Hygiene Association (IOHA) member organisation, viz. the Southern African Institute for Occupational Hygiene (SAIOH), with approximately 1 000 members; only about 50% are registered occupational hygienists.

OCCUPATIONAL HYGIENE TRAINING PROGRAMME

One aim of the Southern African Tuberculosis and Health Systems Support (SATBHSS) project is to advise governments and the private sector on dust exposure control limits and dust management policies and standards. Since 2018, the African Union Development Agency (AUDA-NEPAD) has been training a cohort of occupational hygiene professionals from the member states, who sit for an international exam recognised by IOHA. AUDA-NEPAD is working with partners where the organisation facilitates the exam fees and logistics, with zero training and administrative fees. In 2018, 24 participants enrolled in the programme, in collaboration with Workplace Health Without Borders (WHWB). Twelve completed the training and wrote exams for the following courses: Basic Principles in Occupational Hygiene (OHTA W201), Measurement of Hazardous Substances (OHTA W501), and Control of Hazardous Substances (OHTA W505). The Noise – Measurement and its Effects (OHTA W503) course has recently been completed by the participants.

The training programme is funded by a World Bank grant, which will end in December 2023. The aim is to assist candidates who are working as occupational hygiene professionals in the four project countries (Lesotho, Malawi, Mozambique, and Zambia) to complete the International Certificate in Occupational Hygiene (ICertOH). The certificate is administered by the British Occupational Hygiene Association (BOHS), approved and regulated by IOHA, and recognised by SAIOH and other international occupational hygiene organisations.

The training could not have come at a better time, mainly because the International Labour Organization (ILO) classified occupational health and safety (OHS) as a fundamental principle and right at work during the 110th International Labour Conference in June 2022.[4] Fundamentally, this means that OHS is universal and applies to people in all ILO member states, regardless of the level of economic development. Therefore, all ILO member states commit to respecting and promoting the fundamental right to a safe and healthy working environment. Specifically, ILO conventions 155 and 187 are now binding, irrespective of their ratification status.

The training also supports a number of the African Union (AU) policy frameworks, such as the AU Agenda 2063, the Africa Mining Vision (AMV), the Africa Health Strategy 2018–2030, and the Science, Technology, and Innovation Strategy for Africa (STISA-2024). The programme further supports the United Nations (UN) sustainable development goal (SDG) 3 and other SADC protocols.

The training, which is continuous, is expected to build a cadre of experts that will support the development and implementation of a standardised approach to the occupational hygiene principles of

identification, evaluation, monitoring, and control of workplace hazards. The training is a highly technical module of the Occupational Hygiene Training Association (OHTA), and is conducted by Sedulitas, an OHTA-approved training provider (ATP), in partnership with the Durban University of Technology (DUT).

OHTA develops and maintains training materials that enhance the competency of those responsible for assessing workers' health risks. The Association also implements an international training scheme and qualifications framework, and the infrastructure for low-cost training courses, as part of an internationally recognised programme of study for the occupational hygiene profession. The international qualifications framework promotes consistent, high-quality, and recognised qualifications for occupational hygienists in all participating countries. OHTA appointed BOHS, which develops the examination, marks the assessment, and awards certificates as per the agreed framework, using ATPs[5] such as Sedulitas.

TRAINING ON NOISE MEASUREMENT AND ITS EFFECTS

In 2022, the training conducted focused on noise measurement and its effects (OHTA course W503) (Figure 1).

The W503 workshop provided training in the broad technical principles of noise measurement, including anticipation, recognition, evaluation, and control of noise hazards in the workplace.

The objectives of the workshop were:

- To describe the consequences of excessive noise exposure to health and wellbeing;
- To understand the measurement (including dosimetry) of noise in relation to current standards;
- To learn how to conduct noise surveys in the workplace to assess risks;
- To be able to advise on the need for, and means of, control, including personal protective equipment;
- To appreciate and advise on environmental noise assessment and concerns; and
- To understand current standards and good practices regarding noise exposure, effects, and controls.

The training was organised by AUDA-NEPAD, under the leadership of Norman Nkuzi Khoza, regional occupational health and safety specialist. Peter "Jakes" Jacobs, Sedulitas Managing Director, facilitated the training and was the Training Director. He was assisted by Dr Ivan Niranjan, Senior Lecturer in occupational health and safety at the DUT, Goitsemang Keretetse, Lecturer at the Wits School of Public Health, and Zarco Geldenhuys from Sedulitas.

The training was hosted by the DUT's Department of Community Health Studies (Faculty of Health Sciences) in Durban, South Africa. Twelve candidates, sponsored by AUDA-NEPAD, attended the training in person (Table 1). An additional eight participants joined the workshop, virtually: Aldrighi de Oliveira (Mozambique), Alexandre Cumbane (Mozambique), Elisidio Elias Cossa (Mozambique), Lucio Nhamundo (Mozambique), Vongai Nancy Chindedza (Zimbabwe), Wendy Gerber (South Africa), Ahmed Salem Brahim (Mauritania), and Abdul Aziz Al Abri (Oman).

The training was conducted over five days, from 5 to 9 December 2022. The workshop included discussion groups, and individual and group assignments. Participants wrote a three-hour formal assessment at the end of the five days, and those who obtained a mark of at least 50% received an international certificate (W503) conferred by OHTA. The training was free for all participants, including transportation (flights and ground transport), accommodation, training materials, and meals. A daily subsistence allowance was provided for all participants and facilitators. Nine out of twelve candidates passed the W503 modules, and qualified to progress to register for the additional W500 series modules. If they pass all the remaining modules, they will receive an ICertOH.

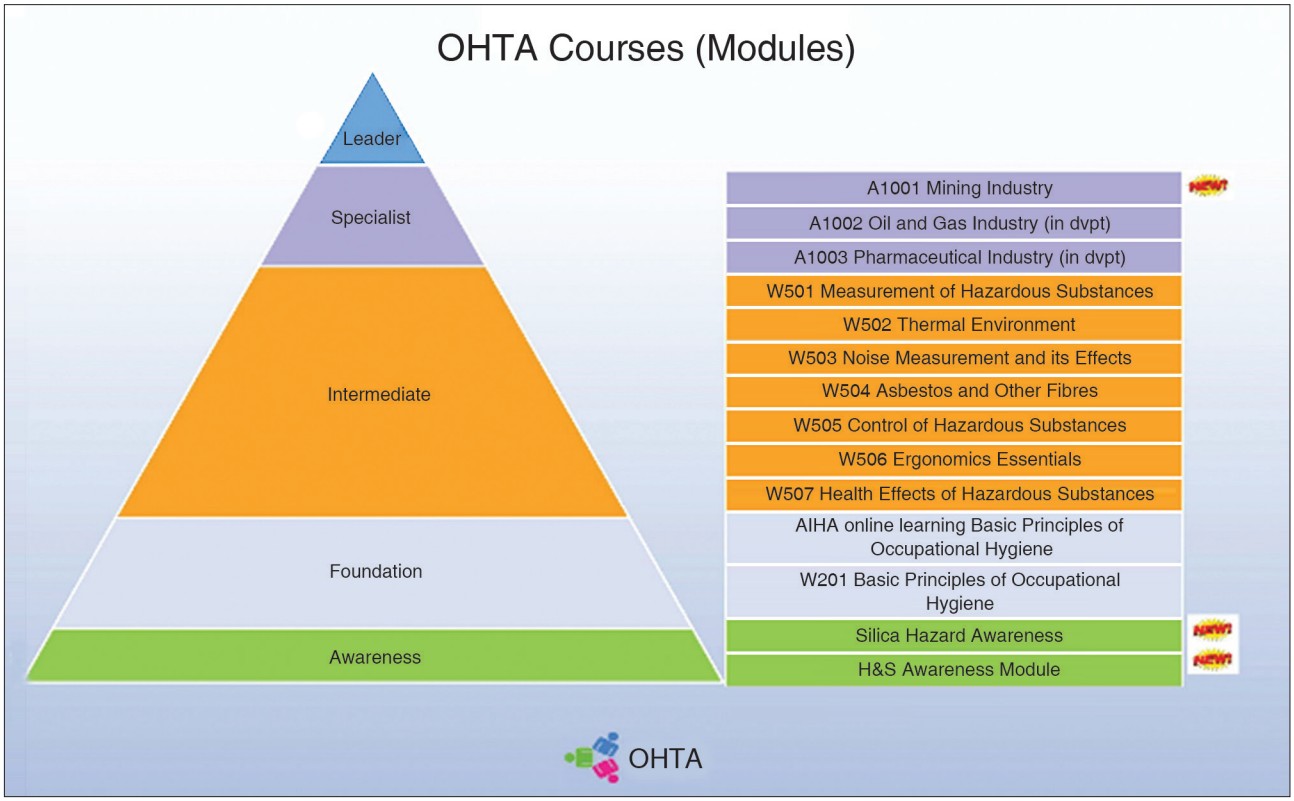


Figure 1. Structure and modules of the OHTA training framework (Source: OHTA)[5]

Table 1. W503 Noise Measurement and its Effects: participants sponsored by AUDA-NEPAD

#	Name	Designation	Ministry/Country	Biosketch
1	Patricia Chilaisha	Chief Inspector of Factories	Occupational Safety and Health Services Department, Ministry of Labour and Social Security, Zambia	Master's degrees in Chemical Risk Management, and Health Informatics; postgraduate diploma in OSH; BSc degree. Studying towards recognition as a chartered occupational hygienist with the BOHS. More than 15 years of experience in OSH Responsibilities: coordinating development and application of appropriate OSH standards in the workplace; evaluating practices and procedures to assess risk and adherence to standards; reviewing risk assessments, inspections, incident investigations, and advising the industry on good OSH practices; facilitating review of regulatory policies and legislation
2	Joseph Sindawa	Senior Occupational Hygienist	Occupational Health and Safety Institute (OHSI), Ministry of Labour and Social Security, Zambia	Postgraduate qualification in Occupational Health and Safety (Turin University, Italy); BSc in Environmental Health (University of Zambia); certificate in Business Administration; BOHS certificates (W201, W501, W505, and W503). Has worked as an OSH specialist for the Zambian Occupational Health and Safety Institute. Responsibilities: conducting OSH risk assessments, health and safety compliance audits, medical surveillance for various employers and employees in Zambia
3	Absalom Ndlovu	Chief Industrial Hygienist	Occupational Health and Safety Institute (OHSI), Ministry of Labour and Social Security, Zambia	BSc in Environmental Health: radiation protection certificate; registered with SAIOH. More than 17 years of experience in OSH. A strategic planner with competency in devising solutions and implementing OSH management systems for maintaining good environmental and safety conditions Responsibilities: conducting safety internal audits and risk assessments; implementing measures to achieve safe workplaces. Has experience in conducting occupational hygiene monitoring, and medical surveillance such as lung functioning, vision testing, etc.
4	Mathews Silondwa	Senior Inspector of Factories	Occupational Safety and Health Services Department, Ministry of Labour and Social Security, Zambia	MSc in Environmental Engineering (Copperbelt University, Zambia); member of the Engineering Institution of Zambia Responsibilities: conducting general factory inspections; inspections, testing, and certification of lifting machinery and pressure vessels; occupational hygiene functions; incident and accident investigations
5	Shadrick Magombo	Principal Industrial Hygienist (PIH)	Occupational Safety and Health Directorate, Ministry of Labour, Malawi	Master's degree in Public Health (University of Malawi, College of Medicine); postgraduate certificate in Radiation Protection (University of Ghana); and BOHS certificates in Measurement of Hazardous Substances, and Control of Hazardous Substances Responsibilities: conducting inspections; examining plants and machinery; facilitating training programmes; conducting industrial hygiene surveys
6	Umali Mohamed Yasidu	Senior Mining Engineer	Department of Mines, Ministry of Mining, Malawi	Master's degree in Engineering: Sustainable Resources (Hokkaido University, Japan) Responsibilities: conducting mine inspections; collection and compilation of mineral production statistics; preparation of tender documents for mine reserve areas; supervising surveying team; advising on the issuance of mineral licenses; advising, monitoring, and implementing environmental management plans (EMPs); advising, monitoring, and implementing environmental and social impact assessments (ESIAs)
7	Dalitso Tizifa	Mining engineer	Malawi	BSc in Mining Engineering (Botswana University of Science and Technology); more than five years' experience in private and public sectors in mining industry. One of the first qualified female mining engineers in Malawi. Believes that protecting worker health and providing safe working environments are essential components of achieving high productivity and quality results
8	Elton Mhone	Senior occupational hygienist	Malawi	BSc in Biology (University of Eastern Africa, Kenya) Responsibilities: conducting workplace inspections; inspection, certification, and approval of plants and machines, and equipment; hygiene surveys in workplaces; accident investigations and recommendations for remedial measures; collaboration with Malawi Environmental Affairs Department to address environmental hazards; drafting legislation and standards in occupational hygiene; training workers and employers in OSH matters
9	Palesa Makepe	Government representative	Ministry of Mines, Lesotho	BSc in Biology and Chemistry; Government representative in mines in Lesotho; registered SAIOH member. Has completed OHTA modules W201, W501, W503, and W505
10	Ntsoaki Makafane	Health Inspector	Ministry of Mines, Lesotho	Diploma in Environmental Health Science (National Health Training College, Lesotho) Responsibilities: conducting inspections at food premises, health facilities, hospitals and businesses such as hotels; disease surveillance and water quality surveillance; assessment of public and private health workplaces to ensure worker safety
11	Luisa Rafael Ginela Mahocha	Head of the Mine Inspection	Mine Inspection Department at the General Inspectorate of Mineral Resources and Energy (IGREME), Mozambique	Degree in Geology (Eduardo Mondlane University, Mozambique); postgraduate degree in Oil and Gas Business Management *(Instituto Superior Politécnico de Maputo,* Mozambique). Trained in risk assessment, inspections, and incident and accident investigations. Interested in evaluation of occupational hygiene stressors
12	Noredi Muzama	DUT student	Democratic Republic of Congo (DRC)/South Africa	BSc in Environmental Health (Durban University of Technology (DUT)). OHS top student, studying towards a Master's degree. Has participated in the GreenFlag Association (GFA) indoor air quality initiative to fight spread of COVID-19 and other airborne diseases in the public space. Speaks, reads, and writes English, French, Xitsonga (RSA), and Lilanga (DRC)

OSH: occupational safety and health, SAIOH: Southern African Institute for Occupational Health, OHTA: Occupational Hygiene Training Association

At the end of the workshop, Mr Khoza, occupational hygiene training project manager from AUDA-NEPAD and SAIOH Regional Coordinator, congratulated the candidates on their progress. He emphasised that this is a performance-based programme. Candidates can only regisiter for other modules, leading to the ICertOH, once they have demonstrated commitment by passing the examinations. AUDA-NEPAD is committed to supporting member states to achieve the AU Agenda 2063, but commitment must be reciprocal. Mr Khoza thanked the DUT management and Dr Ivan Niranjan for hosting the training. This was truly an exceptional collaborative engagement, as DUT provided the participants with transport and meals. He concluded by thanking Peter "Jakes" Jacobs, who, since 2018, has provided training to the continent without asking for payment. He complimented him for being a true pan-Africanist, as the AU's ancestors had dreamed of Africa being developed by Africans. Dr Moeti Kgware, Head of Community Health Studies, Faculty of Health Sciences, warmly welcomed the delegates to DUT and Durban and thanked Dr Niranjan for making the workshop possible. Dr Kgware expressed his excitement at having had an opportunity to host AU delegates. He said that, through its drive and strategy plan (ENVISION2030), DUT aspires to be an engaged university, ensuring that anyone who passes through its doors does not go out for him or herself, but instead to change other people's lives. *"We firmly believe that you will do likewise, even though we just interacted for a week",* he said to the training candidates.

Mr Jacobs presented the training objectives and warned candidates about the intensity of the course. He said, *"As per the requirements, candidates will have to complete overnight group and individual work, undertake practical sessions and assessments, complete an individual assignment, and then sit for a formal examination graded by the BOHS. We all have a massive responsibility to create safe and healthy work environments. Therefore, the information you will acquire here is for you to take and implement to make workplaces healthier."*

Naadiya Mundy, SAIOH President (2023/2024), also addressed the workshop participants, stating that *"SAIOH has developed a five-year strategic implementation plan to focus on developing occupational hygiene in Africa".* She added that *"several initiatives are being implemented, including this one, to ensure that SAIOH realises the strategy".* She expressed her pleasure at seeing the training of candidates from more than five African countries taking place and said that *"SAIOH's door remains open for countries to request any operational and technical assistance in developing occupational hygiene on the continent".* She concluded by wishing everyone the best with their careers in occupational hygiene and life, saying that they were most welcome to join SAIOH in serving the 'noble profession'.

CONCLUSION

The need for the development of the occupational hygiene profession in Africa cannot be over-emphasised. Meaningful collaboration between the AU, regional economic communities (RECs), AUDA-NEPAD, member states, academic institutions, civil society organisations, and development partners is crucial. It is estimated that the continent has about 466 million working people,[6] with many working in the informal sector. Consequently, we need to accelerate the capacity development of the profession in terms of both numbers and skills. Even then, Africa will not have an adequate number of occupational hygienists for several reasons, including emigration. Thus, there is a need to incorporate and promote technology, such as real-time monitoring in occupational hygiene. It offers rapid assessment of workplace noise exposures, using sound-level meters and noise dosimeters. As demonstrated during the training workshop, the technology will aid instant implementation of control measures.

ACKNOWLEDGEMENTS

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Workshop facilitators and organisers; L–R: Dr Ivan Niranjan (DUT, Senior Lecturer and SAIOH Council member), Naadiya Mundy (SAIOH President 2023/2024), Dr Pavitra Pillay (DUT Deputy Dean), Norman Khoza (AUDA-NEPAD OSH Specialist and SAIOH Council member), Peter "Jakes" Jacobs (Sedulitas Managing Director), Goitsemang Keretetse (Wits School of Public Health Lecturer and SAIOH member), and Delvin Govender (SAIOH member)
Photograph: Norman Khoza



Workshop facilitators and participants; front row, L–R: Dr Moeti Kgware (DUT, RSA), Norman Khoza (AUDA-NEPAD), Palesa Makepe (Lesotho), Ntsoaki Makafane (Lesotho), Dalitso Tizifa (Malawi), Goitsemang Keretetse (Wits School of Public Health, RSA), Umali Yasidu (Malawi); middle row, L–R: Mathews Silondwa (Zambia), Shadrick Magombo (Malawi), Luisa Mahocha (Mozambique), Patricia Chilaisha (Zambia), Zarco Geldenhuys (RSA), Anusha Karamchand (DUT RSA); back row, L–R: Joseph Sindawa (Zambia), Peter "Jakes" Jacobs (Sedulitas, RSA), Dr Ivan Niranjan (DUT, RSA), Absalom Ndlovu (Zambia), Elton Mhone (Malawi)
Photograph: Norman Khoza

University of Technology; the Southern African Institute for Occupational Hygiene (SAIOH); and Sedulitas, for their invaluable contributions and support.

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Workshop participants in the discussion group session
Photograph: Norman Khoza

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13th IOHA International Scientific Conference

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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!

GLOBAL EXPOSURE MANAGER

Edited by **Dr Thomas P Fuller:** IOHA Past President
e-mail: tpfuller1@gmail.com

Japan Association for Working Environment Measurement (JAWE) – Joint Workshop and Presentation Session on Occupational Hygiene and Working Environment Measurement 2022, Himeji, Japan

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The Japan Association for Working Environment Measurement (JAWE) and the Japan Occupational Hygiene Association (JOHA) held their Joint Workshop and Presentation Session on Occupational Hygiene and Working Environment Measurement 2022 in Himeji where the world heritage Himeji-jho (castle) is located, from 26 to 28 October 2022. This event marked the 43rd annual meeting for JAWE and the 61st for JOHA.

This annual event was held both in person and virtually due to COVID-19 pandemic restrictions. The conference provided a good opportunity to discuss and exchange views on their daily technical issues for some 400 participants (the most ever), made up of researchers and technical experts in working environment control. Partcipants included JAWE-certified occupational hygienists (JAWE-COH), manufacturers/dealers of measuring equipment, and other interested people.

There were 57 presentations on research and case studies by researchers and experts, among which were 25 presentations on work environment measurement and analysis, eight on work environment improvement, five on case studies of risk assessment for specific work, and five on evaluation of exposure to noise.

An exhibition of measurement-related equipment was held concurrently with this event, in which 21 manufacturers participated. The exhibition covered a wide range of equipment such as respiratory protection, protective clothing, digital dust monitors, air samplers, mini-pumps, local ventilation systems, respiratory protection fit-testing, acoustic cameras, real-time monitors, and air purifiers.

The 3.5-hour annual joint seminar by JAWE and JOHA enticed most of the 400 conference participants. The theme related to the recent Japanese Government announcement of the change in the regulatory system for occupational health management of hazardous chemicals, including its overall impacts on occupational health in workplaces. There were presentations by three lecturers, followed by a panel discussion comprising five panelists, including the Director of the Ministry of Health, Labour and Welfare, which is in charge of this matter. According to the new policy, the number of chemicals for which employers will be required to exercise risk assessment for handling will increase dramatically from the current 674 to around 2 900, within in a few years. Approximately 800 of the 2 900 chemicals will eventually be assigned air concentration exposure limits by the Government. Employers will be obliged to keep workers' exposures below these limits.

The underlying goal of the Government, in this regulatory change, is to foster voluntary safety and health management among employers amid the increasing number of potentially hazardous chemicals, as defined by the Globally Harmonised System.[1] The question remains, however, whether the regulations will work in small and medium-sized enterprises (SMEs) where occupational safety and health staff are often scarce or non-existent. As this new policy will be enforced in 2024, employers should start preparing for the changes now.

The next Joint Workshop and Presentation Session will be held in November 2023 in the city of Mito, Ibaraki Prefecture, located about 90 km northeast of Tokyo.

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Report on the 6th Asian Network of Occupational Hygiene (ANOH) Conference, 2022

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The 6th Asian Network of Occupational Hygiene (ANOH) (hybrid) Conference, in conjunction with the 7th Indonesian Industrial Hygiene Association (IIHA) Conference, was held in Indonesia, from 19 to 23 September 2022. The theme was *Exploring the Asian Way: Protecting Workers' Health in a Challenging World*. More than 200 onsite participants and almost 100 online participants from 18 nations attended the conference. Six professional development courses (PDCs) were delivered: 1) chemical risk assessment: strategy, limit values, modeling, 2) noise engineering control, 3) industrial hygiene risk management, 4) chemical risk assessment: measurements, health surveillance, compliance testing, 5) certification exam preparation, and 6) connected wearable occupational hygiene monitoring devices.

There were eight keynote addresses at the conference:

- 'Exploring the Asian way: protecting workers' health in a challenging world', Prof. Doo Yong Park
- 'Mental health and psychosocial topics', Jacqueline Agius
- 'OEL-based regulations for management of chemicals – the forthcoming big change in Japan', Haruo Hashimoto
- 'Sustainable workplaces under the challenge of the Pandemic – the possibility of working from home', Prof. Jean Feng-Jen Tsai
- 'University laboratory management plans', Ass. Prof. Sjahrul M Nasri
- 'Ventilation and air purification for the indoor environment – how good is the evidence for reducing the risk of airborne infectious diseases?', Adj. Prof. Dino Pisaniello
- 'Strengthening global occupational health capabilities through standardised credentialing practice', Philip Hibbs
- 'The science of fit', Vinay Pathak

Prior to the conference, the IIHA organised two important meetings: the ANOH Board meeting and the International Occupational Hygiene Association (IOHA) Board meeting and annual general meeting. Several issues were addressed at the ANOH meeting, such as financial reports and activities held under the presidency of Prof. Dong Uk Park, a presentation from ANOH's Advisory Board, and strengthening industrial hygiene in Asia by Prof. Doo Yong Park. These were followed by the election of Philip Hibbs from Australia as the new ANOH President for the January 2023–December 2024 period. Furthermore, it was decided, through voting on 5 October, that the next ANOH Conference will be held in Manila, Philippines.

During the IOHA meeting, committee reports from stakeholder communication, national accreditation recognition, education, and governance were delivered. The meeting was closed by the welcoming of the new International Occupational Hygiene Association President, Maharshi Mehta, and an appreciation ceremony for the Past President, Norhazlina Mydin.



ANOH Conference attendees
Photograph: courtesy of Mila Tejamaya

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Review of the palliative care service of the Asbestos Relief Trust and Kgalagadi Relief Trust, 2007–2022

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Mesothelioma is an aggressive and deadly form of cancer caused by asbestos exposure. It is predominantly a pleural disease affecting the outer lining of the lungs. It also occurs, albeit rarely, in the abdomen, pericardium and scrotum.[1] The bulk of cases of mesothelioma result from asbestos exposure, which usually occurs in the workplace, resulting in it being classified as an occupational disease. Exposure can also occur in the environment.

Palliative care, as defined by the World Health Organization (WHO), is *"an approach that improves the quality of life of patients and their families who are facing life-threatening illness. It prevents and relieves suffering through the early identification, correct assessment and treatment of pain and other problems, whether physical, psychosocial, or spiritual."*[2] The discipline of palliative care has received prominence in South Africa of late, with the adoption of the National Policy Framework and Strategy on Palliative Care 2017-2022,[3] with one objective being to include palliative care in the undergraduate and postgraduate curricula of all healthcare providers.[4]

The idea for a palliative care service for the mesothelioma patients of the Asbestos Relief and the Kgalagadi Relief Trusts (the Trusts) was conceived in 2006 after it became apparent that there was a high incidence of mesothelioma in and around the asbestos mining town of Kuruman, Northern Cape, and that only providing monetary compensation for the sufferers was inadequate. While asbestos mining in Kuruman ended in 1998, and all asbestos-related commerce was banned 10 years later,[5] new cases of mesothelioma continued to emerge[5] and, despite some considerable compensation payments, the need for palliative care became compelling because of the inexorable toll levied by mesothelioma. The service was designed and jointly funded by the Trusts, with Dr Jim teWaterNaude and the late Phiroshaw Camay playing pivotal roles.

People with mesothelioma and their families have palliative care needs from diagnosis to end of life. Mesothelioma carries a significant symptom burden[6] and typically progresses rapidly, with most sufferers dying within eight to 14 months after diagnosis.[7]

People with mesothelioma experience a range of debilitating symptoms, including intractable pain, breathlessness, profound weight loss, weakness, and fatigue. There are currently no curative treatments for mesothelioma, but surgery, chemotherapy, and radiotherapy can assist in improving survival and lessening symptoms. The greatest need of mesothelioma sufferers is palliative care and the support of family and friends.[8]

The Trusts' palliative care service was launched in March 2007 when the trustees appointed Sr Phemelo Magabanyane in the role of palliative care nurse. She was joined by Sr Gomolemo Moetsi in October 2018. The main objective of the Trusts' palliative care service is to facilitate a personal connection to those suffering the worst effects of asbestos exposure to assist them to experience a full and dignified life as they approach death, which unfortunately awaits.

The service is intended for anyone living in the greater Kuruman area who is suffering from an asbestos-related cancer, as well as other asbestos-related conditions needing palliative care, regardless of whether or not they qualify to receive financial compensation from the Trusts. Former asbestos miners make up the largest beneficiary group, followed by people who were environmentally exposed to asbestos when living near asbestos mines, or whose family members worked on the mines and brought asbestos fibres home on their clothes.

The permanent interdisciplinary team consists of one occupational medicine specialist and two palliative care nurses. The team works closely with specialist oncology and cardiothoracic healthcare professionals at state hospitals in the Northern Cape and Free State provinces. The team also works closely with a pharmacist and a physiotherapist. Additional clinical expertise is available through Cancer Charity Workers, a voluntary organisation that assists cancer patients in the villages surrounding Kuruman.

At the local level, the palliative care nurses work closely with traditional leaders. The primary public sector stakeholders include the national and provincial Departments of Health, the National Institute for Occupational Health (NIOH), the Medical Bureau for Occupational Diseases (MBOD), and One Stop Centre in Kuruman. Private stakeholders are the Trusts, local general practitioners, and service providers – including radiologists, funeral services, and prosectors. Mesothelioma UK and the Bristol Myers Squibb Foundation and have shown an active interest in the programme.

The service aims to meet the palliative care needs of patients, their families, and care givers, from initial testing, to diagnosis, possible surgery, and chemotherapy, through to the end of life. It is salutary and satisfying that, when measured against the WHO's statements on palliative care,[2] the service meets almost all the normative requirements.

As regards end-of-life services, the Trusts have made substantial investments in enabling patients to undergo the prosection of their hearts and lungs upon death so that the NIOH can carry out post-mortems thereof. This investment includes counselling patients about the benefits of post-mortem examinations, recruiting a service provider to carry out the prosection of hearts and lungs, renovating the prosection room at the International Funeral Society in Kuruman, creating a prosection manual for use by prosectors, and paying a courier to transport the specimens from Kuruman to the NIOH pathology laboratory in Johannesburg.

The palliative care service also provides:

- Monthly home visits
- Clinical evaluations
- Home oxygen therapy
- Pain management, and supplemental opioids when the provincial services cannot provide these
- Physiotherapy
- Referrals to local and provincial health facilities
- Provision of treatment support
- Patient advocacy
- Transport of patients to medical appointments in Kimberley and Bloemfontein
- Education on asbestos-related diseases
- Education on palliative care and its benefits
- Education on budgeting, foster parenting, and living wills
- Preparing families and care givers for terminal care, death, and bereavement
- Diagnostic radiography services, specifically chest and abdomen computer tomography

The Trusts have spent close to R11.5 million on social investment in the palliative care service. In addition, numerous palliative care patients and their families were beneficiaries of the hunger alleviation project of the Kgalagadi Relief Trust during the COVID-19 shutdowns, which totalled more than R1 million.

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An insight into RMA's Prevention Programme

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Background

In the September 2022 edition of *Occupational Health Southern Africa*, Rand Mutual Assurance (RMA) published an article on the launch of its Prevention Programme. RMA administers claims for occupational injuries and diseases as required by the Compensation for Occupational Injuries and Diseases Act No. 130 of 1993 (COIDA). RMA has the licence to administer claims for both the mining and metals-related industries.

In April 2022, RMA launched the Prevention Programme, which is a strategic focus area of the business. RMA believes that the prevention of injuries and diseases at work is crucial to contribute to enhanced employee productivity for employers and, more importantly, to improve the health and safety of employees. RMA understands the impact of working conditions and environments that contribute to workplace fatalities, injuries, and diseases. It is for this reason that RMA launched the Prevention Programme to help its members reduce the number of incidents by assisting them with various health and safety initiatives.

Purpose of the Prevention Programme

RMA's Prevention Programme is a pilot project that supports the employers in the metals class. This class consists of various industries, ranging from foundries to automotive plants, light and heavy steel work, and garages. The programme partners with various stakeholders, including employers, employer associations, and unions to reduce occupational incidents by offering a blend of occupational health and safety and financial wellness solutions. The aims of the programme are to improve employee safety, reduce the incidence and severity of injuries and diseases, and reduce the debt burden of employees.



RMA's Prevention Programme is based on the view that safe and healthy workers are more productive workers
Photograph: courtesy of RMA

Insights from 2022

Upon reflection, RMA can share the following insights from the pilot project implemented in 2022.

First, the metals class is varied with regard to the types of businesses that operate and the size of the companies. Companies that have signed up to the Prevention Programme range from family-owned and -run businesses to large international companies. The variance in the types of companies and their size influences how occupational health and safety is viewed and applied in these organisations.

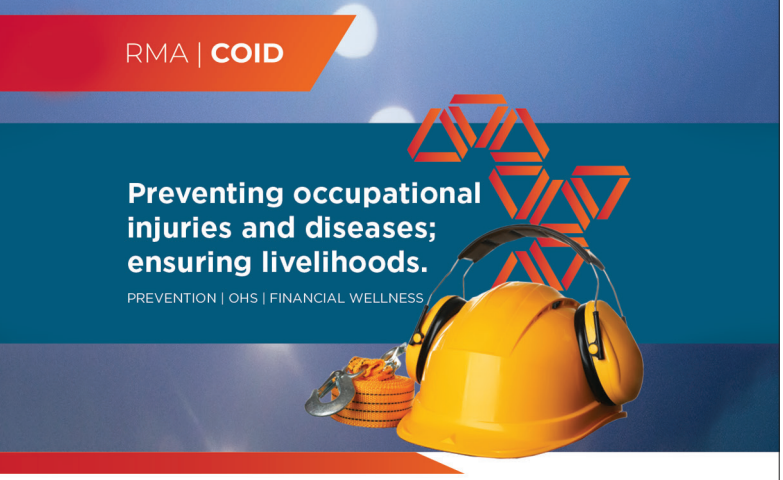
The understanding and application of legislation, the way in which the prevention of incidents is conducted, and the resources provided for safety management are significantly different between these types of organisations.

The pilot project started with a small sample of 10 companies that signed up to the programme in 2022. It became evident that prevention (used interchangeably with health, safety, and wellness) is fairly established in the larger organisations and poor, if considered at all, in smaller organisations with 40 and fewer employees. In the smaller organisations, safety is very much either a 'nice-to-have' or is addressed in 'pockets' because of a lack of expertise in these organisations, budget or financial constraints, a lack of understanding (and knowledge) of the legislative requirements and the need for legal compliance, or because the primary focus of small-medium enterprises is survival. Prevention, in its all-encompassing fields, is simply not prioritised. In the event of a major accident that results in a fatality or serious injury, these factors will be of no concern to the various investigating bodies as the Occupational Health and Safety Act and its regulations ought to have been in place, irrespective of the above issues. It is of the utmost importance for employers to be cognisant of the consequences of failing to fulfil their legal health and safety obligations.

Having developed insight into this lack of prevention capacity, as identified in the pilot project companies in 2022, RMA has the reassurance that the Prevention Programme is necessary. By rolling out the programme, we will be able to help companies ensure that, at a minimum, they become legally compliant. No company wants to be known for being unsafe or not caring for its employees. This gives us the confidence that the Prevention Programme is vital, not only to drive lower compensation claims, but also to establish RMA as a social insurer that cares and serves with compassion. The view that safe and healthy workers are more productive workers lies at the heart of RMA's Prevention Programme.

The second insight from the programme in 2022 is related to the larger organisations where health and safety is fairly established, and where one would expect legal compliance. 'Fairly established' can be defined as having some resources dedicated to managing health and safety, such as human resources and finances. However, it was evident from the audits conducted at these organisations that there is much room for improvement to assure best practice. We found that some of the most basic of safety principles are overlooked, or go unattended, or that complacency has set in. With the help of a 'fresh pair of eyes', these unsafe conditions and actions needed to be addressed. Unlike the smaller companies, the larger organisations have invested in

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safety by employing dedicated personnel who are qualified to manage safety; assumingly, they have an allocated budget for this. However, the evidence indicates that budgets are inadequate. Additionally, the safety teams are not always 'heard', are disempowered, and are unable to implement corrective actions (timeously) to ensure that safety is prioritised. In some cases, the teams are demoralised when leadership does not take safety seriously. The findings showed that:

- corrective action was not taken when employees did not wear personal protective equipment (PPE);
- legal appointments were not in place;
- legal liability training was not provided to executive management;
- there was a lack (or poor guarding) of equipment;
- hazardous materials were being used without (or with incorrect) PPE;
- there were issues relating to unsafe equipment;
- there was a lack of safety training; and
- there was poor incident management.

In larger organisations, it is expected that significant business focus is on safety as the consequences of neglecting this can result in financial, reputational, and legal ramifications. It is sadly a reflection that prevention is not a business imperative. RMA believes that further attention, awareness, and education around prevention at a managerial level is warranted. The need for a cost-benefit discussion between RMA and these organisations is evident. Spending R1 million in compensation for occupational injuries and diseases must surely ring alarm bells, especially during the economic hardships facing our country. This financial risk serves as a motivation to join RMA's Prevention Programme; investing in safety is cost effective in the long term.

The third insight from 2022 pertains to the eagerness for collaboration in preventing injuries, loss of life, and occupational diseases in employees, by labour organisations. Stakeholders from both the employer (such as employer associations, e.g. the Steel and Engineering Industries Federation of Southern Africa (SEIFSA)) and employee representatives (such as trade unions, e.g. National Union of Metalworkers of South Africa (NUMSA)) have demonstrated a keen willingness to support RMA's Prevention Programme. It is imperative for safety initiatives to succeed. Safety must be tackled by all participating entities within an organisation. RMA's stakeholders' involvement in the Prevention Programme extends beyond the promotion of the programme; it includes further education, awareness, and training around prevention of injuries and diseases.

The final insight relates to perspective. Although there was a slow start in terms of members joining the Prevention Programme in 2022, there is no doubt that it is much needed in the metals space, as indicated by the number of claims received by RMA. There is a need to drive further participation in the programme if it is to make a tangible difference to the severity and incidence rate of injuries and disease in the metals class. Complementing our members' existing health and safety systems and helping them to become legally compliant (and take them to best practice) is at the top of our agenda.

Interventions provided by RMA to create healthier and safer workplaces is the focus for 2023. Sustainability is critical to making a significant difference. This year, we aim to implement solutions and interventions for continuous improvement and the inculcation of safety as a key business imperative. Ultimately, we want our members' employees to return home healthy and safe every day.

For further information about how the Prevention Programme could work in your organisation, contact the RMA team at rmaprevention@randmutual.co.za

Tshiamiso Trust pays out first billion rands in silicosis and TB compensation

Johannesburg, 28 February 2023

Two years after the Tshiamiso Trust started processing claims for the historic R5 billion settlement agreement, the Trust has announced that the first billion rands have been paid over to 11 316 eligible silicosis and TB claimants.

The Tshiamiso Trust was established in 2020 to give effect to the settlement agreement reached between six mining companies and claimant attorneys in the historic silicosis and TB class action. The companies are African Rainbow Minerals, Anglo American South Africa, AngloGold Ashanti, Harmony Gold, Sibanye Stillwater, and Gold Fields. The Trust is responsible for compensating all eligible current and former mine workers across southern Africa with permanent impairment due to silicosis or work-related TB, or their dependants where the mine worker has passed away.

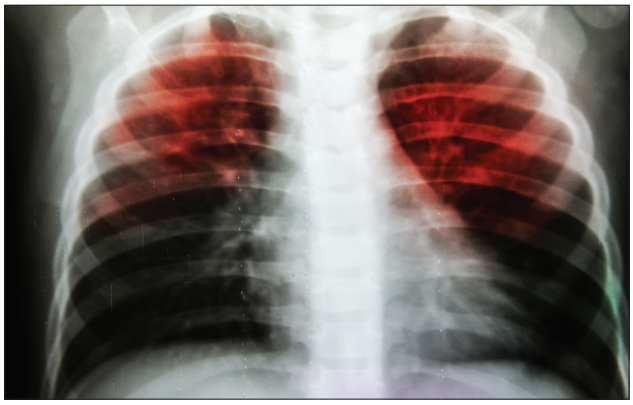
Commenting on the milestone, the Trust's Acting Chief Executive Officer, Lusanda Jiya, said, *"It's been two years since the Tshiamiso Trust officially began accepting claim lodgements. Two years of serving our claimants, with the help of service providers, stakeholders, and our staff. Our people come to work every day with the mission of impacting lives for the better, and the first billion rands paid out to more than 11 000 families is just the beginning. We know that there are many frustrations, and we know that no compensation will never be enough to undo the suffering endured by mine workers and their families. However, we are committed to deliver on our mandate and to ensure that every family that is eligible for compensation receives it."*

The frustrations that Ms Jiya alludes to are plentiful, mostly related to the lack of understanding of the limitations of the Trust, the requirements of the Trust Deed that governs it, and expectations of where it fits within the broader social benefits and compensation framework.

Ms Jiya explains that *"Trusts are limited, both in terms of the time in which they can operate, and the extent to which they can assist those seeking compensation. The Tshiamiso Trust has a lifespan of 12 years, ending February 2031. It cannot change the compensation system and it cannot help people who do not meet the criteria for compensation. What it can and will do is spend the next eight years using the Trust as a tool to deliver benefits to as many qualifying ex-mine workers as possible, by empowering claimants and potential claimants with the correct information and servicing them in the best way possible, within the constraints of the Trust Deed. Unfortunately, the eligibility criteria dictated by the Trust Deed result in the majority of claims being rejected for medical reasons alone, and many claims, especially for deceased mine workers, taking far longer to process than we'd like."*

Broadly speaking, the eligibility criteria include, amongst others, that the mine worker must have:

- Carried out risk work at one of the qualifying GOLD mines during the qualifying period between 12 March 1965 and 10 December 2019 (bearing in mind that some mines changed ownership during that time and are only considered during the periods that they were owned by the participating mining companies); AND
- For living mine workers they must have permanent lung damage from silicosis or TB that they contracted from doing risk work at these mines;
- For deceased mineworkers, there must either be evidence that they died FROM TB within the year of leaving the mine (if it is a TB claim and the mineworker died before 10 December 2019), OR evidence that they had silicosis or died from silicosis if it is a silicosis claim.



Certain mine workers with silicosis and/or TB are eligible for compensation in terms of the Tshiamiso Trust Deed
Photograph: courtesy of Tshiamiso Trust

The once-off compensation amounts were updated in February 2023 in line with the consumer price index (CPI), and range from a little over R10 000 to just under R534 000, with most claims paid to date being around R74 000. The maximum amount payable for each of the 10 compensation classes may be reduced, based on risk work done on non-qualifying mines or outside of the qualifying periods, including if the qualifying gold mine changed ownership between 1965 and 2019.

More than 111 000 claim lodgements have been received to date, through offices in South Africa, Lesotho, Botswana, Eswatini, and Mozambique. The Trust is working with stakeholders in these countries and others to mobilise its efforts and expand operations.

Potential claimants, including mine workers, or their families if they are deceased, are encouraged to call the Tshiamiso Trust contact centre on 0801 000 240 (within South Africa) or 0027 10 500 6186 (outside South Africa). They can also connect on the Tshiamiso Trust Facebook page and have their questions answered.

Claimants are reminded to be careful of people impersonating the Trust or promising to help speed up their claims. Only the Tshiamiso Trust can process claims. This is a FREE service. Claimants must only share their documents with the officials at the lodgement offices.

Useful links:

- To see if the mine worker qualifies to lodge a claim: https://www.tshiamisotrust.com/information/status-check/
- To view the claims process: https://www.tshiamisotrust.com/information/how-to-claim/
- To view the compensation classes: https://www.tshiamisotrust.com/information/compensation-classes/
- To view daily progress of claims and payments: https://www.tshiamisotrust.com/information/progress-report/

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Choosing the correct workmen's compensation specialist

Workmen's compensation (WC) has developed a bad reputation in the medical fraternity in recent years. Private medical service providers refuse to see injury on duty (IOD) patients or, if they do, they provide the minimal service to these employees until they are transferred to state-run institutes.

The challenge for most medical providers is simply the lack of payment from the relevant Government department, viz. the Compensation Fund (CF), for services rendered. Payment delays result in a slowdown of the medical services offered.

All blame, however, cannot be laid at the doorstep of Government. There are ongoing attempts to implement new and improved systems to assist medical service providers to upload invoices and be paid for their services. However, before any service provider can claim for services, there must be a valid claim loaded and accepted by the CF, and a claim number issued. Only then will the administration of the claim begin.

Workmen's compensation 'specialists' are companies that will, for a fee, assist employers to get claims registered and paid, as well as a host of other WC services. There has been an influx of these companies over the years due to the inefficiency of Government departments, yet not all of them have been able to fulfill their delivery mandates. Despite non-delivery, this seems to be the only avenue for frustrated employers.

Being in the WC field for more than 13 years and, more importantly, working closely with the CF over this period has given Euttopia Consulting a 'bird's eye' view of this problem – from the side of the employer, the Government, and the so-called specialists in the industry. We see employers who are content to have passed on claims to a WC specialist and then assume that their responsibility for the matter has ended. We see WC specialists who are content just to get a claim registered and not finalised, and we also see the custodians of WC wait passively for 'further information' before activating the claims process. This is certainly a recipe for disaster and fuels the 'blame game' fire. There needs to be more collaboration between parties.

Euttopia Consulting is approached almost daily to rectify other WC specialists' shortcomings or failure to deliver. While we do have a high success rate, this is a costly exercise for clients or employers who end up paying twice for a service. We encourage all clients to examine the agreements they have in place with WC specialists, and to ensure that they are receiving fair treatment. Service delivery should be judged on claims finalised and NOT on claims registered. Unfortunately, many employers believe that once a claim is registered that is the end of the process. However, registration is only the beginning and claims need to be followed up rigorously to ensure that medical service providers and employees receive fair treatment, and that they are ultimately compensated. Claims that are merely registered and not finalised could have dire consequences for service providers, employers, and employees.

Finalisation of a claim can:

1. Prevent employees and service providers from making further claims on an existing claim
2. Safeguard the company from facing legal action due to claims remaining open and compensation not being paid to relevant beneficiaries
3. Safeguard against service providers taking legal action against the company for non-payment of services, etc.
4. Help an employer comply with the Compensation for Occupational Injuries and Diseases Act (COIDA)

A good WC specialist should not only assist employers with claims but also be able to help service providers get their invoices paid. This creates an environment conducive to the treatment of IOD patients, which contributes to the wellbeing of the employee who is the ultimate beneficiary of these services.

Employers should ensure:

1. They partner with a WC specialist that brings claims to finalisation, not simply registers them
2. Compensation for injured employees and medical service providers is paid
3. Comprehensive reporting during the processing of the claim and upon its finalisation

To find out more about workmen's compensation services, contact Euttopia Consulting:
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Strengthening occupational health systems in the post-COVID-19 and the State of Disaster era in South Africa: strategies for the road ahead

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Background and introduction

South Africa has emerged from the COVID-19 pandemic with major impacts on communities – from loss of family members and severe disabilities, to considerable economic consequences. During the Pandemic, South Africa called on its workers to be on the front-line to protect the health of people and communities to ensure that our factories, mines, educational institutions, markets, and commercial centres continued to drive the economy. This placed workers in many economic sectors at risk of being infected and a considerable number experienced the more severe forms of the disease. Stakeholders in various occupational contexts responded in a variety of ways.

The 17th Annual Public Health Conference of the Public Health Association of South Africa (PHASA), held in Durban in September 2022, provided an opportunity to discuss important issues pertaining to occupational health in the time of the epidemic – lessons learnt and the ways forward. A panel was convened under the auspices of the Colleges of Medicine of South Africa, bringing together occupational medicine and public health medicine specialists Rajen Naidoo, Mohamed Jeebhay, Sujatha Hariparsad, Muzimkhulu Zungu, and Itumeleng Ntatamala.

In keeping with the conference theme, *Building Back Better*, the overall purpose of the Panel was to identify high-level interventions that would strengthen the overall occupational health system in South Africa, based on the experiences of the COVID-19 pandemic, to promote and protect the health of all workers in the country.

Purpose of this position statement

The position statement:

1. Reports on the pre-Pandemic deficiencies in occupational health (OH) in South Africa and strategies that emerged during the Pandemic to address these shortcomings
2. Emphasises the need for strengthened, sustainable, and integrated OH services across all sectors (formal and informal, public and private) in the country
3. Recommends new and innovative paradigms for implementation within occupational health, whilst promoting and strengthening intersectoral collaboration

Occupational health status in the period before the Pandemic

Research has shown that, at best, only 20% of South African workplaces have occupational health services, and these are generally available within larger workplaces.[1,2] Workers in the public sector (other than health workers), small enterprises, and the informal economy have limited access to OH services.[3] Although South Africa already has reasonably progressive OH legislation, it is poorly

enforced. In addition, the legislative framework in the country is extremely fragmented. The Department of Mineral Resources and Energy is responsible for monitoring and enforcement of OH on mines and works, while the Department of Employment and Labour is responsible for the same in other workplaces. The latter Department is responsible for compensation of workers, but mining-related respiratory diseases are compensable through processes within the Department of Health, which is also responsible for providing occupational health services only for health workers.

The impact of the Pandemic on workplaces

This fragmentation, poor enforcement of legislation, and lack of services for the majority of workers impacted negatively on workplaces as the Pandemic unfolded. Employers failed to respond to legislation and guidelines, mostly because of the lack of capacity at a workplace level. Furthermore, differential responses to protect workers meant that certain categories of workers, such as health workers and miners, were better protected, whilst others were neglected – especially those in small, micro and medium enterprises (SMMEs) and the ever-growing informal economy. There was an absence of worker understanding, limited behavioural change, and apprehensions regarding COVID-19 infection, as well as severe disease and ineffective prevention measures, and no coherent plan for return of affected workers to work. Many work sectors, including retail, small businesses, and mining, reached out to the national OH Task Team for additional technical support and assistance.

The national response relating to occupational health

Several drivers contributed to the development of multidisciplinary OH teams of experts in various Government agencies during the Pandemic. Some of these included recognition of the pending disaster, lack of OH capacity for ground-level implementation, and strong coordination for occupational health and safety (OHS) teams with rapid responsiveness. The national Departments of Health, Employment and Labour, and Mineral resources and Energy, together with academic institutions, the National Institute for Occupational Health (NIOH), tripartite structures such as the National Economic Development and Labour Council (NEDLAC), and professional bodies such as the South African Society of Occupational Medicine (SASOM), the South African Society of Occupational Health Nursing Practitioners (SASOHN), and the Southern African Institute for Occupational Hygiene (SAIOH) formed a national OH Task Team. Trade unions and worker organisations also had direct involvement pertaining to areas of concern – a significant issue being workplace trust in personal protective equipment (PPE) provided and COVID-19 vaccine hesitancy.

Strengthening occupational health systems in South Africa

The need for equitable and sustainable OH service delivery integrated across both public and private sectors, covering formal and informal workers, beyond the COVID-19 pandemic was identified. It has been a longstanding challenge and requires transparency with broad collaborative engagement to protect workers' health. It is widely accepted that an organised effort for service delivery must involve the Departments of Health, Employment and Labour, Mineral Resources and Energy, and Environment, Forestry and Fisheries. Participation of local municipalities in this initiative is crucial to address OH service delivery in the informal economy. A paradigm shift is needed; multidisciplinary teams (including environmental health practitioners) that investigate and address future outbreaks should have the necessary expertise to assist in workplace interventions.

A platform for identifying occupational diseases, addressing disability, and facilitating rehabilitation needs to be created to address the impact of the Pandemic on the current occupational health system. Post-COVID-19 condition ('long COVID') presents a unique challenge in developing guidelines for fitness to work and occupational disease compensation.

To overcome fragmented and under-resourced OH systems, a monitoring and response system with clearly defined roles and responsibilities at multiple levels is proposed. This should include the establishment of: 1) a technical framework to address OH emergencies, 2) a surveillance system with access to dynamic data to assess the impact of policies and interventions in workplaces, 3) integration of occupational health within the public sector health services, and 4) an independent OH coordinating authority to pool resources and strengthen networks for addressing challenges. In addition, the Department of Employment and Labour requires capacitation to enforce technical aspects of legislation. A medical inspectorate is also needed for non-mining industrial sectors, akin to the structure that exists for mine workers.

Conclusion

In summary, to protect workers' health, enablers needed for OHS include strengthened resources, a deliberate and strengthened role for health departments, access to information, collaborative and responsible teams, workplace interventions, surveillance, inspection, and enforcement. Although the COVID-19 pandemic was a major threat to OHS systems, our resilience, responsiveness, and ability to innovate were evident. These lessons must not be forgotten, and the momentum for establishing and improving OHS systems must be sustained.

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SASOM news

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SASOM annual general meeting 2022: a review of the year's highlights

The South African Society of Occupational Medicine (SASOM) KwaZulu-Natal Chapter hosted the SASOM annual general meeting (AGM) on 25 November 2022. Due to the impacts of the ongoing COVID-19 pandemic, the AGM was held in a fully virtual format, using the SASOM Zoom platform, and there was no conference associated with the AGM. The last SASOM ExCo meeting of 2022 was held on 21 November 2022, also virtually.

At the AGM, Prof. Daan Kocks (SASOM Chair) read the 2022 annual report prepared by the SASOM 2022 National Secretary, Dr Frank Fox, and highlighted the following activities and outcomes – another challenging year due to the ongoing Pandemic:

SASOM National Office

- The SASOM National Office experienced growth in its activities during 2022 after the many challenges faced during the 2020 and 2021 COVID-19 pandemic years. Prof. Kocks made a special mention of Claudia Frost, the National Office Coordinator, and thanked her for her excellent contributions to the Society, including her work in keeping SASOM running smoothly throughout the past year, and her expert technical and logistics support.
- The SASOM office bearers for 2023 were elected at the AGM: Prof. Daan Kocks (Chair), Dr André Kotzé (Vice Chair), and Dr Frank Fox (Secretary); the Treasurer post has not yet been filled.
- As at 31 October 2022, SASOM had 451 paid-up members in good standing, representing an increase of 5% from 2021. This number includes 18 student members, 10 honorary life members, six retiree members, and eight corporate memberships.
- SASOM Guidelines are provided free of charge to members in good standing, as a membership benefit. The Guidelines are continuously revised to ensure that they remain relevant for good practice in occupational health/medicine. Thirteen full sets of SASOM Guidelines and five Guidelines on 'Medical Requirements for Fitness to Drive' were sold to non-members during the past year.
- On behalf of SASOM, Prof. Kocks thanked SASOM ExCo member, Claudina Nogueira, for her facilitation of the publication of SASOM's pages in *Occupational Health Southern Africa*, and Prof. Mary Ross, for drafting the continuing professional development (CPD) questionnaires. Members can earn three CPD/CEU points per questionnaire, potentially earning 18 CPD/CEU points per annum. Despite all the hard work and time that goes into developing the CPD questionnaires, the take-up on completing these is extremely low, with less than one per cent of members submitting the questionnaire during 2022.
- Formal communication with organisations engaged in the enhancement of occupational medicine continued with SASOM ExCo members (co-opted) from the National Institute for Occupational Health (NIOH), the Compensation Commissioner (CC), the International Commission on Occupational Health (ICOH), the South African Society of Travel Medicine (SASTM), and the Mine Medical Professionals Association (MMPA).
- SASOM liaison with other organisations continued at both national and international levels, e.g. the South African Department of Employment and Labour (with SASOM being an active participant in, and contributor to, the Occupational Health Forum); *Occupational Health Southern Africa*; the Council for Health Service Accreditation of Southern Africa (COHSASA); the International Occupational Medicine Society Collaborative (IOMSC); and the American College of Occupational and Environmental Medicine (ACOEM).
- The SASOM website (www.sasom.org) remains interactive and is continuously updated. WebScripto continues to act as the web developer, and the SASOM National Office as content manager. Summary website statistics for the period 1 November 2021 to 31 October 2022 are as follows:
  - o Number of unique visitors (excluding repeat visits): 5 899
  - o Number of unique visitors, including repeat visits: 27 410
  - o Top six trending pages in decreasing order: member login; home page; membership; members' information; order SASOM Guidelines; and Guidelines.

SASOM and ICOH activities

- The ICOH2022 Melbourne-Rome Global Digital Congress of ICOH, themed *Sharing solutions in occupational health through and beyond the Pandemic*, was held in a fully virtual format, from 6 to 10 February 2022.
- SASOM congratulated two of its ExCo members on their elections at the ICOH2022 Congress to ICOH leadership posts for the 2022–2024 triennium – Claudina Nogueira (South Africa), who is serving a second term as ICOH Vice President for Scientific Committees (SCs), and Dr Dingani Moyo (Zimbabwe), who is serving a second term on the ICOH Board.
- SASOM congratulated its Chair and the ICOH National Secretary for South Africa, Prof. Kocks, for recruiting the highest number of new ICOH members from Africa during the past triennium (2018–2022).
- Claudina Nogueira and Prof. Rajen Naidoo (University of KwaZulu-Natal) are engaged in the organisation of the 7th International Conference on the History of Occupational and Environmental Health (an event of the ICOH SC on the History and Prevention of Occupational and Environmental Diseases), to be held in Durban from 15 to 17 November 2023. Prof. Naidoo is the Chair of the conference organising committee and Ms Nogueira represents SASOM. More information about the conference can be accessed at https://icohhistory.ukzn.ac.za
- A new ICOH SC has been created in the current triennium (2022–2024), bringing the total number of ICOH SCs to 38. The SC on Biohazards and Occupational Health (SC BOH), whose interim

Chair is SASOM ExCo member Prof. Mary Ross (South Africa), arose from the conversion of the ICOH Working Group on Occupational Infectious Agents (WG OIA), which had been in existence for many years.

SASOM awards

- The SASOM Medal of Excellence, awarded to candidates for the Fellowship of the College of Public Health Medicine of South Africa – Division Occupational Medicine (FCPHM(SA) OccMed) 2022, was awarded to Dr Zahida Sonday from the Western Cape.
- The following two papers received the SASOM awards for best publications in *Occupational Health Southern Africa* journal for 2020 and 2021:
  - o Mthombeni SK, Coopoo Y, Noorbhai H. Fitness levels of rural emergency medical and rescue service providers in the North West province, South Africa. Occup Health Southern Afr. 2020; 26(3):111-116.
  - o Liedemann KP, Dramowski A. A 'nice to have' or a 'non-negotiable': South African healthcare workers' knowledge, attitudes, practices and perceptions of vaccination. Occup Health Southern Afr. 2021; 27(2):38-45.

Webinars and conferences hosted by SASOM

- After not holding an annual congress over the past two years (2020 and 2021) due to the impact of the global COVID-19 pandemic, SASOM held a CPD-accredited virtual annual congress, themed *Updates in Occupational Health and Occupational Medicine in the COVID-19 era*, over four months (July to October) in 2022. The congress offered SASOM members four sessions in webinar format with individual sub-themes, with four presentations in each session. Prof. Kocks and Ms Nogueira facilitated and coordinated the scientific programme, and Mrs Frost provided technical and logistics support. Presenters were both international (from Australia, India, Portugal, and USA – all ICOH members) and local. The SASOM Annual Congress 2022 webinar series was well attended by delegates (a total of 376 across the four sessions), representing countries from across the globe. The webinar recordings are available in the 'Members only' area on the SASOM website; they show how SASOM is extending its range and sphere of influence in occupational health at national, regional, and global levels.
- SASOM and its Northern Cape Chapter, the Asbestos Relief Trust, the Kgalagadi Relief Trust, and Cipla sponsored and/or co-organised a CPD-accredited hybrid workshop at the Red Sands Country Lodge near Kuruman, on 24 August 2022. A total of 65 delegates participated – 24 in person and 41 online. This was the first hybrid event co-organised by the SASOM National Office.
- The SASOM Western Cape Chapter has continued to be the most active of the chapters, and hosted eight well-attended CPD-accredited sessions in webinar format for its members via the SASOM Zoom platform (monthly in February, March, May, June, and August to November 2022). Webinar topics ranged from 'An evening of toxicology', and 'Refresher: risk assessment for hazardous biological agents and audits in occupational health – key considerations', to 'COVID-19 vaccination in the workplace: a critical reflection', and 'Managing back pain in the working environment'. The most well-attended webinar was 'Managing mental health in the workplace'.

SASOM wishes its members a happy, healthy, safe, productive, and rewarding 2023.

SASOHN's 41st Conference and AGM: *Four Seasons*

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Overview

The South African Society of Occupational Health Nursing Practitioners (SASOHN) celebrated the return of its Annual Conference to the beautiful city of Cape Town in 2022. The venue, the Blaauwberg Beach Hotel, with breath-taking views over Table Mountain and Table Bay, revealed the city's iconic status to the delegates. The event was hosted by the SASOHN Western Cape Region and took place from 23 to 25 November 2022.

The conference theme was *Four Seasons* – celebrating the notorious Cape Town weather where one can experience four seasons in one day! The aim was to address various topics, as identified from member polls and requests to entertain, enlighten, and educate the delegates. The conference further afforded delegates the opportunity to network with fellow occupational health nursing practitioners (OHNPs), visit exhibitor stands, and attend the cocktail and gala dinner events, and the annual general meeting (AGM).

Conference presentations

The pre-conference workshops presented on Wednesday 23 November 2022 were well attended. Conference delegates had a difficult choice in selecting one of three possible workshops to attend. 'Fundamental principles of ergonomics' was presented by Dale Kennedy – an acclaimed ergonomist who was part of the steering committee that developed the 2019 Ergonomics Regulations, and therefore a knowledgeable presenter of this workshop. The second workshop, 'Mental health, self-care and self-caring', was facilitated by Henk Blignaut, an industrial psychologist who specialises in employee wellness. The workshop delegates gained insights into their personal mental health as well as the health of their occupational health clients. The third workshop, 'Beyond COVID', was presented by Benjamin de Waal, Senior Lecturer in the Department of Emergency Medical Sciences, Cape Peninsula University of Technology. Mr de Waal holds an MSc in Medical Sciences (Clinical Epidemiology) degree from the University of Stellenbosch. He was well suited to equip the attendees with tools to manage the COVID pandemic; he also shared information on lessons learned during the Pandemic and how to prepare for the next 'Big One'.

Conference day proceedings on Thursday, 24 November 2022 opened with a warm seasonal welcome by the SASOHN Western Cape Regional Chairperson, Joan Visser, followed by a welcome address by our SASOHN President, Michelle Bester.

The first session of the day, *Summer*, was chaired by weather forecaster, Yolande Jooste, and began with a presentation by Justin Malherbe, a senior attorney specialising in insurance and health law. He focused on the Protection of Personal Information (POPI) Act and how it applies in healthcare and beyond. A key message was that, in healthcare, the importance of proper record keeping, informed consent, and right to privacy can never be overstated.

This was followed by an insightful session lead by Dr Zahida Sonday, an occupational medical practitioner who works for the Assurance Directorate, Western Cape Department of Health. She addressed the Regulations pertaining to Hazardous Biological Agents, promulgated in March 2022. The topic of discussion included an introduction to what a hazardous biological agent is, the types of hazardous biological agents, and how they reproduce and affect workers. This was followed by an overview of the new Hazardous Biological Agents Regulations, and the changes that were made, including new definitions of a biohazard, a 'competent person', 'control measures', and 'decontamination'. Information was shared on both standard and universal precautions, classification of hazardous biological agents, employers' and employees' duties, and medical surveillance and record keeping requirements. Of relevance to the delegates was guidance on how to conduct a risk assessment for hazardous biological agents.

The third presentation of the day was a motivational talk by Tanya Bothma, who shared the inspiring story of her journey through debilitating chronic illness, the death of her brother (which included the agonising decision that the family had to make regarding organ donation), followed, shortly thereafter, by her double lung transplant. She shared her experience of how organ donation affected her and her family, from the perspectives of both donor and recipient. Her presentation was moving and thought-provoking and many tears were shed over the 'paradox of life'.

During the tea break that followed the first session, attendees had the opportunity to visit the many exhibitors' stands to learn about their various products and services.

The second session of the day, *Autumn*, introduced Ernst van Biljon, a lawyer who obtained his BProc degree from the Rand Afrikaans University in 1985. Mr Van Biljon travelled from George to discuss 'Legislative compliance: exploring case studies'. His key experience was gained when he joined the Department of Justice as a public prosecutor at the Roodepoort Magistrates Court. His career progressed through promotion to the Specialists Court where he prosecuted wrongdoers of occupational health and safety offences. He focused on selected case studies as they applied to occupational health, followed by a mock-trial, which was much enjoyed by the delegates. The lecture and demonstration left the attendees with much-needed insight into the consequences of not adhering to the Occupational Health and Safety Act.

The fifth presentation of the day was facilitated by Dr Greg Kew: 'To screen or not to screen: substances of abuse'. Dr Kew is a nationally known figure in occupational medicine and has vast experience in occupational health, including substance abuse and testing. His presentation incorporated details of the High Court decision to decriminalise private use of cannabis, which lead to a revolution in substance-abuse testing. The presentation included steps to implementing a workplace substance-abuse programme, typical procedural scenarios generally linked to substance abuse, important concepts for substance-abuse programmes, testing, testing equipment, and cross-reactivity. He included information on the importance of laboratory testing (confirmatory testing) after a non-negative result and how it aids in the fair and legal discipline of an employee, if he or she is found to have used substances of abuse. Additional discussion included the selection of test kits and information on the difference between urine testing and oral fluid testing. His presentation continued with the difference between being 'under the influence' and 'over the limit', the reasons for testing, how to deal with non-compliance, and who can legally conduct the testing. In conclusion, he discussed court cases that applied to substance-abuse testing.

The third session of the day, *Winter*, began with 'Cultural diversity: implications for the workplace', presented by Siyabulela Sabata, a teaching and learning specialist in the Academic Planning Unit of the University of the Western Cape. Mr Sabata holds a Master's degree in Education from the University of Cape Town. He focused on why cultural diversity is important in the health profession, cultivating relational gaze for nurse specialists in occupational health, re-imagining cultural diversity through Ubuntu, implications for the field of nursing education, implications for the nursing profession, and the use of Ubuntu as African philo-praxis for liberation. His passion for the topic was evident and the presentation was very informative.

Dr Frank Magwegwe, who holds a PhD in Personal Financial Planning from Kansas State University, provided the closing presentation on resilience. Dr Magwegwe has extensive corporate experience with a cumulative 22 years in the financial services industry. Prior to joining the Gordon Institute of Business Science (GIBS) in 2021, he held several leadership positions. Dr Magwegwe is founder and Managing Director of Thrive Financial Wellness, a company that develops and delivers evidence-based employee financial education and wellness solutions, based on behaviour change science. He shared a brief history of where he started his career, which was selling fruit in the streets of Johannesburg when he left school. His presentation included a colourful explanation of stressors and coping with them, using resources available to the individual. He shared research that identified links between chronic stress and a wide range of health problems, presenting a graph showing the link between stress and the depression continuum. He talked about the effects of stress on decision making and productivity, and how to become resilient despite stress.

Gala dinner and awards ceremony

The gala dinner event, with the theme *Spring*, was made possible by sponsorship from Amtronix. The night saw the delegates in flamboyant dress against the backdrop of the ocean and the city lights. Dr Terence Hermanus, a personal branding specialist, was the master of ceremonies for the event. The bestowing of the awards for the exceptional achievers of the occupational health nursing profession was interspersed with information pertaining to personal branding.

The award recipients were:
OHNP of the Year: Melanie Pillay
Region of the Year: KZN Inland Region
Honorary Life Member: Joan Visser

Conclusion

The conference exceeded everyone's expectations and the Western Cape Region Committee can pride themselves on a successful and enjoyable event. The committee wishes to thank all the delegates, presenters, exhibitors and volunteers who helped to make this event great!

Special mention goes to the exhibitors, without which the conference would not have been possible:
Ampath
Amtronix
Clinsys
Cape Peninsula University of Technology
Dodgen Enterprises
Education for Health Africa
Ergonomicsdirect
Euttopia Consulting
Homemed
iMED Distributors
Lancet Laboratories
Medical Solutions
On-Site Occupational Health X-Rays
PathCare
Prismia
Software 1066
SSEM Mthembu Medical
Stanyer Electroserve

SAIOH news

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 for its members and is reliant on them to continue to serve this noble profession ethically. Therefore, we invite your inputs and feedback on any matters communicated below.

SAIOH PRESIDENT'S ADDRESS

Naadiya Mundy: SAIOH President
e-mail: president@saioh.co.za



Naadiya Mundy
Photograph: courtesy of SAIOH

As I enter my first year as the incoming President of SAIOH, my sense of nervousness is right but temporary; as with any new job, the position comes with great support. In my term on National Council, I have grown to appreciate and recognise the outstanding contributions made by all the Past Presidents, especially Hennie van der Westhuizen. Besides Hennie's professional support and enthusiasm for the growth of occupational hygiene, he often added a special touch with his interactions. The best way that I can describe him is to compare him to a succulent plant, in that he offers immense richness to any conversation, affording mental nourishment to all. With our gratitude, Hennie will remain as Immediate Past President, so his support and guidance will not be absent.

As per the SAIOH Constitution, my tenure will continue through to 2024, as will those of my fellow Council members (details are in the next section). I look forward to serving with them; as a team, we accept the responsibilities assigned to us and will discharge our duties with humility. We are dedicated to growing our profession.

We look forward to an exciting year. The hybrid SAIOH Scientific Conference planned for October this year in Cape Town, paired with the International Occupational Hygiene Association's (IOHA's) meeting, is a key event. Regional workshops/seminars, driven through our branches, also promise to be of immense value. More information regarding these events will be disseminated throughout the year.

As I face this responsibility, I look forward to serving you and appreciate your vote of confidence in electing me to this leadership role. I reiterate my commitment to being impartial, objective, and facilitating processes for the growth of our profession and the protection of the health of our workers and communities.

SAIOH COUNCIL 2023/2024

SAIOH Council members for the 2023/2024 tenure are listed in Table 1.

Table 1. SAIOH Council members, 2023/2024

Title	Name	Portfolio position
Ms	Naadiya Mundy	President
Dr	Hennie van der Westhuizen	Immediate Past President
Ms	Karen du Preez	Vice President
Ms	Corlia Peens	PCC Chair
Dr	Ivan Niranjan	PCC Vice Chair
Mr	Deon Jansen van Vuuren	General Manager
Mr	Norman Khoza	Co-opted member (regional organiser Africa)
Prof.	Cas Badenhorst	Co-opted member (ethics and general)
Mr	Jaco Pieterse	Co-opted member (strategic planning)
Mr	Moses Mokone	Council member (branches and regional organiser Southern Africa)
Mr	Wessel van Wyk	Council member (technical)
Mr	Tebogo Mpshe	Council member (marketing)
Mr	Oscar Rikhotso	Co-opted member (ethics)
Ms	Kate Smart	Chief Administrative Officer
Ms	Lee Doolan	PCC Administrator

NATIONAL COUNCIL FEEDBACK

Naadiya Mundy: SAIOH President
e-mail: president@saioh.co.za
Deon Jansen van Vuuren: SAIOH General Manager
e-mail: deon.jvvuuren@gmail.com
Nico Potgieter: Co-opted member
e-mail: njpotgieter101@gmail.com

Strategic plan

The current SAIOH strategy (five-year) plan is steered by Jaco Pieterse. The strategy is discussed, and progress thereof is evaluated, at each monthly SAIOH Management Board meeting and at the quarterly Council meetings. Several objectives/targets have been met. Progress was made on Portfolio #6 – good corporate governance – with this completed in January 2023.

The next five-year strategy plan was finalised at a special strategy meeting on 10 February 2023, and will be circulated to all SAIOH members and launched at a special meeting early in 2023.

Ethics

As previously mentioned, 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 from NGO Law and are preparing our comments. This needs to be circulated to all SAIOH members and approved at the previously mentioned special meeting early this year.

Our legal advisor's next task will be to review the SAIOH Ethics Policy and Procedure(s), thus enabling the Ethics Committee to start its work in earnest. The ethics plan forms an important part of the SAIOH strategy.

Please note: 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 2021 Annual Virtual Conference was sent to all attendees and those who purchased the recording.

During the 2022 conference, Terry McDonald presented a hybrid Professional Development Course (PDC) on Ethics in the occupational hygiene environment. A multiple-choice assessment/test (MCQ) was developed, based on the 2021 webinar. This is in a Survey Monkey format that SAIOH uses. There is a time limit of 30 minutes; only members who qualified (attended the course) will receive a passcode and access to the test. Everyone will have three opportunities to complete the test at weekly intervals, with the system automatically marking the paper and notifying the candidate of their result. The required pass rate is 60%.

We will develop a similar MCQ for the 2022 Ethics PDC. During 2023, further ethics sessions will be offered at the branch workshops, and at the 2023 SAIOH Annual Conference.

SAIOH branch activities

The Western Cape branch hosted their fourth in-person meeting on 18 November 2022, combining it with a lawn bowls social event afterwards. A presentation was given on dermal exposures, by Lynicka Paulse of ESKOM, Koeberg.

The Gauteng branches held their fourth successful virtual meeting on 1 December 2022. Peter-John (Jakes) Jacobs gave a very informative presentation on real-time occupational hygiene sampling, providing actionable data when needed most.

The KwaZulu-Natal branch held a specialist workshop on occupational hygiene statistics: the Expostats course in a webinar format. Prof. Jerome Lavoue (University of Montreal in Canada), who was instrumental in developing the software, was the online lecturer. The workshop took place on 1 December 2022.

A few online meetings and some e-mail correspondence took place between the SAIOH administration, the SAIOH regional organisers for Africa (Norman Khoza) and southern Africa (Moses Mokone), and the newly registered Botswana Occupational Hygiene Association (BOHA) – previously the SAIOH Botswana branch. The discussions revolved around assistance from SAIOH for BOHA's development as a national occupational hygiene association. Further meetings are envisaged for 2023.

A meeting was held and plans have been formulated to revive the SAIOH Mpumalanga branch early in 2023.

IOHA AND OHTA FEEDBACK

The Occupational Hygiene Training Association (OHTA) and IOHA continue to publish their newsletters. Links are e-mailed to all SAIOH members and published on the SAIOH website: www.saioh.co.za. Please note OHTA's new website: www.ohtatraining.org

Garth Hunter, SAIOH's representative on the International Occupational Hygiene Association (IOHA) Board and it's National Accreditation Recognition Committee (NARC), explained the proposed fee structure for the IOHA NARC certification schemes. IOHA is also investigating a new capitation fee structure. The IOHA newsletter, *Global Exposure Manager* (GEM), was published in the November/December 2022 issue of *Occupational Health Southern Africa*.

SAIOH Technical Committee feedback

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

Our second Technical Committee started developing technical procedures and a SAIOH position paper on heat stress management. The follow-up meeting, assisted by Schu Schutte, took place on 7 December 2022. This committee will continue doing research on heat stress. The focus is two-fold, i.e. to develop a technical paper and to enable SAIOH to provide comprehensive and relevant comments on the recently released Physical Agents Regulations (the old Environmental Regulations for Workplaces).

SAIOH will give comment on the newly released Noise-Induced Hearing Loss (NIHL) Regulations.

The Council Technical Co-ordinator is, furthermore, busy writing a position paper on real-time monitoring.

Annual SAIOH Scientific Conference

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

SAIOH received a large financial donation from one of its stakeholders, Biograde Laboratory. Apex Environmental pledged sponsorship to pay all the fees for a worthy registered occupational hygiene assistant (ROHA) or registered occupational hygiene technician (ROHT) to attend the OHTA core modules and write the Occupational Hygiene Training Association (OHTA) exams, up to the International Certificate in Occupational Hygiene (ICertOH) qualification – a real life-changing opportunity! Huge thanks 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 eased administration and registration. The conference technical sub-committee finalised the 2022 SAIOH conference programme, which was circulated before the start of the conference. It is believed that the many last-minute registrations were due to the quality of the programme.

An abstracts book was produced and sent to all online attendees; for those who attended physically, it was printed and placed in their conference bags. The abstracts book contained a message from the SAIOH President (Dr Hennie van der Westhuizen) and the 2022 Conference Organising Committee Chair (Lené Niemand, 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 45 attended online (Ethics and Ventilation PDCs) – 123 in total. It is envisaged that, in future, more PDCs will be presented, all of which will be live streamed.

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

SAIOH took the decision to present awards for the preceding COVID years, i.e. 2019, 2020, and 2021. A total of 27 awards were presented. A new award was introduced for the best branch of the year. The Western Cape and Gauteng were the winners for 2021 and 2022, respectively. Every award included a framed certificate and a monetary prize.

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

New SAIOH website

SAIOH engaged website developers to overhaul the current website – specifically to allow integration with the Member Management System (MySAIOH). The framework, with the necessary integration, was delivered. The SAIOH administration teams are progressing with the implementation and population of the new website. Special assistance will be brought in soon to speed up the finalisation thereof.

Communications

SAIOH published its newsletter and Presidents' page in two electronic media formats, namely *Occupational Health Southern Africa*, 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 November 2022). The links were sent to all members via our Mailchimp system and posted on the SAIOH website. Six issues of these two publications were sent to all SAIOH members in 2022. Jabu Mhlophe (Department of Employment and Labour (DoEL)) published a report on the new Hazardous Biological Agents (HBAs) in the Sep/Oct 2022 issue of *Occupational Health Southern Africa*.

The *OHTA Global Link* newsletter was published again in September 2022, with a video insert of Naadiya Mundy. Well done, Naadiya. The newsletter was posted on the SAIOH website and sent to all our 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, occupational hygiene job opportunities, occupational hygiene products and services, courses, and webinars on occupational hygiene, health, occupational and environmental safety, 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 Authorities (OH AIA) Association held a virtual meeting on 2 December 2022. Tatjana Radojevic-Rogowski from SASOL facilitated a workshop on the latest released DoEL Noise-Induced Hearing Loss (NIHL) Regulations, and the Physical Agents Regulations (PAR) (previously Environmental Regulations for Workplaces). The aim of this workshop was to collate comments from the OH AIA Association and its AIAs on these Regulations. Twenty-three persons attended.
- A presentation about collaboration in occupational hygiene was given at the 2022 Annual SAIOH Conference by Jaco van Rensburg, Director of the OH AIA Association. The OH AIA also had a stall at the conference.
- Workplace Health Without Borders (WHWB) held their AGM on 21 November, followed by a webinar on control banding and risk assessments, coordinated by Dr David Zalk, on 29 November 2022.
- SAIOH circulated DoEL amendments to the HBA regulations and the Diving Regulations, dated 31 October 2022, to all its members in November 2022.
- On two dates (30 November and 1 December 2022), the DoEL virtually launched the newly published NIHL Regulations and the PAR Regulations, respectively. Both webinars were hosted by SAIOH on the Zoom platform.
- On 17 November 2022, Deon Jansen van Vuuren, the SAIOH General Manager, presented SAIOH and the PCC Certification system to 4th-year Tshwane University of Technology (TUT) Environmental Health students; 40 students attended in person and five joined online. The PCC administrators received 35 applications from TUT to sit the ROHA (student) assessment.
- SAIOH circulated the Mine Medical Professionals Association's (MMPA's) Congress invitation, programme, and registration details. The congress took place, in person, at Emperors Palace on 2 and 3 December 2022.
- SAIOH circulated the Indoor Air Quality Association of Australia's (IAQAA's) webinar on the importance of indoor air flow in air quality assessments, which was presented on 16 December 2022.

FROM THE PROFESSIONAL CERTIFICATION COMMITTEE (PCC)

Lee Doolan: SAIOH PCC Administrator
e-mail: lee@saioh.co.za
Deon Jansen van Vuuren: SAIOH General Manager
e-mail: deon.jvvuuren@gmail.com
Corlia Peens: PCC Chairperson
e-mail: corlia.peens@sasol.com
Nico Potgieter: Co-opted member
e-mail: njpotgieter101@gmail.com

Resolutions

Two resolutions were confirmed, following debates and discussions:

1. There will no longer be a limitation on the time that an ROHA can remain in the SAIOH certification system; and
2. The PCC will recognise the BTech degree in Environmental Health as meeting the PCC's qualification requirements at the ROH level (written into the Quality Management System (QMS) as an exception rule).

The necessary Mailchimps were sent to all the members; edits were made to the QMS in this regard.

The PCC Executive Committee held a meeting on 6 December

Table 2. SAIOH PCC certification assessment results (31 December 2022)

Certification category	Written assessments				Oral assessments			
	Assessed	Passed	Failed	Pass rate	Assessed	Passed	Failed	Pass rate
	n	n	n	%	n	n	n	%
OH assistant	166	151	15	91.0	166	151	15	91.0
OH technologist	61	32	29	52.5	49	36	13	73.5
Occupational hygienist	51	21	30	41.2	29	19	10	65.5
Total	**278**	**204**	**74**	**73.4**	**244**	**206**	**38**	**84.4**

2022 to address the discrepancies between the websites of the South African Qualifications Authority (SAQA) and SAIOH, regarding the qualification requirements for all three designations/certification levels. The updated document was submitted to SAQA on 7 December 2022.

Certification assessments

A summary of results from the 2022 assessments, as of 31 December 2022, is provided in Table 2.

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. The first is updating the SAIOH self-assessment tool and revising the PCC oral assessment format and the second is developing questions and the required answers. Improvements in the assessment format are to ensure that the growing field of occupational hygiene is covered and that the assessment format and tools remain relevant and current.

Occupational Hygiene Skills Forum (OHSF)

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, and occupational hygiene training providers and institutions) and the development and management of assessment and examination systems, where required.

The OHSF was instrumental in coordinating the development of a bulk asbestos sampling and analyses training course. Julie Hills, Celia Keet and Karen du Preez spent a lot of time and energy in developing the necessary course training materials.

The OHSF also participates in the W201 MCQ Consortium, comprising WHWB, the AIHA, SAIOH and the AIOH. The consortium met again on 1 December 2022. This working committee is developing and verifying MCQs, which will be on a database that will be accessible to all assessment paper developers to use in the OHTA W201 papers and, in SAIOH's case, also for the ROHA papers.

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. It has developed a matrix to evaluate the occupational hygiene content in line with the 50% occupational hygiene subject requirement. North-West University's and TUT'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 organised a virtual meeting with the University of the Witwatersrand School of Public Health and had several e-mail exchanges regarding the MSc (Med) Exposure Science degree. The OHSF evaluated the University of the Witwatersrand's Recognised Training Provider application and regrettably advised that the content did not meet the required occupational hygiene criterion. The OHSF is currently evaluating the Cape Peninsula University of Technology's (CPUT's) programme.

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).

Details of recognised training providers and recognised qualifications will be available on the SAIOH website (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 international requirements.

MINERALS COUNCIL
SOUTH AFRICA

NATIONAL INSTITUTE FOR OCCUPATIONAL HEALTH
Division of the National Health Laboratory Service

MASQUISE
Health Programme



INVITATION

MINERALS COUNCIL SOUTH AFRICA - NATIONAL INSTITUTE FOR OCCUPATIONAL HEALTH TRAINING WEBINAR SERIES ON

NOISE INDUCED HEARING LOSS



DATE:
FRIDAY,
31 MARCH
2023



TIME:
08:30 – 13:30



ZOOM LINK REGISTRATION:
https://zoom.us/webinar/register/WN_0bnqrYAWSq68Q9b8Pxzesg

(Note: Registration is required in order to access the session online)

This programme will take place online

Sign up here for Zoom
https://zoom.us/SIGNUP

See you there!

This training is intended for:

- Occupational medicine and nursing practitioners
- Occupational health and safety (OHS) professionals
- Advisors and practitioners
- Employers and management representatives
- Trade union and safety, health and environment (SHE) representatives
- Employee health and wellness coordinators
- HR practitioners

MINERALS COUNCIL
SOUTH AFRICA

NATIONAL INSTITUTE FOR OCCUPATIONAL HEALTH
Division of the National Health Laboratory Service

MASQUISE
Health Programme

PROGRAMME

MINERALS COUNCIL SOUTH AFRICA - NATIONAL INSTITUTE FOR OCCUPATIONAL HEALTH TRAINING WEBINAR SERIES ON

NOISE INDUCED HEARING LOSS (NIHL)

DATE:
FRIDAY,
31 MARCH
2023

TIME:
08:00 – 13:30

FACILITATOR:

Dr Thuthula Balfour,
Minerals Council
Head of Health



PROGRAMME

Time	Agenda item	Responsible
08:00 - 08:30	Arrival and registration	All
	Session 1: Setting the scene	**Session chair:** Dr Nothando Moyo
08:30 - 08:45	Welcome Purpose of the workshop	**Dr Thuthula Balfour** **Dr Spo Kgalamono**
08:45 - 09:15	State of NIHL in the industry	**Dr Lindiwe Ndelu** **Dr Luvuyo Dzingwa**
09:15 - 10:15	Basics of hearing loss - audiology and ear, nose and throat (ENT) perspective	**Ms Linda Prinsloo** **Dr Odendaal**
10:15 - 10:30	Discussion	**All**
10:30 - 10:45	Tea break	**All**
	Session 2: Reporting and compensation	**Session chair:** **Dr Jenny Sapire**
10:45 - 11:05	Problems with the current NIL legislation in South Africa and the suggested way forward	**Dr Dave Barnes**
11:05 - 11:25	Compensation for NIHL	**Dr Luvuyo Dzingwa**
11:25 - 11:40	Discussion	**All**
11:40 – 11:55	Comfort break	**All**
	Session 3: Noise control and conservation	**Session chair:** **Dr Thuthula Balfour**
11:55 - 12:15	Noise control in the industry	**Mr Kagisho Motseme**
12:15 - 12:35	Noise conservation programmes	**Mr JJ Van Staden**
12:35 - 12:55	Investigating NIHL	**Dr Khawulani Msimeki**
12:55 - 13:10	Discussion	**All**
13:10 - 13:30	Closing remarks	**Dr Thuthula Balfour**

Mine Medical Professionals Association Annual Congress 2022

Dipalesa Mokoboto: MMPA President; Medical Inspector, Department of Mineral Resources and Energy
e-mail: Dipalesa.Mokoboto@dmre.gov.za

BACKGROUND

The Mine Medical Professionals Association (MMPA) Annual Congress was held on 2 and 3 December 2022, at Emperors Palace Conference Centre. This was the first MMPA congress since 2019, due to the COVID-19 pandemic. The annual congress is a platform for allied health professionals in the mining industry to interact and be updated on developments in the industry.

INTRODUCTION

The theme of the congress was *Past, present and future in mining health*. The congress was well attended by various health professionals, including occupational medical practitioners (OMPs), occupational hygienists, audiologists, occupational therapists, and radiologists, representing Gauteng, Limpopo, Mpumalanga, and North West provinces. Several institutions were also represented, including, but not limited to, the Department of Mineral Resources and Energy (DMRE), the Medical Bureau for Occupational Diseases (MBOD), the Mine Health and Safety Council (MHSC), Rand Mutual Assurance (RMA), and Minerals Council of South Africa (MCSA).

DAY 1

The first day of the congress was divided into three sessions, in line with the technical topics presented. The programme director for the day was Florence Magampa.

Session 1: Setting the scene – past and present

The MMPA President, Dr Dipalesa Mokoboto, welcomed the delegates and reminded them that the congress was long overdue as there had not been one since 2019. A special welcome was extended to Past Presidents who were present and continue to support the MMPA.

The MMPA has been in existence for over 100 years and the history was eloquently presented by Dr Vanessa Govender, an MMPA Past President. Setting the scene, she shared pictures of previous MMPA congresses and saluted the great work done in the past by practitioners in the mining industry, who dealt with phthisis, tuberculosis, and many more conditions that plagued miners.

Duduzile Mahlaba gave an overview of occupational health statistics, focusing on noise and occupational lung diseases (OLDs), from the annual report released by the DMRE. The statistics were based on data submitted by the mines to the DMRE as per the statutory requirements of the Mine Health and Safety Act (MHSA). The summary data provided an overall picture of the performance of the South African mining industry (SAMI) and the challenges that still exist in terms of managing occupational diseases.

Session 2: Protection of the lungs and preventing OLDs

Chaired by Dr Lwazi Maepe, this session focused on prevention of OLDs through the implementation of hygiene measures. Peter-John Jacobs gave an insightful presentation on future respiratory protection and global trends. He discussed, at length, different types of respirators that can be used in different working environments and the value of using them, looking at what is practised globally.

Israel Sibisi followed, giving a presentation on dust control in the SAMI. This emanated from the work done by the Mining Industry Occupational Safety and Health (MOSH), which focuses on leading practices to address health and safety challenges. Mr Sibisi discussed leading practices that have been proven to significantly reduce airborne pollutant exposure amongst mine employees. This would go a long way in assisting the industry to eliminate OLDs, if adopted by mine operations.

The final presentation, a case study of verifications of employees newly diagnosed with pneumoconioses, was delivered by Dr Govender.This emanates from the MHSC's milestone of having no new cases of silicosis amongst previously unexposed individuals,[†] using current diagnostic techniques. Dr Govender reported that approximately three people who entered the industry for the first time after 2008 were diagnosed with silicosis. These employees



Conference delegates
Photograph: courtesy of MMPA



Gala dinner welcome by MMPA President, Dr Dipalesa Mokoboto
Photograph: courtesy of MMPA

[†] Those unexposed to mining dust prior to December 2008, i.e. equivalent to a new person who entered the industry in 2009

were followed up to verify the diagnosis, considering occupational hygiene measures that were put in place to reduce airborne pollutants. However, after the verification, silicosis was excluded in all three cases. In the discussions that followed, the issue of how chest X-rays were read and interpreted was raised. Clearly, more training is required, especially for new OMPs.

Session 3: Hearing loss – the situation

Session 3, chaired by Dr Jenny Sapphire, addressed both the hygiene and medical aspects of hearing loss in the SAMI. Dr Dave Barnes presented the 2016 guidance note on standard threshold shift (STS), which was drafted by tripartite stakeholders at the MHSC. It addresses identifying hearing loss at an early stage so that appropriate interventions can be taken. The industry uses percentage loss of hearing (PLH) as an indicator; however, by the time an employee is compensated for hearing loss using this indicator, it is already severe and irreversible. Dr Barnes pointed out gaps in the guidance note that might have caused confusion in industry and failure to implement measures as required. The guidance note will be reviewed to address the gaps identified, so that early identification of hearing loss can be moved up higher on the occupational health and safety agenda.

Senki Kesilwe presented a case study on equipment maintenance at Impala Platinum Mine. This was based on the MHSC milestone of 2014 on reducing noise emissions from equipment. The milestone states that, *"By December 2024, the total operational or process noise emitted by any equipment must not exceed a milestone sound pressure level of 107 dB(A)".* This milestone requires that mine operations monitor and maintain their equipment and ensure that the machinery does not emit excessive noise, resulting in a decrease in the incidence of hearing loss in the SAMI. Mr Kesilwe shared the practicalities and best practices for maintaining and keeping equipment as quiet as possible, considering the challenges.

Dr Samantha Iyaloo concluded the day by sharing the MHSC research outcomes that the Safety in Mines Research Advisory Committee (SIMRAC) and the MHSC Centre of Excellence are assessing.

After the long day of technical presentations, delegates were given an opportunity to freshen up in preparation for the gala dinner. It was a grand affair, with a photo session, and delegates were able to unwind and relax. They were also entertained by a musician who belted out old-time favourites, and a deejay who played requests. The MMPA President, Dr Mokoboto, was the programme director for the dinner and three toasts were proposed by Dr P Mothapo, Dr D Sibeko and Dr T Balfour – to South Africa, the mining industry, and the MMPA.

DAY 2

The programme director for the second day was Dr Mpho Rabada. Another MMPA Past President, Dr Elton Dorkin, kicked the day off with a presentation on international trends in occupational health. He shared how other countries are managing occupational health and the possible future of South Africa in terms of following international practices. Several companies shared their practices in managing occupational health and the challenges thereof.

Session 1: Holistic view on fitness to work

This session was chaired by Dr N Moyo, another MMPA Past President. The first presentation was on holistic occupational risk exposure profiles (OREPs) on fitness to work, by Tia-Marie Hofmann, based on occupational therapists' assessments. She emphasised the importance of physical and functional assessments, which give a good indication of an employee's ability to cope with the required demands of the job. To ensure holistic medical surveillance, OREPs depicting fitness-to-work standards should not be limited to hygiene exposures only; they should be comprehensive, indicating the level of function required to perform the work and exposures to strenuous work.

Dr Leonard Mahlare shared several case studies on fitness to work regarding employees with diabetes mellitus (DM). He was able to demonstrate that sometimes it is not necessary to declare employees unfit simply because they have DM. He also discussed new treatments that are available and result in good control of DM, with diminished hypoglycaemic side effects. It is obvious that OMPs need to keep up with the latest DM treatments and need not generalise fitness-to-work decisions for all employees with DM. Individualised assessments for employees during medical surveillance is key.

Session 2: Legislation – what's new?

Dr Olga Masekoa presented the Mine Health and Safety Amendment Bill 2022, updating delegates about the latest inputs from stakeholders. Certain sections of the MHSA were no longer in sync with the latest developments; these needed to be updated to improve the health and safety of employees in the industry.

An ethical topic on non-disclosure of HIV to intimate sexual partners was presented by Dr Benny Choeu. The question was whether it was right, as a health practitioner, to disclose the HIV status of one partner to the other without consent from the former. Several case studies from other continents were discussed, where partners were jailed for knowingly not disclosing their status to their partners. This topic ignited much interest and opened a floodgate of questions from the delegates.

Dr Luvuyo Dzingwa from Rand Mutual Association shared compensation trends in the industry. He reported that employees aged 30 to 39 years remain at risk for injury in a comparison of data from 2011 and 2021. The most dangerous industry in terms of fatalities was the mining industry, compared to the metal and other industries. It was established that most employees experienced either fatal or non-fatal injuries from work deep underground.

The MBOD has been undergoing many changes under the new management. Dr N Mtshali presented the new developments and the impact of operational efficiencies. Compensation claims can now be submitted electronically to the MBOD using the Compensation Claims Management System (CCMS). The backlog of claims was reportedly reduced from more than 13 000 in 2019 to about 2 000 in 2021. She indicated that a parliamentary process is underway to have the Occupational Diseases in Mines and Works Act (ODMWA) amended to ensure efficient administration of the compensation fund.

In the final session, Dr Tumi Legobye thanked the presenters, the delegates, the task team that planned the congress, the MMPA administrator who took care of the logistics, and the sponsors, viz. the MCSA, LTE Medical Solutions, RMA, Noise Clipper, and Inqaba Biotech Industries.

CONCLUSION

Delegates reported that attending the congress was a worthwhile experience and that they learnt a lot from the presentations. The MMPA intends to continue empowering health professionals in the mining industry and updating them on the latest developments in occupational health.

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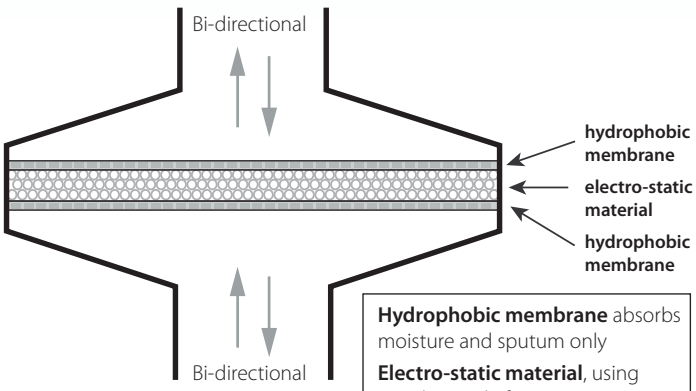
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LOPF33	Orange	IQTeq, SpiroFlow, AME
LOPF36	Cherry	Jaeger, SensorMedics, SanusiDiagnosa, Vitalograph
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