Breaking barriers: women's impact on occupational hygiene in South Africa

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ABSTRACT

The field of occupational hygiene was founded by, and historically dominated by, men. However, as more women entered the workplace, they also entered the field of occupational hygiene. This paper highlights the contributions of women to the field of occupational hygiene, globally, and provides a brief overview of the history of women in occupational hygiene in South Africa. It also highlights the impact of women in the Southern African Institute for Occupational Hygiene (SAIOH), the National Institute for Occupational Health (NIOH), the mining industry, academia, and government – specifically, the South African Department of Employment and Labour. The emphasis of this paper is largely focused on the field of occupational hygiene, but the connection to occupational health should not be overlooked. As an all-female authorship, we wish to encourage young women interested in science to enter the fields of occupational health and occupational hygiene, by showcasing the impressive progress that has been made by women.

INTRODUCTION

In South Africa, women have been historically under-represented in the fields of science, technology, engineering, and mathematics (STEM) due to societal attitudes and traditional gender roles, which have limited their access to education and career opportunities. However, the active promotion of gender equality and inclusivity has changed this. Mentorship, female role models, and supportive networks in STEM are inspiring more women to obtain tertiary qualifications and to enter the workforce in these fields.[1]

In 2023, only 23% of STEM professionals working in South Africa were women, of which only 17% held leadership positions.[2] This gender imbalance reflects trends within the scientific community, where women's contributions have often been overlooked or received less attention than those of men.[3-5] According to the World Economic Forum's global gender gap reports, women make up one half of the world's human capital,[6-8] but this is not reflected in workforces across the world.

Women are increasingly making their marks in occupational health and hygiene, contributing significantly to its development and implementation across various sectors, nationally and internationally.[9,10] Recently there has been an increased focus on women's health needs in the workplace, including reproductive health and personal protective equipment (PPE) designed specifically for women.[11,12]

This paper explores the historical and current contributions of women to occupational hygiene, with a particular focus on South Africa. As female authors, we recognise and celebrate the role of women in occupational health and hygiene, and hope to inspire women and foster gender inclusivity in scientific research and practice. The women mentioned in this paper are representative of female contributions to occupational health and hygiene, but there are many other women who have played major roles in the discipline. We acknowledge and celebrate the contributions of all.

HISTORY OF OCCUPATIONAL HYGIENE

Hippocrates was probably the first to identify occupational disease when he documented lead toxicity in mining in the 4th century BC.[13] Bernardino Ramazzini is known as the father of occupational hygiene (or industrial medicine as it was then known), as he linked disease with occupation in 1700 by asking *"What is your trade?"*.[13]

Occupational hygiene was founded by men, and the global development has been primarily driven by men. Dr Alice Hamilton broke through the barriers as the first female expert in occupational health. She was a pioneer in toxicology and her research focused on the effects of metals, specifically lead, on the human body. In 1908, she published her first paper about occupational diseases in the USA. In 1919, she was the first woman to be appointed to the faculty at Harvard Medical School, as an assistant professor in the Department

of Industrial Medicine. As a woman, she was excluded from social activities and the graduation processions. Dr Hamilton was the only female member of the League of Nations Health Committee from 1924 to 1930.[14] She described an epidemic of phossy jaw caused by exposure to phosphorus in workers tasked with making matches.[15] Dr Hamilton's research created awareness about the dangerous effects of various chemicals amongst government and industry workers. She is regarded as the matriarch of occupational medicine in the USA.

Other women have historically impacted the field of occupational hygiene. In 1894, Adelaide Anderson was the first female factory inspector in the UK; her most noticeable contribution was the improvement of women's working conditions in the textile industry. She also authored a book, *Women in the Factory: An Administrative Adventure, 1893 to 1921*.[17,18] Molly Newhouse, a South African-born occupational physician in Britain, researched asbestos dust exposure and the development of mesothelioma in 1965. Her work was instrumental to the banning of asbestos by many countries.[19,20] Even the name, 'occupational hygiene', is derived from the female Greek goddess, Hygeia, who represented the preservation of good health and prevention of disease.[21]

SOUTH AFRICAN PERSPECTIVE

Gender-based discrimination is prohibited in South Africa under the Employment Equity Act No. 55 of 1998 (EEA). The EEA stipulates that no individual may unfairly discriminate against an employee, either directly or indirectly, based on grounds such as race, gender, pregnancy, marital status, ethnic or social origin, colour, sexual orientation, and age, amongst others.[22] However, women still face unfair treatment in terms of remuneration, promotion, and opportunities for advancement in many workplaces. Stereotyping and cultural norms can also contribute to gender-based discrimination in the workplace. Nevertheless, efforts are being made to address these issues through initiatives aimed at promoting gender equality and enforcing anti-discrimination laws.

Figure 1. Dr Alice Hamilton, first female Faculty member at Harvard University

Source: Harvard University, 2024[16]

Women are under-represented in leadership and academia in South Africa, with only six of 26 academic institutions led by women in 2024.[23,24] Women have often been underestimated or overlooked for leadership roles, despite their qualifications and capabilities.[25] Even when they secure employment, women often struggle to attain decision-making positions in specific sectors. According to the Quarterly Labour Force Survey of the 2nd quarter of 2023, men in the South African labour market are more likely than women to be employed in paid positions, regardless of race.[26]

The historical under-representation of women in occupational hygiene is underpinned by numerous barriers, including limited access to education and training opportunities, and entry into, and advancement in, this field. However, in South Africa, women are increasingly taking leadership roles and making significant contributions to the field.[27]

WOMEN IN THE SOUTHERN AFRICAN INSTITUTE FOR OCCUPATIONAL HYGIENE

The Southern African Institute for Occupational Hygiene (SAIOH) has made major strides in promoting gender equality and increasing women's participation in the field of occupational hygiene. As of February 2025, SAIOH had 566 registered female members; 53% of members were women, compared to 27% in 2005 (personal communication, SAIOH administrative team). Over the past 10 years, almost 50% of branch chairs have been women.

SAIOH provides mentorship programmes and support networks designed to help women advance their careers in occupational hygiene, offering guidance, professional development, and networking opportunities. The Institute promotes inclusive policies and practices that ensure equal opportunities for all members, regardless of sex.

Annually, SAIOH recognises the exceptional professional conduct and achievements of an occupational hygienist during the previous year. According to available records, in the last 15 years, six out of 15 (40%) of the Occupational Hygienist of the Year awards were awarded to female members of SAIOH (personal communication, SAIOH administrative team). These include Miranda Melk, Tatjana Radojevic Rogowski, Corli Venter, Keneilwe Matjola, Jeanneth Manganyi, and Melinda Venter.

Some of the extraordinary women in the field of occupational hygiene are Jo-Anne Bradley, who served as the Occupational Hygiene Association of South Africa (OHASA) President from 1989 to 1990, and Melinda Venter, who, in 2010, 10 years after the launch of SAIOH, became the first woman to serve as its President. Not only did Melinda open doors for other women to serve on the SAIOH Council, but she was also instrumental in the development of the SAIOH Quality System.

Since 2017, the key leadership roles within SAIOH have predominately been held by women (Table 1).

The Professional Certification Committee (PCC) of SAIOH has historically had the largest representation of women in SAIOH, with five female PCC Chairs to date, demonstrating women's growing influence in the development of occupational hygiene professionals in South Africa. Elsabe Steyn served as the first female SAIOH PCC Chair during 2004–2005, followed by Melinda Venter, Julie Hills, Karen du Preez, and Corlia Peens (personal communication, Deon Jansen van Vuuren).

Julie Hills served as PCC Chief Examiner from 2014 to 2015 and PCC Chair from 2015 to 2016. During this tenure, she guided the development of the SAIOH self-assessment system and was integral in introducing the Occupational Hygiene Training Association (OHTA) training modules into South Africa. After stepping down as Chair of the PCC, she became SAIOH Vice-President in 2017, and President in 2018. She remained an active Council member in 2019/2020, guiding the development and launch of the Occupational Hygiene Skills Forum to pull all aspects of education and qualifications, training, and modular learning under a single umbrella. In 2019, Julie was the first woman to be awarded an honorary SAIOH fellowship, one of only seven ever awarded.

The position of PCC Chair was held by Karen du Preez from 2020 to 2021, followed by Corlia Peens who continues to oversee professional development projects, ensuring continuous improvement of the necessary certification systems and international registration standards. Within the PCC, the role of Chief Examiner has also been held by women, with Maryke van der Walt serving from 2022 to 2024.

Non-occupational hygiene professionals have also played important roles in SAIOH. Claudina Nogueira's contribution as a SAIOH Council member, from 2012 to 2018, enabled the Institute to develop and strengthen relationships with other workplace health-related organisations, locally and internationally. She continues to serve on the South African Society of Occupational Medicine (SASOM) Council and the International Commission on Occupational Health (ICOH) Council, highlighting the ongoing impact of women in occupational health in South Africa. She remains a member of SAIOH. She is the current President of Workplace Health Without Borders (WHWB), an international non-profit volunteer organisation of occupational health and safety professionals founded in 2011 by occupational hygienists, whose founding president was a woman, Marianne Levitsky. Other women who currently contribute to SAIOH are Kate Smart and Tracy Mphaphuli, who oversee administrative matters related to the SAIOH Head Office, and Lee Doolan and Rebecca Dick, who handle the SAIOH PCC administration.

Table 1. Female representatives on SAIOH Council, 2009 to 2026

Role	Name	Year(s)
President	Karen du Preez	2025–2026
	Naadiya Mundy	2023–2024
	Celia Keet	2019
	Julie Hills	2018
	Melinda Venter	2010–2012
SAIOH Immediate Past President	Naadiya Mundy	2025–2026
	Celia Keet	2020
	Julie Hills	2019
	Melinda Venter	2012–2013
SAIOH Vice President	Karen du Preez	2023–2024
	Naadiya Mundy	2021–2022
	Celia Keet	2018
	Julie Hills	2017
	Melinda Venter	2008–2009
Council member	Lizette Greef	2024–2025
	Goitsemang Keretetse	2024–2025
	Naadiya Mundy	2019–2020
	Claudina Nogueira	2012–2018
	Elize Lourens	2012–2015
	Milly Ruiters	2009
	Corlia Peens	2009
Secretary	Delmarie Kruger	2010–2011

Although the focus of this paper is on South African women, it is important to mention Keneilwe Matjola, the 2016 Occupational Hygienist of the Year winner. She not only holds the position of Senior Occupational Hygiene Manager at the Debswana Corporate Centre in Botswana, but she was also pivotal in the launch and development of the Botswana branch of SAIOH, which was formally registered as the Botswana Association for Occupational Hygiene (BAOH) in 2017. Keneilwe served as its first Chair from 2017 to 2022. She continues to work closely with the University of Botswana, the Botswana Chamber of Mines, and the Ministry of Labour and Home Affairs to establish a formal occupational hygiene programme in Botswana.

WOMEN IN THE SOUTH AFRICAN MINING INDUSTRY

Two centuries ago, the mining sector boasted a significantly larger female workforce than in contemporary times, possibly even outnumbering men by a factor of 10.[28] The demographic shift was a result of the enactment of the British Mines and Collieries Act of 1842, allegedly introduced out of concern for women's safety.[29] However, rather than addressing the inherent dangers and exploitative practices in mining, authorities opted for an expedient solution: the exclusion of women from underground labour.

The dawn of democracy in South Africa heralded a paradigm shift, epitomised by the appointment of Phumzile Mlambo-Ngcuka as Minister of Minerals and Energy in 1999. Her tenure catalysed the establishment of organisations championing women's participation in the mining sector, alongside legislative reforms aimed at fostering inclusivity and gender parity.[28,30]

The repeal of the Minerals Act in 2004 reaffirmed South Africa's commitment to expanding opportunities for historically marginalised groups within the mineral and petroleum industries, including women.[31] In the following years, there was a notable increase in the representation of women in the mining sector, from 3% in 2002 to 15% in 2018.[32] This period coincided with the emergence of women in the ventilation and occupational hygiene disciplines. The increase in the number of women in mining is a testament to the transformative power of inclusivity and equal opportunity.

While obtaining a degree in mining engineering was never explicitly prohibited for women, the practicality of such a degree was called into question. After all, what good/use is a degree if one is barred from utilising it in the field? The prohibition on women entering underground mining environments rendered their academic qualifications seemingly redundant – a mere 'worthless piece of paper'.[28] Yet, amidst these challenges, trailblazers emerged. Dale Pearson etched her name in the annals of history as the first woman in South Africa to obtain a mining engineering degree, from Wits in 1994. Her groundbreaking achievement paved the way for future generations of women to defy convention and pursue careers in the male-dominated mining industry. Nearly a decade later, in 2005, Celiwe Mosoane shattered another barrier by becoming the first black woman to follow in Pearson's footsteps in mining engineering, further expanding the horizons of possibility for women in the field.[28,33]

The Mine Ventilation Society of South Africa (MVSSA) emerged from a recognition among industry stakeholders of the importance of ventilation challenges in the mining sector. Established in November 1944, the Society attained official registration as a Section 21 company in 2003, but elected its first female president, Julize van Niekerk, only in 2023.

While the timeline may appear lengthy, particularly considering the Society's predominantly male leadership over 78 years, it is crucial to acknowledge the swift strides taken by the MVSSA in integrating women once they were permitted to work underground from 1996. Examination of the MVSSA Constitution reveals that the pathway to the presidency entails a substantial commitment of 15 to 20 years of active participation and contribution to the Society. The election of a female President underscores the visions of Past Presidents and Council members to foster an environment conducive to female participation and leadership.

The registration of the first female member in 1990, despite incomplete record-keeping until 2000, marked the beginning of a shift towards greater gender diversity within the MVSSA. This was evident in a steady increase of female membership – a total of 277 female members – with Lebo Molefe as the first black female member in 2003, highlighting the Society's drive towards inclusivity. Membership is based on qualifications, while Fellow grading depends on active participation at a managerial level. Unfortunately, only 11 of the almost 300 registered women are Fellows. There is, thus, a need to increase the role of women in the Society (personal communication, Liezl Slabbert: Administrative Assistant MVSSA).

The Minerals Council South Africa has taken a proactive stance to address the gender disparity, with a target of 30% of women in the industry by 2025 through targeted initiatives. Furthermore, they strive to have women in 50% of management positions by 2035.[34]

WOMEN IN THE SOUTH AFRICAN GOVERNMENT

There have been 18 Ministers of Labour in the South African Government since 1924. The only woman in this position was Mildred Oliphant, who served from 2010 to 2019. Although qualified in macroeconomics, she empathised with the ordinary worker in South Africa[35] and, during her tenure, recognised the value of occupational hygiene to safeguard workers.

The late Siyanda Pearl Nxawe was Deputy Director General for the Inspection and Enforcement Branch of the then Department of Labour from 2009 to 2013, where she led the Branch through a turbulent time of public service strikes.[36] She was part of the Department for her entire career, from 1982 until her death at the age of 50 years in 2013. In 1995, she obtained a Bachelor's Degree in Law, which, along with her other qualifications, enabled her to move up the ranks, becoming Chief of Staff to the former Labour Minister, Membathisi Mdladlana, in 2005.[37] In conversation, Jabulile Mhlophe (19 April 2024) recalled her as a decisive leader who operated with an 'open-door policy', leading the drive to ensure the professionalisation of the labour inspectorate, amongst others in the field of occupational hygiene, and establishing a comprehensive case-management system.

In 2023, Millicent Ruiters was appointed as Chief Inspector of Occupational Health and Safety at the Department of Employment and Labour – only the second woman to fill this position; the first was Faiza Salie, who served from 1995 to 2002. Ruiters was appointed as the Director for Occupational Health and Hygiene from 2009 to 2017. Her career led her to a three-year stint at the Compensation Fund, before returning to take up the position of Chief Inspector of Occupational Health and Safety. During her years of employment in the field, she managed occupational hygienists, occupational health nurses, radiographers, occupational medical practitioners, medical doctors, and labour inspectors.[38]

Regulations under the Occupational Health and Safety Act No. 85 of 1993, as amended, which deal with occupational hygiene and enforce the involvement of occupational hygienists in the workplace, include: Regulations of Hazardous Biological Agents, 2022; Lead Regulations, 2001; Noise-induced Hearing Loss Regulations, 2003; Asbestos Abatement Regulations, 2022; and Regulations for Hazardous Chemical Agents, 2021.[39] Four of these regulations are currently (February 2025) under review, with the Technical Committees being chaired by women. The strong presence of women in the Department of Employment and Labour, responsible for occupational health and hygiene, resulted in the inclusion of vulnerable workers into legislation, including reproductively able, pregnant, and lactating women. The Ergonomics Regulations of 2019, under the Act, were one of the first pieces of legislation, internationally, to regulate ergonomic risk in the workplace; the Technical Committee working on this was established by a woman, Bulelwa D Huna.

The Department of Employment and Labour currently has three SAIOH-registered occupational hygienists in its employ, two of whom are women.

OCCUPATIONAL HYGIENE PRACTITIONERS IN ACADEMIA

Academia has historically been male-dominated, but many institutions have amended their policies and strategies to increase the number of women in leadership roles.[40] A study by Mouton et al. (2022) reported the gender gap in research outputs from universities in 2022, although the contributions of women have increased since 2005.[40] This is also reflected in the field of occupational hygiene, where women have increasingly taken on key roles in research and education, with the aim of mentoring the next generation of occupational hygienists.

There are many female academics currently active in the field of occupational hygiene in South Africa. At North-West University (NWU), 50% of the staff in the Occupational Health and Hygiene Research Initiative (OHHRI) are female. Prof. Anja Franken, Prof. Sonette du Preez, and Dr Cynthia Ramotsehoa are three of the five female academics who are actively involved in teaching undergraduate students and supervising postgraduate students in OHHRI within the NWU. Prof. Franken studies occupational skin exposure to metals, and in vitro skin permeation of platinum group metals. Prof. du Preez is a trailblazer in studying occupational exposures during additive manufacturing (3D printing). Dr Ramotsehoa's research focuses on opencast mine workers' occupational exposure to solar ultraviolet radiation. At the University of the Witwatersrand, Dr Goitsemang Keretetse, an occupational hygienist, is a lecturer in occupational hygiene and exposure science, and studies the assessment and control of exposure to volatile organic compounds (VOCs). At the University of Limpopo, Dr Karlien Linde's research focuses on occupational solar ultraviolet radiation exposure, where she is a lecturer in the Department of Physiology and Environmental Health. Zanele Zulu is a senior lecturer in occupational health and safety at the Mangosuthu University of Technology. She is currently pursuing her PhD, focusing on occupational heat exposure among female workers, with a particular focus on pregnancy outcomes.

NATIONAL INSTITUTE FOR OCCUPATIONAL HEALTH

The National Institute for Occupational Health (NIOH) has a history of female leadership, starting with Prof. Mary Ross as Executive Director from 2004 to 2007, followed by Dr Sophia Kisting-Cairncross from 2014 to 2018. The current Executive Director, Prof. Spo Kgalamono, is the first black leader of the Institute and was also the first female Head of the NIOH Occupational Medical Section. The Occupational Hygiene Section at the NIOH was led by male occupational hygiene professionals until 2016, when Dr Jeanneth Manganyi was appointed as the first female Head of Section.

The role of women in scientific disciplines that contribute towards occupational health is evidenced by the large number of female scientists involved in occupational health research and training.[41] With a research history of more than 60 years, the NIOH has trained many extraordinary female scientists. During the worldwide COVID-19 pandemic, women from various disciplines led initiatives that guided workplaces and government. The NIOH Occupational Health Outbreak Response Team (OHORT) consisted mostly of women and was instrumental in the development of COVID-19 guidelines and procedures, infographics, and providing online training and education. Four of the women in leadership positions who participated in this team were Prof. Spo Kgalamono, Prof. Tanusha Singh, Dr Odette Volmink, and Dr Jeanneth Manganyi.[42]

CONCLUSION

Women play a major role in occupational hygiene in South Africa and globally, from research to policy development, while others are heading occupational hygiene associations or organisations, such as SAIOH or government departments. While women have been under-represented in STEM historically, the promotion of gender equality has enabled more women to participate in occupational health- and occupational hygiene-related fields. As more women continue to contribute to STEM, they provide diversity and a unique perspective for more inclusive solutions. As female authors of this paper, we wish to encourage young women interested in science to enter the field of occupational health and hygiene. We hope that the acknowledgement of women's contributions in occupational hygiene will strengthen the discipline, dismantle barriers, and foster a diverse and representative workplace.

KEY MESSAGES

1. The relevance and contributions of women are increasingly recognised in the formerly male-dominated field of occupational hygiene.
2. The exceptional women working in occupational hygiene should inspire young women to enter the occupational hygiene- or occupational health-related fields, where they can make an impact on the health of workers.
3. Women are in leadership roles, heading relevant committees, institutions and organisations, and government departments.

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DECLARATION

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

AUTHOR CONTRIBUTIONS

Conception and design of the study: AF
Data acquisition: AF, KdP, SdP, JH, GK, EL, JM, NM, ZS-D, JvN
Drafting of the paper: AF, KdP, SdP, JH, GK, EL, JM, NM, ZS-D, JvN
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