### NATIONAL INSTITUTE FOR OCCUPATIONAL HEALTH

**Division of the National Health Laboratory Service** 

KIIII

# 2021-22

National Institute for Occupational Health Annual Review

# CONTENTS

List of Abbreviations	
Executive Director's Overview	

PATHOLOGY DIVISION	8
Diagnostic Services	9
Research and Education	11
Teaching and Training	12
Professional Development	12
Surveillance/Diagnostics Services	14

0	CCU	PATIO	NAL MEDIC	INE SECTI	ON	 	1	3

Other services	. 1.
Research	. 19
Teaching and Training	. 20
Professional Development	.2
Diagnostic Services	2

IMMUNOLOGY AND MICROBIOLOGY SECTION	22
Research	
Teaching and Training	
Surveillance Reports	
Information Sheets and Awareness Activities	
Professional Development	
Honours	
Conference, Seminar and Technical Meeting Attendance	
Surveillance And Services	

EPIDEMIOLOGY AND SURVEILLANCE SECTION	.28
Research and/or Special Projects	30
Teaching and Training	32
Services	34

OCCUPATIONAL HYGIENE SECTION	33
Research	36
Teaching and Training	37
Professional Development	37
Services	39

QUALITY ASSURANCE DEPARTMENT	38
Training	.41
Professional Development	.41
Service Delivery	.43

HIV AND TB IN THE WORKPLACE UNIT	.42
Research and/or Special Projects	44
Teaching and Training	.45
Public Health Postgraduate Research Supervision	.45
Undergraduate Training	.45
Professional Development	.45
Honours	.45
Staffing	47
Clinical	.47

SAFETY, HEALTH AND ENVIRONMENT DEPARTMENT	46
Occupational Health and Safety Information System	48
Safety, Health and Environment Audits	50
Risk Assessments	51
Health and Safety Representative Committee Meetings	51
Hazardous Waste	52
Conferences and Training	53
Services	55
Teaching and Training	55

ANALTTICAL SERVICES	
Accreditation and Quality Assurance	
Honours/Recognition	
Professional Development	
Service Delivery	
TOXICOLOGY AND BIOCHEMISTRY	
Research	
Research	59 
Research International Collaboration National Collaboration	59 
Research International Collaboration National Collaboration Teaching and Training	59 59 60 61
Research	
Research	59 60 61 61 61

Biobank Quality Management System	64
NATIONAL BIOBANK	63
Biobank Membership	65
Conferences	66
Professional Development	66

.. 64

.... 68

1

Biobank System ......

Services.....

INFORMATION SERVICES AND TRAINING SECTION	67
Professional Development	
Teaching and Training	
The National Institute for Occupational Safety and Health	74
World Health Organization Projects	74

	72
Organisation for Economic Cooperation and Development Projects	/6
European Union Projects	76
International Organization for Standardization	76
Technical Guidelines and Reports – International	76
Surveillance	78

COVID-19 OCCUPATIONAL HEALTH OUTBREAK RESPONSE TEAM	77
The OHSS in South Africa	. 79
Covid-19 Training	. 79
Communications and Marketing	. 80
Fact Sheets	. 80
Research	. 81

PUBLICATIONS 2020/21	
Non-Peer-Reviewed Articles	
Technical Reports	
Surveillance Reports	
Book Chapters	
Conference Presentations: Oral Presentations International	
Conference Presentations: Oral Presentations National	
Conference Presentations: Poster Presentations International	
Conference Presentations: Poster Presentations National	

# **LIST OF ABBREVIATIONS**

AFRICA	Asbestos Fibre Regular Informal Counting Arrangement	MBA	Master of Business Administration
AOP	Adverse Outcomes Pathway	MBOD	Medical Bureau for Occupational Diseases
ARAOH	African Regional Association for Occupational Health	MCSA	Minerals Council South Africa
AUDA	African Union Development Agency	MHI	Moist Heat Incubation
BRICS	Brazil, Russia, India, China and South Africa	MHSC	Mine Health and Safety Council
ССМА	Commission for Conciliation, Mediation and Arbitration	MMPA	Mine Medical Professionals Association
CDC	Centers for Disease Control and Prevention, US	MoU	Memorandum of Understanding
CEFT	Committee for Evaluations and Technical Function	МРН	Master's in Public Health
CEO	Chief Executive Officer	MRC	Medical Research Council
COIDA	Compensation for Occupational Injuries and Diseases Act	MSc	Master of Science
COVID-19	Coronavirus Disease	NBD	National Burden of Disease
CPD	Continuing Professional Development	NEDLAC	National Economic Development and Labour Council
CSIR	Council for Scientific and Industrial Research	NEPAD	New Partnership for Africa's Development
CTDC	Counter-Trafficking Data Collaborative	NHLS	National Health Laboratory Service
DMRE	Department of Mineral Resources and Energy	NICD	National Institute for Communicable Diseases
DEL	Department of Employment and Labour	NIOH	National Institute for Occupational Health
DoH	Department of Health	NIOSH	National Institute for Occupational Safety and Health (US)
DOH	Diploma in Occupational Medicine	NMBP	Nanotechnologies, Advanced Materials, Biotechnology and
DOMH	Diploma in Occupational Medicine and Health		Advanced Manufacturing and Processing
DPSA	Department of Public Service and Administration	NMISA	National Metrology Institute of South Africa
DSI	Department of Science and Innovation	NOMS-SA	National Occupational Mortality Surveillance South Africa
ESBB	European, Middle Eastern and African Society for Biopreservation	NRF	National Research Foundation
	and Biobanking	NRGC	Nano Risk Governance Council
EU	European Union	NUM	National Union of Mineworkers
FFR	Filtering Facepiece Kespirator	OECD	Organization for Economic Cooperation and Development
FIOH	Finnish Institute for Occupational Health	OEHS	Occupational and Environmental Health and Safety
FTIR	Fourier Transmission Infrared Spectroscopy	OHASIS	Occupational Health and Safety Information System
GEMP	Graduate Entry Medical Programme	OHORT	Occupational Health Outbreak Response Team
GLP	Good Laboratory Practice	OHS	Occupational Health and Safety
GPG	Gauteng Provincial Government	OHSS	Occupational Health Surveillance System
HIV	Human Immunodeficiency Virus	OMP	Occupational Medicine Practitioner
HPCSA	Health Professions Council of South Africa	PACC	Premier's Advisory Committee on COVID-19
HRA	Health Risk Assessment	PATHAUT	Pathology Disease Surveillance Database
HSE	Health, Safety and Environment	PathReD	Pathology Research and Development Congress
HSL	Health and Safety Laboratory, UK	РСМ	Phase Contrast Microscopy
HWSETA	Health and Welfare Sector Education Training Authority	PCR	Polymerase Chain Reaction
ICOH	International Commission on Occupational Health	PhD	Doctor in Philosophy
IEC	International Electrotechnical Commission	PMR	Proportional Mortality Ratio
ILO	International Labour Organization	PPE	Personal Protective Equipment
ISBER	International Society for Biological and Environmental	QCT0	Quality Council for Trades and Occupations
		QMS	Quality Management System
150	International Urganization for Standardization	qPCR	Quantitative Polymerase Chain Reaction
IT	Information lechnology	RedCap	Research Electronic Data Capture

SABCOHA	South African Business Coalition on Health and AIDS
SABS	South African Bureau of Standards
SACCESS	South African Collaborative COVID-19 Environmental Surveillance System
SACNSP	South African Council for Natural Scientific Professions
SADC	Southern African Development Community
SAFETP	South African Field Epidemiology Training Programme
SAIMR	South African Institute for Medical Research
SAIOH	Southern African Institute for Occupational Hygiene
SANAS	South African National Accreditation System
SARS	Severe Acute Respiratory Syndrome
SASOHN	South African Society of Occupational Health Nursing Practitioners
SASOM	South African Society of Occupational Medicine
SETA	Sector Education Training Authority
SHE	Safety, Health and Environment
SHSPH	School of Health Systems and Public Health
SOP	Standard Operating Procedures
ТВ	Tuberculosis
UK	United Kingdom
UNAIDS	Joint United Nations Programme on HIV/AIDS
UNISA	University of South Africa
URL	Uniform Resource Locator
USA	United States of America
UVGI	Ultraviolet Germicidal Irradiation
VHP	Vapourised Hydrogen Peroxide
WHO	World Health Organization
WHWB	Workplace Health Without Borders
Wits University	University of the Witwatersrand
WPMN	Working Party on Manufactured Nanomaterials
WRC	Water Research Commission
WWTP	Wastewater Treatment Plant
XRD	X-ray Diffraction
VDE	V ray Eluoroconco



he National Institute for Occupational Health (NIOH) is recognised as a centre of excellence for occupational health and functions as a national and regional source of knowledge and expertise for the South African government, industry and labour, the Southern African Development Community (SADC) countries, and the African region. The institute plays a significant role in supporting the government's occupational health efforts; it provides advice and assistance, conducts research and develops capacity through teaching and training to promote healthy conditions in workplaces and improve the health of workers.

The period under review was once again dominated by the COVID-19 pandemic, which continued to impact workplaces across South Africa and the globe. Under the leadership and continued support of the NHLS, the NIOH had numerous highlights in the area of Occupational Health and Safety (OHS) during this period and pivoted itself to be recognised as a leading organisation in occupational health amidst the backdrop of the global pandemic. The institute provides a collective outbreak response within the public health and OHS fraternity; this required constant adaptation to workplace responses as new OHS information came to light.

Consequently, the NIOH participated in new OHS knowledge generation, conducted numerous training sessions, audits, and designed and adapted OHS tools to assist workplaces in responding to the effects of the COVID-19 pandemic in workplaces to support economic activities across various occupational groups in different sectors. This was achieved through engagements with key stakeholders in South Africa and the region.

The multidisciplinary teams of the institute participated in research at a national and global level in support of innovative programmes to assist vulnerable workers. In the process, the NIOH collaborated with a significant number of key workplace roleplayers locally, nationally, and internationally. In turn, this contributed to the institute's gaining a new body of knowledge that enabled the translation of research into policy and relevant practice.

#### HIGHLIGHTS

There were some notable developments in the OHS in South Africa during the period under review, where the NIOH played a significant role. Many staff members represented the NIOH at key high-level decision-making technical committees, including the National Economic Development and Labour Council (NEDLAC), the National Department of Health (NDoH), and the Department of Employment and Labour (DEL), drafting and revising specific occupational health legislation and guidelines – both in the formal and informal economy.

Year after year, the NIOH's specialised laboratories managed to maintain their quality management system accreditation. The institute is the only entity in South Africa that has acquired four different quality management systems: ISO 15189 (Medical Laboratories), ISO 17025 (Testing and Calibration Laboratories), ISO 17020 (Conformity Assessment for Inspection Bodies) and ISO 9001. It has also provided pre-SANAS internal audits, training and support to NHLS laboratories, including Proficiency Testing (PT) Scheme guidance to staff.

During the reporting period, the Occupational Health and Safety Information System (OHASIS) has proven to be an invaluable OHS management tool and continues to be adapted to cater to the new challenges posed by COVID-19 and the unique needs posed by the laboratory environment within the NHLS. The system provided weekly statistics for the NHLS EXCO and COVID-19 Compliance Officers to assist with decision-making related to monitoring and management. OHASIS supports surveillance and compliance with OEHS legislation and provides information for research.

The developments to the improved system included the adaptation of the system to incorporate COVID-19 as a specific disease in the reporting section; the provision of an online screening platform for self-reporting by employees of COVID-19 symptoms and automatic email notification to an identified health worker; the provision of all COVID-19-related information in dashboards; the facility for the recording of all COVID-19

#### "AS A NATIONAL INSTITUTE, IT IS THEREFORE INCUMBENT ON US TO FIND A CAREFUL BALANCE OF ALL THESE OCCUPATIONAL SAFETY AND HEALTH ISSUES TO MEET THE CHALLENGES AND OPPORTUNITIES PRESENTED BY THE FUTURE OF WORK."

vaccinations, tests and results; the facility for recording COVID-19 and related training in the Workforce Health module; and the capability to capture COVID-19 health care waste. Beyond the NHLS, several local and international organisations have expressed an interest in implementing the system, some of which are at an advanced stage.

The NIOH has enhanced its brand identity and positioned itself as a critical touchpoint for quality OHS guidance and information dissemination when many workplace stakeholders require access to reliable COVID-19 information, placing emphasis on the value and importance of occupational health and safety provision within workplaces. The institute's digital footprint was also increased through the effective utilisation of the social media platforms Twitter and YouTube, which saw sustained growth and an increased viewership base. Coupled with strategic media engagements and interactions, the increase in digital footprint resulted in the image of the NIOH being tremendously and positively enhanced in the public domain during the period under review. These communication channels provided the opportunity for networking on a global scale, assisted with targeting specific stakeholders through tailored communication, and provided diverse public relations platforms to share information. In addition, the NIOH newsletter (OccuZone) continued to be used as a medium for sharing information about the institute's activities. This quarterly publication details current research outputs, specialised service delivery, and the teaching and training activities of the Institute.

#### **COVID-19 ACTIVITIES**

Owing to the pandemic, the NIOH had to put on hold several specialised discipline-specific services it provided to many industrial sectors and government departments to provide national industry COVID-19 advisory support. Despite this shift in focus, the pandemic offered numerous opportunities for NIOH that emphasised its value well beyond traditional occupational health. During the reporting period, the NIOH provided their

professional and technical knowledge to various advisory service activities. These platforms included the NDoH OHS Workstream and Private Public Labour group; NEDLAC and subcommittees, including behaviour change communication; Wits School of Public Health Return to School Committee; surveillance system for worker's policy and technical teams; care for the caregiver; and return to mining committee.

In collaboration with academia and the leadership of the NDOH, the NIOH contributed to COVID-19 regulations, directions and guidelines relating to workers and workplaces. The NIOH dedicated workplace advisory hotline, specifically for occupational health professionals, employees, and employers. The hotline was maintained and enhanced to address OHS needs across the country. Queries from the hotline were used to form the basis for some of the webinars that catered to various occupational groups across different sectors.

Training events were used to equip the industry with the tools required to protect and promote workers' health and safety, including the safe return-to-work during the pandemic. In the period under review, over 11 225 participants were trained on COVID-19 topics through 30 webinars, bringing the total number of webinars conducted since the start of the pandemic in March 2020 to 98, with 52 670 participants trained. A centenary webinar is planned for the first quarter of the new financial year to reflect on our collective outbreak response within the public health and occupational health and safety community.

The members of the NIOH OH Outbreak Response Task team (OHORT) prioritised enhancing access to reliable information to curb misinformation and disinformation. This initiative resulted in the creation and dissemination of numerous fact sheets, posters and infographics relating to various aspects of the pandemic that impacted workplaces. Several posters and fact sheets were updated during the reporting period as legislation changed. All these materials are accessible via the NIOH's zero-rated website. Towards the end of the financial year, NIOH was finalising its E-Learning Platform, which will be launched in the new financial year.

#### RESEARCH

As the national institute for occupational health, our goal is to produce new knowledge and innovation to prevent ill health and injury and promote good health. The research, therefore, remained a priority for the NIOH and focused on the prevention of workplace exposure with specific reference to hazardous biological agents. The following sections reports illustrate large and varied interdisciplinary research programmes covering many issues central to the advancement of workers' health and the health of communities living around workplaces. The topics of the scientific articles published over the year reveal the large variety of research needs in occupational health and safety in the country. In total, the few researchers at the NIOH managed to publish 30 articles in peer-reviewed journals and to supervise 35 postgraduate students on various projects.

#### SURVEILLANCE

In South Africa, surveillance of occupational health, morbidity, injury, and mortality is inadequate. Contributing to improved surveillance is a longstanding but increasingly important part of the work of the NIOH. Surveillance for occupational diseases was prioritised as a new strategic thrust during the period under review. Concerted efforts continue to be made to increase the publication of surveillance reports. The national Occupational Health Surveillance System (OHSS), initiated in October 2020, monitors COVID-19 infection across workplaces in South Africa and provides insights/data into understanding the post infection and return-to-work health outcomes of employees. The OHSS, therefore, provides an overview of the COVID-19 infection spectrum in the South African workforce with early identification of industries and occupational groups at high risk of infection to inform appropriate interventions (e.g., policy, programmatic, resources). To date, there are 5 685 companies registered on the OHSS. With the existing surveillance system, the NIOH intends to strengthen OH reporting for compensated and non-compensated occupational diseases and to create a flexible surveillance system linked to other national databases for comprehensive reporting. The system is a foundation on which surveillance for all occupational diseases and injuries will be based.

In addition, several other surveillance initiatives continue within the Institute. As per statutory obligation, the Pathology Division Surveillance (PATHAUT) report was also published and is accessible on the NIOH Website. The institute also produced several surveillance reports, including the COVID-19 monthly Sentinel Hospital Admissions Surveillance for Health Care Workers (HCWs), NHLS Tuberculosis Surveillance Reports, the 2020 Asbestos Surveillance Report, Occupational Allergies Surveillance Report.



"AS THE NATIONAL INSTITUTE FOR OCCUPATIONAL HEALTH, OUR GOAL IS TO PRODUCE NEW KNOWLEDGE AND INNOVATION TO PREVENT ILL HEALTH AND INJURY, AND PROMOTE GOOD HEALTH. THE RESEARCH, THEREFORE, REMAINED A PRIORITY FOR THE NIOH AND FOCUSED ON THE PREVENTION OF WORKPLACE EXPOSURE WITH SPECIFIC REFERENCE TO HAZARDOUS BIOLOGICAL AGENTS."

#### **INTERNATIONAL LIAISON**

During the reporting period, the NIOH finalised the renewal of the MoU with the National Institute for Occupational Safety and Health of the Centres for Disease Control and Prevention (NIOSH-CDC) in the USA and maintained its status as a World Health Organization (WHO) collaborating centre (CC). This is a recognition and affirmation of the NIOH's achievements in supporting the Occupational Health programmes of the WHO and the extension of opportunities for partnerships and projects with the network of collaborating centres around the world. The NIOH had a prominent role in the WHO's programme on vulnerable workers, such as those in the informal economy.

Through dedicated collaboration and networking efforts with key international agencies, the NIOH fostered strong international relationships. These included the WHO; the International Labour Organisation (ILO); the African Union Development Agency (AUDA-NEPAD); the International Commission on Occupational Health (ICOH); the NIOSH-CDC, USA; the Health and Safety Laboratory (HSL) of the UK, Workplace Health Without Borders (WHWB) and the Organisation for Economic Cooperation and Development (OECD).

# MOVING TO THE NEW FINANCIAL YEAR – THE FUTURE OF THE WORLD OF WORK

The world of work is undergoing rapid transformations that will persist and potentially intensify in the future. These include economic, environmental, technological, and demographic shifts that will change perspectives on how we work. The COVID-19 pandemic has elicited the need to interrogate, adapt and change our way of working and interacting. According to the NIOSH-CDC Future of Work Initiative, employers and employees are confronted by emerging and complex issues such as changing employment patterns and relationships, labour recruitment and retention in competitive markets, an ageing workforce, gender and racial inequalities, and job loss due to technological innovations. Aspects of unemployment and worker health may need consideration by the institute moving forward as a new area of research in collaboration with other partners. The informal economy – large already – will probably continue to expand rapidly, and the NIOH's programmes in this economic sector will need to be geared to respond to the growing needs. All of working life may be altered to some extent, and the work-related health effects that accompany these changes – both the bad and the good – will need to be assessed and carefully managed.

As a national institute, it is therefore incumbent on us to find a careful balance of all these occupational safety and health issues to meet the challenges and opportunities presented by the future of work. The institute will interrogate and try to understand the implications of these new work scenarios to translate effective interventions into practice for employers so that they may safeguard the health and well-being of their workforce. Working with stakeholders and partners, we can build the necessary resilience as a sector in terms of strengthening and renewing our approach and response to the growing and changing needs of OHS to protect employees and employers from occupational hazards and their consequences.

#### **APPRECIATION**

I wish to thank the NHLS and the NIOH management team for the strategic leadership that enabled the NIOH to deliver outstanding results under resource-constrained circumstances. Staff members at the NIOH continue to strive for excellence in their work. I appreciate their contribution and thank them for their hard work towards ensuring healthy, safe and ultimately sustainable workplaces. Our partners, collaborators and stakeholders are acknowledged for contributing to the success of the NIOH.

# PATHOLOGY DIVISION





# PATHOLOGY DIVISION

ACTING HEAD: DR DEEPNA LAKHOO

he origins of the Pathology Division lie in the Pneumoconiosis Research Unit, founded in 1953 to conduct research into dust-induced lung disease in mine workers. Dr JC Wagner discovered the causal link between crocidolite asbestos and malignant mesothelioma of the pleura while working in this unit.

The work of the pathology division has traditionally focused on occupational lung disease. It continues to provide an autopsy service to assist with the compensation of the families of deceased mineworkers. Through the expertise gained in lung pathology, the division has become a referral centre for lung biopsies. Due to a general shortage of histopathologists nationally, the division has also been assisting with diagnostic surgical pathology services for Limpopo. In addition to these pathology services, the division offers analytical electron microscopy services.

The diagnostic service work of the pathology division provides data and material for teaching, research and surveillance purposes. The quality of the work in its laboratories is maintained through participation in external quality assurance schemes and accreditation with SANAS, in accordance with the recognised International Standard, ISO 15189:2007.

#### **DIAGNOSTIC SERVICES**

In terms of the Occupational Diseases in Mines and Works Act No. 78 of 1973, the pathology division continues to carry out the statutory requirement of examining the cardio-respiratory organs of deceased miners. A pathology report from this examination is sent to the Mines Medical Bureau for Occupational Diseases to assist families of deceased mineworkers with the compensation process.

#### **AUTOPSIES**

There was considerable uncertainty regarding the safety of performing autopsies during the initial waves of the COVID-19 pandemic, as the risks facing prosectors were not well established. To assist service providers nationwide, the NIOH's pathology division published guidelines titled "Guidelines for removal of heart and lungs for prosectors and doctors during the 2020 COVID-19 pandemic". In 2021, 512 organs of former miners were received, compared to 557 in 2020, reflecting a steady decline in the total number of cases received. However, the pandemic is not the only factor contributing to the steady decrease in numbers over the years. Other factors include the lower number of miners working in the industry, a lack of awareness of the compensation process and cultural and religious reasons for lack of willingness of family members of a deceased miner to consent to a postmortem. There is, nonetheless, a recognised need to facilitate access to the compensation system. As the country has been placed on an adjusted alert level one, outreach activities with the mines and other stakeholders to increase awareness are being planned for the next financial year.

The autopsy service generates a great deal of information about the examined lungs. The examining pathologists carefully recorded approximately 200 items of information. This information is entered into the pathology division's Pathology Division Surveillance Database. PATHAUT is a national resource containing unique information about diseases in the mining industry. The database has been and continues to be extensively used for research in collaboration with local and international collaborators, and over 150 peer-reviewed publications have been produced using the data. It has been maintained since 1975 and has been used to show disease trends in the mining industry. It is also an important tool for disease surveillance. Detailed disease surveillance reports compiled from PATHAUT data, giving demographic data and disease rates, are produced annually. These have been made available in the public domain through the NIOH's website. The URL for the reports is:

http://www.nioh.ac.za/?page=pathology\_disease\_surveillance\_reports&id=162

"THE DIAGNOSTIC SERVICE WORK OF THE PATHOLOGY DIVISION PROVIDES DATA AND MATERIAL FOR TEACHING, RESEARCH AND SURVEILLANCE PURPOSES. THE QUALITY OF THE WORK IN ITS LABORATORIES IS MAINTAINED THROUGH PARTICIPATION IN EXTERNAL QUALITY ASSURANCE SCHEMES AND ACCREDITATION WITH SANAS, IN ACCORDANCE WITH THE RECOGNISED INTERNATIONAL STANDARD, ISO 15189:2007."



Figure 1A: Macroscopic appearance of a normal left lung and heart, with a massively enlarged and distorted right lung.



*Figure 1B: The cut surface of the right lung showing extensive involvement by malignant mesothelioma.* 

#### SURGICAL PATHOLOGY

The division has vast experience in lung pathology and is recognised as a Centre of Excellence. A diagnostic service is offered to satisfy the demand for opinions on lung biopsies, fine needle aspirates and bronchial washings. In 2017, the Centre of Pulmonary Excellence requested the NIOH's Pathology Division to provide pathology expertise and services for the newly created centre. Due to a lack of capacity at the NHLS laboratories, the NIOH's Pathology Division accepted a request in October 2017 to be the service provider for general surgical pathology in Limpopo. This has resulted in an improved pathology specimens received from Limpopo allow pathologists at the NIOH to examine a broad range of general pathology.

#### **ELECTRON MICROSCOPY**

The electron microscopy unit is an essential component in the pathology division, and its function is to assist in service delivery, research, and training.

The unit is equipped with a scanning electron microscope (SEM), which is linked to an analyser for energy dispersive spectroscopy (EDS) to analyse the chemical composition of asbestos and other various molecules. There are two major functions of the unit. The first lies in determining the type of asbestos fibre and asbestos fibre concentration in the lung tissue of deceased miners to assist with diagnosing asbestos-related diseases. The second function lies in determining environmental and occupational asbestos exposure. Samples are analysed to identify asbestos in building materials and enumerate asbestos fibres in the air. These analyses are performed for other sections of the NIOH and external clients, including national, provincial and local governments, nongovernmental organisations, universities and private businesses. The electron microscopy section participates in an external quality assurance scheme and has maintained its satisfactory rating in the Asbestos in Materials international quality assurance scheme coordinated by the Health and Safety Laboratory, UK. The results of the asbestos fibre analysis are entered into a database. This database is unique in South Africa, and its interrogation provides information about the legacy of asbestos in the country. The information from the database has been used to produce an annual asbestos surveillance report, which is available in the public domain through the NIOH's website. The URL for the report is:

http://www.nioh.ac.za/?page=asbestos\_surveillance\_reports&id=191

#### **RESEARCH AND EDUCATION**

Research relevant to the health of South African workers was conducted by staff members of the pathology division. Material and data from the service work of the division provide information for research projects. Current areas of interest focus on lung diseases in mine workers, which are caused by exposure to silica dust or asbestos fibres, as well as some aspects of the surgical pathology cases received from Limpopo.

**Mr R Manenzhe**, a prosector in the division, is registered for a Master of Science (MSc) (Anatomical Pathology) at the University of the Witwatersrand. His research topic is "Minimally invasive postmortem tissue sampling for the diagnosis of occupational lung diseases", supervised by Dr J de Bruin and Dr D G Lakhoo. He is also in the completion stages of a study titled "Basal Cell Carcinoma in Limpopo Province of South Africa: A Retrospective Study" with Dr C McCusker and Ms L Mhlongo.

**Ms T Mashele**, an intern scientist in the division, is in the completion stages of a research project titled "Morphologic subtypes of cervical carcinoma in Limpopo Province of South Africa", supervised by Dr J Linden. Ms T Mashele is also registered for an MSc (Anatomical Pathology) at the University of the Witwatersrand. Her research project is titled "Investigation of immunophenotypic and molecular features of aggressive B-cell and non-Hodgkin lymphomas that were documented in patients at Chris Hani Baragwanath Academic Hospital", supervised by Dr S. Pather and Dr P. Magangane.

**Ms T Mayeza**, an intern medical scientist in the division, is registered for a Master of Medical Science (Anatomy) at the University of KwaZulu-Natal. Her research topic is titled "Paediatric age assessment: Accuracy and efficiency of radiographic methods for skeletal age analysis in South Africa.

**Ms N Ndawo**, a medical technologist in the division, is registered for a Bachelor of Health Sciences (Honours) at the University of the Witwatersrand. Her research topic is "The positive and negative contributions of standardised cytology reporting systems", supervised by Prof P Michelow and Dr C McCusker.





Figure 2. Scanning electron micrograph showing asbestos fibres and asbestos bodies (left). When analysed by EDS, the fibres exhibited peaks for silica, iron and magnesium, identifying them as Amosite asbestos. The above sample was from the lung of an exasbestos miner from Penge. The picture on the right is of a bulk sample from a residential area in Gqeberha (Port Elizabeth). When analysed by EDS, the curved fibres exhibited peaks for silica and magnesium, identifying them as Chrysotile asbestos.

**Ms S Muthabeni**, a medical technologist in the division, is registered for a Masters in biomedical technology with the University of Johannesburg. Her research study is titled "Potential protective effects of lycopene against fructose-induced changes in the Wister rat gastrointestinal tract" and is supervised by Dr N Pilani and Ms J Mthombeni.

**Ms Z Ngcobo**, a medical scientist in the division, has registered for a PhD with the University of South Africa (UNISA), which commenced in January 2022. Her research topic is titled "Use of wastewater-based epidemiology as a tool to predict and monitor the emergence of antimicrobial-resistant pathogens in South Africa". This project will be supervised by Dr T. Malefetse, Prof H. Nyoni, and Prof T. Nkambule. **Ms L Mhlongo**, a medical scientist in the division, and Ms Z Ngcobo are in the planning phase of a research project titled "Evaluation of the possibility of asbestos environmental contamination and exposure resulting from laboratory processing of probable asbestos-contaminated samples".

**Dr J de Bruin**, a histopathologist in the division, completed her Master's in Medicine (Anatomical Pathology) at the University of the Witwatersrand. Her research project was titled "Is medical postmortem practice dying? An audit on postmortems in the department of Anatomical Pathology, University of the Witwatersrand, Johannesburg, South Africa, supervised by Dr E. McAlpine.

**Dr M Keyter**, a histopathologist in the division, completed his Master's in Medicine (Anatomical Pathology) at the University of the Witwatersrand. His research was titled "Clinicopathological and molecular analysis of serrated lesions of the appendix, supervised by Dr E. McAlpine.

**Dr D G Lakhoo**, a histopathologist in the division, is co supervising Dr C Sriruttan, a microbiologist in the NHLS who has registered for a Master's in Science in Medicine (Anatomical Pathology). The title of her research project is "Histologically confirmed invasive fungal infections before and during the COVID-19 pandemic in South Africa (1 September 2018 to 31 August 2021)".

The division collaborates with other sections within the NIOH as well as other local and international institutions. These include the Council for Scientific and Industrial Research (CSIR), the University of the Witwatersrand: Schools of Pathology, Public Health, Clinical Medicine and Archaeology, the University of Johannesburg: Faculty of Health Sciences, the Health and Safety Laboratory, UK, the Occupational and Environmental Lung Injury Centre, Sheffield University, UK, the University of Wales, UK, Harlan Laboratories, Switzerland, Dokkyo University School of Medicine, Japan, London School of Hygiene and Tropical Medicine, University College, London, UK, Brooklyn College, City University of New York, USA, Sciences Po University, Paris, France, and Environmental and Occupational Health Sciences, School of Public Health, Chicago, Illinois.

#### **TEACHING AND TRAINING**

The division plays a role in teaching and training through workshops, presentations and formal lecturers to professional bodies, universities and teaching hospitals. Prof J Murray is an associate professor in the School of Public Health at the University of the Witwatersrand (Wits University). Staff members participate in the mentoring, teaching and supervision of various students.

The pathologists are actively involved in the undergraduate teaching of medical, dental and allied health care students at the University of the Witwatersrand, as well as anatomical pathology registrar training. Registrars from Wits University rotate through the NIOH for three to four months during their training for exposure to pulmonary pathology and for general pathology training. Dr A Gildenhuys was part of a team of pathologists who conducted the National College of Medicine of South Africa (Anatomical Pathology) part one examination for the second semester in 2021. She presented a workshop at the PathRed congress in 2021 on pulmonary medical pathology. Dr Gildenhuys, Dr J. Linden and Dr C. McCusker presented a poster at the PathRed congress on an unusual case of a malignant ectomesenchymoma of soft tissue. Dr McCusker, Dr Gildenhuys and Dr Graham presented a case of endobronchial anaplastic Kaposi sarcoma at Wits University, faculty of health, clinical research day. The pathologists actively participate in and present cases at regular clinical pathology meetings with doctors from the Johannesburg academic hospitals.

Staff members from the division are also actively involved in the teaching and training of intern medical scientists and student medical technicians.

#### **PROFESSIONAL DEVELOPMENT**

Six postgraduates were enrolled: one postgraduate diploma in Occupational Medicine and Health at the University of Pretoria (second year of study), two Master of Science (Anatomical Pathology) students at Wits University, one Master of Science (Anatomy) student at the University of KwaZulu-Natal, one Master of Biomedical Technology at the University of Johannesburg and one PhD candidate at the UNISA.

Three undergraduates enrolled: one National Diploma in Biomedical Technology student at the Vaal University of Technology, one Diploma in Business Management student at Damelin and one Diploma in Human Resource Management at the Boston City Campus.

# **OCCUPATIONAL MEDICINE SECTION**



# **OCCUPATIONAL MEDICINE SECTION**

ACTING HEAD: DR NOMPUMELELO NDABA

r Ndaba was the acting Head of the Occupational Medicine section, reducing the specialist capacity to other technical functions within the section. The section continued to face human resource constraints. However, this enhanced teamwork and collaboration within the section.

A senior member of the section, Head of Ergonomics Unit- Dr Busisiwe Nyantumbu-Mkhize, retired in December 2021. This was a loss to the section and organisation at large, as the focus of the section had to be redirected to facilitating handover, closing off key projects where the manager was involved and planning business continuity measures.

The last two months of this financial year were exciting, as the section was joined by a new Manager of the Ergonomics Unit, Ms Zandile Hoyi. This was the highlight of the section as well as the achievements mentioned below.

The year under review provided the occupational medicine section with an opportunity to restore the clinical assessment processes that were in place before the COVID-19 pandemic.

#### SURVEILLANCE/DIAGNOSTICS SERVICES

#### **OCCUPATIONAL MEDICINE CLINIC**

The specialist referral clinic was reopened in May 2021 after closing in April 2020 because of the COVID-19 pandemic. Sr Buffel, the clinical coordinator in the section, facilitated the fast tracking of this reopening and scheduling of cases while ensuring implementation and adherence to the COVID-19 guidelines in the clinic space. Some of the implications of the COVID-19 pandemic on occupational health services were the discontinuation of lung function testing in the workplaces, other than by pulmonologists, policies and procedures for identifying vulnerable employees.

The occupational health programmes in workplaces were therefore performing suboptimally and taking longer to close off cases because of the various COVID-19 stages. Since the Occupational Medicine Specialist Clinic provides specialised services in assessing patients for second opinion, or further assessments to establish the work-relatedness of their conditions, the clinic had to reopen and alleviate the backlog that was felt by workplaces.

During the period under review, 54 patients were assessed from different industries, including NHLS. Nonetheless, fewer patients were assessed during this financial year, although it took longer to finalise cases. The majority of patients referred to the Occupational Medicine Specialist Clinic between April 2021 and March 2022 were from Gauteng (n=38, 70.37%), followed by the North West (n=11, 20.37%), Mpumalanga (n=3, 5.56%) and Limpopo (n=2, 3.70%). Most cases assessed during this period were from mining, industry class IV, as shown in Figure 1 below.



"SINCE THE OCCUPATIONAL MEDICINE SPECIALIST CLINIC PROVIDES SPECIALISED SERVICES IN ASSESSING PATIENTS FOR SECOND OPINION, OR FURTHER ASSESSMENTS TO ESTABLISH THE WORK-RELATEDNESS OF THEIR CONDITIONS, THE CLINIC HAD TO REOPEN AND ALLEVIATE THE BACKLOG THAT WAS FELT BY WORKPLACES."

Most of the patients assessed had respiratory conditions, while the rest had musculoskeletal disorders and psychosocial conditions. Some of the patients were referred with confirmed diagnoses requiring attribution to workplace exposure. The most prevalent respiratory conditions assessed were chronic obstructive pulmonary disease (COPD) followed by asthma, as shown in Figure 2 to the right.

Table 1 below represents the outcome of the assessments of these patients during this period. Patients awaiting further assessments and final diagnosis based on details of exposure information from their workplaces and other pertinent information to assist in diagnosis care are classified as inconclusive.

Table 1: Assessment outcome of clinic patients.

DISEASE CATEGORIES	NUMBER
Occupational disease	11
Non-Occupational disease	5
Inconclusive	38
Total	54



#### **ERGONOMIC SERVICES AND SPECIALISED ASSESSMENTS**

The Ergonomics Unit, housed within the Occupational Medicine Section, provides ergonomic services to workplaces in Southern Africa. The service offerings of the unit include ergonomic risk assessments, laboratory testing of patients referred for handarm vibration syndrome (HAVS), and advisory service through responding to queries on ergonomic issues in workplaces. In the year under review, a medical surveillance tool for workers who may be exposed to vibration within the NHLS was developed to facilitate the process of referring personnel for HAVS. This followed two cases examined at the Occupational Medicine clinic of NHLS employees.



Figure 2: Outcomes of clinic patients assessed during this period

Regarding ergonomic risk assessments, three assessments were conducted during the 2020/2021 financial year. Two of the assessments were conducted at NHLS laboratories and offices, assessing the workstations of personnel. One of the assessments was transformed into a presentation that was presented on two different research platforms. The remaining ergonomic risk assessment was conducted upon request from an external client in response to the promulgated Ergonomics Regulations (2019). The outcomes of the assessment were thus presented to the client for further implementation. An additional walkthrough survey was performed for another external client with the same intention, awaiting confirmation of dates for an assessment to be conducted.

#### **OHORT ADVISORY AND SUPPORT SERVICES**

#### **OHORT COVID-19 IN WORKPLACE POSTERS**

The OHORT team was established by the NIOH executive in response to the COVID-19 pandemic early in 2020. As the number of cases of COVID-19 rose in the country, the need to prepare workplaces for dealing with possible infections and strategies to eliminate risk was determined to be a priority by the OHORT group.

This objective was achieved by many means, one of which was by developing and publishing fact sheets for workers and employers on the NIOH website. These fact sheets were numerous and covered a range of topics from risk assessments, dealing with infected workers in the workplace and detailed risk and mitigation of COVID-19 in specific industries.

During this financial year, as many changes were made in the legislation outlined by the Department of Health and Employment and Labour, the OHORT established a technical committee of various departments within the NIOH.

In October 2021, Dr Volmink was nominated to represent the Occupational Medicine department. The main task was to ensure that the relevant occupational medicine fact sheets were reviewed in line with the current legislation and best practices.

Occupational medicine was tasked with updating 13 fact sheets, a write-up on the website and a review of the section on the national resources detailing legislation and guidelines on relevant work-related COVID-19 information. Table 2 below shows the factsheets reviewed by the Occupational Medicine section under the coordination of Dr Volmink.

Table 2: List of fact sheets delegated to occupational medicine department and status as of 31 March 2021.

NAME OF THE FACT SHEET	COMPLETED
What to do when an employee is symptomatic or tests positive for COVID-19 at work?	✓
COVID-19, the importance of medical screening	✓
What to do when an employee tests positive for coronavirus in the workplace?	✓
Ensuring mental health well-being during COVID-19	✓
Coronavirus and dentistry	✓
Coronavirus and the health care workers	✓
COVID-19 Health and safety while working from home.	✓
*Health Workers at risk	✓
Port Health	✓
Law enforcement	✓
Reporting line for HWs	✓
Provision of psychosocial support for health officials during lockdown	N/A
Taxi	✓

During the 2021/22 financial year, the occupational medicine department set up a system to review the abovementioned documents. A further internal audit system within the section reviewed all revised documents before they were sent to the technical committee. The technical committee would then send this information for review by external experts.

Seventy-seven percent of the fact sheets were reviewed in the 2021/22 financial year, as shown in Figure 3 below. One of the fact sheets, "Provision of psychological support from health officials during lockdown", was not a NIOH document and so was not revised by the NIOH team. The review of the website publication and the audit of the national resources' documents were completed.

#### STATUS OF OCCUPATIONAL MEDICINE FACT SHEETS FROM 1 APRIL 2021 TO 31 MARCH 2022



Figure 3: Status of occupational medicine fact sheets during the 2021 financial year

It is noteworthy that, given the numerous legislation changes, all of the fact sheets needed to be reviewed several times with each change in legislation to ensure that they were still relevant and accurate. Furthermore, the occupational medicine section assisted in reviewing occupational medicine content in other fact sheets allocated to other sections located within the NIOH.

## COVID-19 WORKPLACE HOTLINE AND EMAIL QUERY ADVISORY SERVICE

The Occupational Medicine section was represented by Drs Sepirwa and Ndaba, who were appointed to coordinate the advisory service on COVID-19 in the workplace. The main delivery mechanisms of this service were through the development of posters as mentioned above, training webinars, responding to emails channelled from the Information services and the hotline service managed by Dr Sepirwa.

The hotline remains a toll-free service, routed through a dedicated line in the Occupational Medicine section on behalf of the OHORT, and is available from Monday to Friday (8 am to 4 pm). This service is provided by doctors within the section, with one doctor allocated for a day. Queries received from the hotline and emails are documented by demographic characteristics of the caller, the industry and province they work in, the nature of the query, and the response provided. A monthly report is compiled based on these calls, outlining the volume of queries, common themes, industries and occupational categories from which the queries were received.

After a year of living with the pandemic, the lessons learnt, the introduction of vaccines, and additional research, the hotline received enquires primarily regarding clarifications of the information learnt in the previous year and businesses attempting to use guidelines to align their operations as the country recovers economically. The majority of enquiries concerned quarantine, isolation protocols, and leave management, as shown in Figure 4. The majority of queries occurred during the third wave of the COVID-19 pandemic in South Africa, driven by the delta variant in mid-2021.



Figure 4: COVID-19 Workplace hotline query themes, April 2021-March 2022

The adjusted lockdown levels that occurred during the year under review under the Disaster Management Act (57 of 2002) had a significant impact on hotline queries and responses at the time. Most queries were on how these levels influenced workplaces, as they superseded all other guidelines and directives from other government departments. The queries decreased after the third wave, despite a fourth wave of infections in South Africa in December 2021, as illustrated in Figure 5.



STATUS OF OCCUPATIONAL MEDICINE FACT SHEETS FROM 1 APRIL 2021 TO 31 MARCH 2022

*Figure 5. COVID-19 workplace hotline queries count, April 2021-March 2022.* 

The hotline service provided not only real-time responses to the callers but also valuable lessons to the occupational medicine doctors about the impact and responses to the pandemic at a company level.

Some of the gaps identified included the need for dedicated specialist occupational health and safety resources in businesses, more tailored approaches, and communication strategies within workplaces. As lower lockdown levels progressed, business-specific risk management strategies needed to be implemented and aligned with workplaces as they reopened and more workers returned to work. The team managed to identify OHS areas of concern in workplaces from which COVID-19 and the workplace posters were developed, as well as necessary training topics.

The training webinars offered by the occupational medicine team as part of the OHORT were coordinated internally by Dr Maso. These are presented under the Teaching and Training activities of this report.

## SUPPORT SERVICES TO NATIONAL AND PROVINCIAL GOVERNMENT DEPARTMENTS

The Occupational Medicine section supported at least two government departments and one provincial department through active and meaningful participation in structures and committees, as shown below in Table 3. This section participates and provides support as a project team and committee members in the following departments: Medical Reviewing Authority of the National Department of Health's Medical Bureau for Occupational Diseases (MBOD), DEL's Technical Committees and Project Teams, and the Gauteng Provincial Government's Project on Implementation of Occupational Health Services. Participation, progress and outputs from these activities and committees are summarised in Table 3 on page 19.

COVID-19 CORONAVIRUS

FOR SINGLE PATIENT USE ONLY STORE WELL, INJECTION ONLY.

w

COMMITTEE	MEETINGS ATTENDED 2021/22	Reason/Outcome
National Department of Health's MBOD. Medical Reviewing Authoring (MRA)	Nine meetings attended by the MRA, chaired by Prof Rees, including both MRA and Joint Committee meetings	At least 35 appeals were reviewed, and six escalated to the Joint Committee. All six cases' certification outcomes were changed based on the MRA's motivation and review.
DELTechnical Committee (TC7) Meetings	Nine TC7 meetings and seven meetings of the Lead working group within the TC7.	TC7 Meetings worked on the new Regulation for Hazardous Chemical Agents, 2021. Lead Regulations were not included in the above regulations; thus, a separate working group was formed to work on this, updating the standards and levels from the old Lead regulations.
Silicosis Elimination Work Package (WP) 1	Ten team meetings were held for the planning of the workplace surveys. Twenty-seven eligible companies were identified for invitations. Communication established and email contact for presentations of the study and documents required for ethics approval and verification of participation and logistics.	Fifteen presentations were conducted with identified companies. Budget revision, survey planning and progress reports were compiled. Letters to confirm company agreed to participate, awaited to submit this project package for ethical approval.
Silicosis Elimination WP2	Twelve meetings were held, scoping exercise and literature review were conducted.	Stakeholder identification for participation in the stakeholder interviews. Awaiting approval/agreement documents for submission for ethical clearance of this project package.
Gauteng Provincial Government's Baseline Survey of Occupational Health and safety services	Fifteen meetings were attended, convened by the Occupational medicine team as part of data collection and interviews with departments.	Thirteen departmental representatives interviewed and submitted data on behalf of their departments. Consolidated preliminary report compiled and presented on the 15 September 2021. More reports are requested to be compiled after the presentation.

Table 3: National and provincial government departments are supported by the Occupational Medicine Section.

#### RESEARCH

The research projects reported below include a project conducted jointly by the Ergonomics Unit and the members of the Occupational Medicine Section.

## THE DEPARTMENT OF EMPLOYMENT AND LABOUR'S PROJECT ON THE PREVALENCE OF SILICOSIS IN SOUTH AFRICAN NONMINING SECTORS

#### Collaboration Team: CSIR, WHC, Wits SPH and the NIOH.

#### Funding: South African Department of Employment and Labour.

The objective of the project is to determine the prevalence of silicosis in South African nonmining sectors, as there is an absence of prevalence data on silicosis in these sectors. This project will use three WPs to conduct a scoping review of the available sources of information on silicosis prevalence in South Africa and internationally, followed by a crosssectional survey conducted in at least five selected subsectors based on a clinical assessment of workers in occupations with silica dust exposure for more than ten years. A third component will be conducting activity-based surveys in selected companies to understand work processes, dust-generating activities, and dust silica measurements for selected tasks. These activities will assist in developing strategies for silicosis elimination in these sectors in South Africa. This study will commence after approval from ethics has been granted. However, planning activities are underway.

## THE HARMONY/NUM/NIOH PROJECT: MUSCULOSKELETAL DISORDERS AND ASSOCIATED RISK FACTORS AMONG MINEWORKERS ON A MAN-RIDING CONVEYOR BELT GOLD MINE IN SOUTH AFRICA

#### Project team: Mr V Ntlebi, Dr K Wilson, Dr N Ndaba, Dr B Nyantumbu, Dr H Maso and Ms B Nkosi

#### Funding: Harmony Gold Mining Company Limited.

The project is an investigation to be conducted by the NIOH to determine if the transportation method used is a significant predictor of the reported health complaints in the form of diseases. The project involves a scoping exercise and subsequent in-depth investigation to be carried out using appropriate research methods following ethical approval. The outcome of the study is meant to inform if the reported health effects can be classified as compensable occupational diseases.

#### **TEACHING AND TRAINING**

The section contributed to several training programmes in occupational health, ranging from occupational medicine specialist exam participation to postgraduate diploma programmes and COVID-19 in workplace training, conducted for other occupational health and safety professionals, workers and other stakeholders in different settings. However, there were no undergraduate teaching programmes.

## TRAINING INTERVENTIONS FOR THE COLLEGE OF OCCUPATIONAL MEDICINE

The two occupational medicine specialists in the section were appointed as core-examiner/marker and co-moderator (Dr Volmink) and examination observer (Dr Ndaba), respectively, for the 2021 second semester College of Public Health Medicine [FCPHM (SA) Occ Med] exams. Dr Volmink attended several meetings, set exam questions as allocated, marked exams and participated in the oral exam proceedings.

#### **POSTGRADUATE MASTER OF MEDICINE REGISTRAR TRAINING**

The occupational medicine specialists within the Section provided ongoing postgraduate registrar (occupational medicine and public health medicine) training programmes from within the NIOH throughout the year. The in-house programme complements the formal academic lectures in the fields of occupational and public health offered by the Wits School of Public Health (SPH), aligned with the College of Public Health Medicine guidelines for specialist training. The programme comprises various components, namely, specialist clinic assessment supervision, report writing, clinical discussion meetings, in-house occupational medicine technical workshops, journal clubs, COVID-19 in the workplace webinar presentations, ergonomic introductory tutorials and workshops on ergonomic practical exposure, and the identification and selection of common hand-held tools.

#### TRAINING INTERVENTIONS FOR POSTGRADUATE ACADEMIC QUALIFICATION PROGRAMMES - DIPLOMA IN OCCUPATIONAL HEALTH

The addition of new registrars in the Section provided enhanced support and contributed to the postgraduate teaching activities, as the registrars were able to contribute to the section's teaching and training activities. These activities include preparing and presenting lectures, clinical presentations for postgraduate Diploma programmes in Occupational Health, COVID-19 and workplace webinar planning, coordination and presentations.

As of the end of the 2021/22 financial year, a total of 12 postgraduate lecture presentations were provided by the section as well as programme coordination of the assigned block or within a block of lectures. The lectures were offered to both University of Pretoria's School of Public Health and Health Systems and Wits School of Public Health programmes.

#### TRAINING OFFERED TO OCCUPATIONAL HEALTH (OH) PROFESSIONALS AND STAKEHOLDERS

The COVID-19 pandemic provided an unprecedented challenge and attention to occupational health issues among OH professionals as well as other stakeholders. The occupational medicine section prioritised this at the beginning of the pandemic but also had to continue to expand communication of health information in a simpler way to various industries, professionals and workers within workplaces.

Training activities were predominantly focused on COVID-19 and the workplace during this financial year, as shown below. Thirteen COVID-19 webinars were planned and coordinated for different stakeholders within the occupational health and safety community, and 22 presentations were delivered by occupational medicine, as shown below in Figure 6.



*Figure 6. Occupational medicine teaching and training activities for the 2021/22 financial year.* 

The Occupational Medicine section also provided presentations to professional bodies, not for academic qualification purposes or for COVID-19 specifically. These are presented and coordinated by the section listed below:

- DEL Inspectors' lecture on Biological Monitoring in the workplace as part of the Measurement of Hazardous Chemical Substances course (18-22 October 2022),
- Occupational health practitioners' spirometry update based on 2019 guidelines on 20 May 2021,
- The South African Forum of Civil Engineering Contractors (SAFCEC) webinar on the SA 2019 Ergonomics Regulations: Implications for the Construction Sector will be on 2 July 2022.

#### **PROFESSIONAL DEVELOPMENT**

Two staff members within the section are enrolled for MMed in Community Health (Occupational Medicine) and are currently in year two of their studies. No postgraduate students graduated during the year.

# IMMUNOLOGY AND MICROBIOLOGY SECTION



# IMMUNOLOGY AND MICROBIOLOGY SECTION

HEAD: DR TANUSHA SINGH

he immunology and microbiology section plays a critical role in supporting preventive efforts towards preventing occupational allergies and infectious diseases, which continue to be challenging in both the formal and informal economy. Workplaces particularly affected include healthcare facilities, agriculture, wastewater treatment plants, and waste recycling. The section also contributes to implementing effective and sustainable mitigation strategies, particularly in airborne infection control. The section also provides tailored occupational allergy diagnostics to clinically manage workers' allergies. One of the main thrusts of the reporting cycle was the promotion and awareness of hazardous biological agents and their impact on occupational allergies and infectious diseases. The Section provided strategic leadership and participated in various stakeholder forums, such as the National Department of Health, Department of Employment and Labour, Africa Centers for Disease Control and Prevention (CDC), the New Partnership for Africa's Development (NEPAD), and the CSIR and academia, in accelerating and strengthening occupational health resilience. The Section's deliverables were aligned to its teaching and training mandate, consultations, allergy testing and efficacy testing of devices purported to reduce microbial transmission as well as water quality testing.

#### **DIAGNOSTIC SERVICES**

During the reporting period, the diagnostic services provided a worker-centric approach to allergy testing for occupationally related allergic diseases tailored to specific workplace exposures. This specialised service provides a confirmatory diagnosis of specific occupational allergies to better manage workers' exposure. As a result, we can identify high-risk occupations and recommend measures to control exposure in the workplace. A case to mention is that of a factory worker who was exposed to lentils during the packaging process. From our laboratory testing service, we could specifically identify which agent the worker was allergic to. Further details are provided in the following reference. "Sonday Z, Adams S, Singh T, Ratshikhopha E, Jeebhay MF. 2022. Occupational rhinitis and asthma resulting from lentil and split pea allergies in a food handler. Current Allergy and Clinical Immunology, 35(1): 1-8". The service has also contributed to the prevention of job loss due to a wrongful diagnosis. Sterility testing of nanoparticle samples was also conducted, which is important as it contributes to toxicological testing for research. In this cycle, the section will expand its testing service to water quality testing. The South African National Accreditation System (SANAS) surveillance assessment for International Organisation for Standardisation 15189 (ISO 15189) went very well, with the Occupational Allergy team maintaining its accreditation status for the 14<sup>th</sup> successive year. In addition, the bioaerosol unit obtained the ISO 17025 accreditation certificate for the test: Air sampling of Mycobacterium tuberculosis in a test room and guantification of Mycobacterium tuberculosis using real-time PCR was issued on 27 July 2021 and will expire on 26 July 2026. The technical signatories conferred are DO Matuka, T Duba, and Z Ngcobo.

#### **SCIENTIFIC REPORTS**

- Report number: 2021/05/28. Evaluation of Disinfection diffuser device in reducing airborne Mycobacterium tuberculosis (MTB H37Ra) in a laboratory testing facility. O. Matuka, T. Duba, L. Muleba and Z. Ngcobo
- Report Number: IM 008/21-22. Evaluation of FAR UVC Device in reducing airborne Mycobacterium tuberculosis (MTB H37Ra) in a laboratory testing facility, 02 September 2021, Dikeledi Matuka, Thabang Duba, Zethembiso Ngcobo, Tanusha Singh.
- Repot Number: IM 009/21-22. Evaluation of FAR UVC Device in reducing surface SARS-CoV-2, Staphylococcus aureus and Escherichia coli in a laboratory testing facility. 10 September 2021. Dikeledi Matuka, Lufuno Muleba, Zethembiso Ngcobo, Tanusha Singh.
- Report number 011/21-22, Evaluation of ThornBiovac™ HVAC 2x55 W Device in reducing airborne Mycobacterium

tuberculosis (MTB H37Ra) in a laboratory testing facility, 26 October 2021, Dikeledi Matuka, Thabang Duba, Zethembiso Ngcobo, Tanusha Singh,

 Namibia research 170921, Environmental samples were received from Debmarine Namibia for (1-3)-ß-Dglucan analysis, bacterial endotoxin concentrations and quantification of Mycobacterium tuberculosis. The samples were processed by L. Muleba, T. Duba, Z. Ngcobo, O. Matuka and T. Singh.

#### RESEARCH

The Section actively contributed to strengthening research and development within the NIOH by providing leadership to the Research Committee with Dr T Singh as chair. The research conducted involved section supported and collaborative projects with multiple stakeholders across various disciplines, including infection control and engineering. The ongoing projects with which the section is involved include the following:

#### PREVALENCE AND TRENDS OF ALLERGIC SENSITISATION IN PATIENTS TESTED AT THE NHLS LABORATORIES

#### Collaboration Team: T Singh<sup>1,2,3</sup>, E Ratshikhopha<sup>1</sup>, M Muvhali<sup>1</sup>, N Naicker<sup>3</sup>.

NIOH, a division of the National Health Laboratory Service,<sup>1</sup> Department of Clinical Microbiology and Infectious Diseases, University of the Witwatersrand, <sup>2</sup> Department of Environmental Health, University of Johannesburg<sup>3</sup>.

Summary: The study aims to analyse the prevalence of allergic sensitisation to various allergens tested at NHLS laboratories. There are published data from patients tested at private laboratories in South Africa, and these are mostly patients with access to private healthcare. Therefore, it is important to determine the prevalence and trends of allergic sensitisation in working-age patients tested at the NHLS because it will include those tested at public facilities. These allergy trends can inform preventive measures to reduce exposure to allergen characterisation, guide clinical management, influence planning and implementation, and evaluate health policies for the diseases under surveillance. Permission to conduct research and access specific IgE results from the NHLS database was obtained from the Academic Affairs and Research Management System (AARMS) division of the NHLS. In addition, ethics clearance was received from the Wits University Human Research Ethics Committee (Medical). The study is making good progress.

#### CHARACTERISATION OF BIOAEROSOLS, VOLATILE ORGANIC COMPOUNDS, ODOUR EMISSIONS IN WASTEWATER TREATMENT PLANTS AND ASSESSMENT OF THE ASSOCIATED EMERGING EPIDEMIOLOGICAL, OCCUPATIONAL, AND PUBLIC HEALTH RISKS

#### Collaboration Team: D Masekameni<sup>1</sup>, D Mmereki<sup>1</sup>, A Gomba<sup>2</sup>, T Singh<sup>1,2,3</sup>, L Singh<sup>2</sup>, T Duba<sup>2</sup>.

University of the Witwatersrand<sup>1</sup>, NIOH, a division of the National Health Laboratory Service,<sup>2</sup> Department of Clinical Microbiology and Infectious Diseases, Department of Environmental Health, University of Johannesburg<sup>3</sup>.

**Summary:** The proposed study seeks to characterise bioaerosol, volatile organic compound (VOC) and odour emissions in waste water treatment plants (WWTPs) and to assess the associated epidemiological, occupational, and public health risks. The results from this study will help elucidate the presence, concentration levels and variability of bioaerosols, VOCs and odours in wastewater environments. In addition, the results will be useful in establishing human health risks caused by hazardous air pollutants at WWTPs with the ultimate aim of informing policy to implement effective and appropriate control methods to abate air pollutant emissions from WWTPs and ensure the sustainable development of treatment technologies starting at the design phase while protecting public health and worker safety. The Water Research Commission recommended that the Waterborne Pathogens Unit collaborates with Wits University on a project investigating bioaerosol exposure in wastewater treatment plants. Both units finalise the collaborative agreements. Permission to conduct research and access specific IgE results from the NHLS database was obtained from the Academic Affairs and Research Management System (AARMS) division of the NHLS. In addition, ethics clearance was received from the Wits University Human Research Ethics Committee (Medical). The study is making good progress.

#### INVESTIGATION OF THE ANTIMICROBIAL ACTIVITY AND EFFECTIVENESS OF SURFACE-DEFENCE SD-ST DISINFECTANTS ON DIFFERENT SURFACES

#### Collaboration Team: G Sandhelani<sup>1</sup>, O Matuka<sup>1</sup>, L Muleba<sup>1</sup>, T Singh<sup>1,2,3</sup>.

NIOH, a division of the National Health Laboratory Service,<sup>1</sup> Department of Clinical Microbiology and Infectious Diseases, University of the Witwatersrand, <sup>2</sup> Department of Environmental Health, University of Johannesburg<sup>3</sup>.

**Summary:** A new research study was submitted to AARMS for review. The study forms part of the intern medical scientist training. Investigation of the antimicrobial activity and effectiveness of surface defence SD-ST disinfectants on different surfaces. The aim of the study was to validate and test the efficacy of the test disinfectant (SD-ST) to determine the prolonged bactericidal activity (90 days) claimed by the manufacturer. This may be a cost-effective alternative for laboratory settings. Sandhleni (medical intern scientist) was awarded NHLS K-funding for the research project.

## DETECTION IN WASTEWATER, GENOTYPIC ANALYSIS AND MICROBIOME INTERACTIONS OF SARS-COV-2 IN BOTSWANA AND SOUTH AFRICA

#### Collaboration Team: University of Botswana<sup>1</sup>, N Gomba<sup>2</sup> and T Singh<sup>2,3,4</sup>.

University of Botswana, Facultry of Health Sciences<sup>1</sup>, NIOH, a division of the National Health Laboratory Service<sup>2</sup>, Department of Clinical Microbiology and Infectious Diseases, University of the Witwatersrand<sup>3</sup>, Department of Environmental Health, University of Johannesburg<sup>4</sup>.

**Summary:** The Section is participating in a collaborative project with researchers from the University of Botswana. The project seeks to 1) assess the prevalence and fate of SARS-CoV-2 in wastewater and its environments in Botswana and South Africa, 2) assess the prevalence of different lineages and genomic variations of SARS-CoV-2 in Botswana and South Africa and 3) assess the impact of wastewater microbiomes on the molecular evolution and/or adaptation of SARS-CoV-2. The project is funded by the COVID-19 Africa Rapid Grant Fund for a total of USD 90 000.00 for two years, starting in January 2021 and ending in December 2022.

#### ESTABLISHMENT OF A NATIONAL COVID-19 WASTEWATER SURVEILLANCE PILOT-PHASE 2.

#### Collaboration Team: NICD<sup>1</sup>, SACCESS Network<sup>1</sup>, N Gomba<sup>2</sup> and T Singh<sup>2,3,4</sup>

National Institute for Communicable Diseases<sup>1</sup>, NIOH, a division of the National Health Laboratory Service<sup>2</sup>, Department of Clinical Microbiology and Infectious Diseases, University of the Witwatersrand<sup>3</sup>, Department of Environmental Health, University of Johannesburg<sup>4</sup>.

**Summary:** This project will be utilised to accumulate surveillance data on the prevalence and distribution of SARS-CoV-2 in South Africa. The knowledge gained from each laboratory partner will contribute to the South African Collaborative COVID-19 Environmental Surveillance System (SACCESS). The project is funded by the Centre for Vaccines and Immunology (CVI) of the National Institute for Communicable Diseases (NICD) in partnership with the Water Research Commission for a period of seven months starting August 2021 and ending February 2022, inclusive.

#### INVESTIGATING THE APPLICATION OF UVGI TECHNOLOGY TO EFFECTIVELY DEACTIVATE AIRBORNE BACTERIA IN A TAXI.

#### Collaboration Team: O Matuka<sup>1</sup>, T Duba<sup>1</sup>, L Muleba<sup>1</sup>, A Bilankulu<sup>1</sup>, T Singh<sup>1,2,3</sup>.

NIOH, a division of the National Health Laboratory Service<sup>1</sup>, Department of Clinical Microbiology and Infectious Diseases, University of the Witwatersrand<sup>2</sup>, Department of Environmental Health, University of Johannesburg<sup>3</sup>.

Summary: Several studies have reported an increased risk of airborne TB transmission from passengers while using public transport, such as minibuses. This has both occupational health and public health implications in South Africa since minibus taxis are the most common mode of transportation, accounting for 68% of public transport nationally. Poor indoor air quality in minibus taxis is one of the contributing factors to the transmission of airborne diseases, thus increasing the risk to both passengers and drivers. UVGI technology is developing rapidly as a potentially new and improved infection control system to deactivate airborne microorganisms, including viruses, bacteria such as TB and fungi, with distinct advantages. The study aims to determine the proof of concept of a UVGI device in reducing airborne bacterial concentration in a commuter taxi. The study was commissioned and funded by the African Potential Management Consultancy (AMPC) (PTY) LTD, February-September 2022.

#### VALIDATION OF THREE DECONTAMINATION METHODS FOR RESPIRATORS USED IN SOUTH AFRICA TO ADDRESS STOCK SHORTAGES DURING THE COVID-19 PANDEMIC

**Collaboration Team:** T Singh<sup>1, 2, 3</sup>, T Duba<sup>1</sup>, L Muleba<sup>1</sup>, O Matuka<sup>1</sup>, D Glaser<sup>4</sup>, Z Ngcobo<sup>1</sup>, N Naicker<sup>3</sup>, E Ratshikhopha<sup>1</sup>, T van Reenen<sup>4</sup>, Z Kirsten<sup>1</sup>, Z Masuku<sup>5</sup>, D Singo<sup>1</sup>, L Ntlailane<sup>1</sup>, T Nthoke<sup>1</sup>, D Jones<sup>1</sup>, M Ross<sup>1</sup>, P du Toit<sup>7</sup>

NIOH, a division of the National Health Laboratory Service<sup>1</sup>, Department of Clinical Microbiology and Infectious Diseases, University of the Witwatersrand<sup>2</sup>, Department of Environmental Health, University of Johannesburg<sup>3</sup>, Council for Scientific and Industrial Research (CSIR) <sup>4</sup>, NICD<sup>5</sup>, School of Public Health, University of the Witwatersrand<sup>6</sup>, National Metrology Institute of South Africa (NMISA) CSIR<sup>7</sup>.

**Summary:** This study aimed to demonstrate the effectiveness of low-cost and scalable decontamination methods for SARS-CoV-2 and the effect on fit testing using people instead of manikins. The results suggest that ultraviolet germicidal irradiation (UVGI) decontamination performed better than vapourised hydrogen peroxide (VHP) and moist heat incubation (MHI) methods. The UVGI was a low-cost prototype and can be used in smaller healthcare facilities such as public healthcare clinics, while the VHP method can be adopted for larger facilities with higher throughput. These methods did not impact respirator filtration; however, donning and doffing may be significant contributors to fit failure. In addition, a handful of studies showed that UVGI and VHP are effective at inactivating SARS-CoV-2 by three logs from new respirators or respirator swatches, and we demonstrated a similar log reduction on worn-in respirators using UVGI and using VHP, but only for certain types of respirators. It is recognised that extensive experimental evidence for the reuse of decontaminated FFRs is lacking, and thus, this study would be relevant and of interest in crisis-capacity settings, particularly in low-resource facilities. It also highlighted the importance of validating the decontamination method at the facility level. The project has been completed, and publications are pending.

## POTENTIAL OCCUPATIONAL EXPOSURE TO ENTERIC AND RESPIRATORY BACTERIAL PATHOGENS AT WASTEWATER TREATMENT PLANTS: A PRELIMINARY STUDY

#### Collaboration Team: E Poopedi<sup>1,2</sup>, S Kwenda<sup>3</sup>, T Singh<sup>1,2,4</sup>, and N Gomba<sup>1</sup>.

NIOH, Division of the National Health Laboratory Service<sup>1</sup>, Clinical Microbiology and Infectious Diseases, University of the Witwatersrand,<sup>2</sup> Core Sequencing Facility, National Institute for Communicable Diseases, National Health Laboratory Service<sup>3</sup>, Department of Environmental Health, University of Johannesburg<sup>4</sup>.

Summary: WWTPs provide an invaluable public service while also being at constant risk of exposure to microbiological contaminants. However, there is a paucity of data on the precise cause of symptoms and illnesses reported among workers at WWTPs. The current study aimed to provide a qualitative profile of human pathogenic bacteria present in untreated municipal wastewater (sewage) that could pose an occupational health risk to WWTP workers if ingested or inhaled. Untreated grab wastewater samples were collected from five WWTPs in Pretoria and analysed for bacterial community composition, including potentially pathogenic bacteria, using Illumina MiSeq 165 rRNA gene amplicon sequencing. The most predominant phyla identified were Bacteroidota, Campilobacterota, Proteobacteria, Firmicutes, and Desulfobacterota, accounting for 85.9% of the total bacterial community. A comparison of bacterial profiles across the five WWTPs revealed that while some WWTPs contained exclusive genera, the predominant genera in untreated wastewater did not differ considerably irrespective of plant location and size. A total of 23 genera are known to contain bacterial species of medical importance to human health, including Mycobacterium, Coxiella, Escherichia, Shigella, Arcobacter, Klebsiella, Erysipelothrix, Laribacter, Citrobacter, Actinomyces, Treponema and Aeromonas, which were identified in this study. This study also highlights the relevance of the metagenomics approach in determining wastewater bacterial signatures circulating at WWTPs with the potential to cause complicated health issues to exposed workers. Significant progress was made in the reporting cycle, and one publication was drafted.

#### ASSESSMENT OF THE ANTIBACTERIAL EFFICACY OF HAND SANITISERS COMMONLY USED IN SOUTH AFRICA

#### Collaboration Team: L Muleba<sup>1</sup>, R Van-Wyk<sup>2</sup>, J Pienaar<sup>3</sup>, E Ratshikhopha<sup>1</sup>, T Singh<sup>1,2,4</sup>.

NIOH, a division of the National Health Laboratory Service<sup>1</sup>, Department of Environmental Health, University of Johannesburg<sup>2</sup>, Biomedical Technology, University of Johannesburg<sup>3</sup>, Clinical Microbiology and Infectious Diseases, School of Pathology, University of Witwatersrand<sup>4</sup>.

Summary: Hand hygiene is vital in reducing infections in various settings, particularly in healthcare. Hand sanitisers are used as an alternative to hand washing to reduce the number of viable microorganisms when soap and water are not readily available. However, they are only effective if quality products are used and only effective if hands are not heavily soiled or greasy. This study aimed to investigate the antibacterial effectiveness of commercially available hand sanitisers and those commonly used in healthcare facilities. Twenty volunteers were also recruited to perform a handprint before and after the application of the hand sanitiser. Four of eighteen hand sanitisers (22%) were most effective against all tested bacterial species, and another four (22%) were ineffective. Hand sanitisers (n=7) with a label claim of 99.99% were all effective against E. coli only. Only five hand sanitisers (27%) were effective in the bacterial reduction of participant handprints. One hand sanitiser was 100% and was 99.9% effective in bacterial reduction on the participants' hands. This study showed that only one-fifth of hand sanitisers were effective against selected microorganisms. The hand sanitisers were also only effective against one of the five microorganisms tested. The findings raise concerns about the efficacy of hand sanitiser and its role as a preventive measure in reducing microbial transmission. This study was completed, and publications are pending.

#### **TEACHING AND TRAINING**

In the second year of the COVID-19 pandemic, the Section refocused its training initiatives to raise awareness of occupational allergies, water reuse and interventions for airborne infection prevention and control. Various occupational health professionals, employers and employees across several sectors were trained. Training of intern medical scientists, which is accredited by the Health Professionals Council of South Africa (HPCSA), continued, and support was provided to the NHLS medical technologist training for a second year. The training prepares this cadre for employment in medical laboratories. The Section also supported occupational health curricula for various universities (for example, a Diploma in Occupational Health for the Universities of KwaZulu-Natal, Pretoria and the Witwatersrand) and the South African Institute for Occupational Hygienists (SAIOH).

#### **LECTURES AND TUTORIALS**

- 1. A Fourie. Occupational skin diseases, 8 June 2021, for the Occupational Medicine registrars.
- 2. A Fourie. PPE: a necessity but ensure appropriate use, 22 June 2021, Mpumalanga Department of Health Occupational Health and Safety workshop.
- A Fourie. Practicalities of Occupational Skin Diseases, for the Diploma in Occupational Health students, University of Pretoria.
- 5. A Fourie. Practicalities of patch testing, for Wits dermatology registrars, University of the Witwatersrand, 18 February 2022.
- A Fourie led a session on "COVID-19 and Skin Conditions in the Workplace" for NIOH COVID webinars and presented a talk entitled "Skin reactions to COVID preventive measures – cleansing agents and PPE". The session was well attended, with approximately 185 attendees.
- O Matuka. How to Conduct HIRA given the COVID-19 Omicron Variant, 11 March 2022, Gauteng Provincial Government, Occupational Health and Safety Seminar.
- 7. Z Kirsten and A Fourie facilitated Quality Management System Training, 10 March 2022, NHLS Medical Technologist students.

#### SURVEILLANCE REPORTS

- The annual surveillance report on occupational allergies: 2020. Fourie A, Ratshikhopha E, Muvhali M, Singh T, Willson K and Ntlebi V. Report no. IM 019/21-22.
- 2. Kerrigan McCarthy, Said Rachida, Mukhlid Yousif, Nkosenhle Ndlovu, Wayne Howard, Shelina Moonsamy, Gina Pocock, Leanne Coetzee, Janet Mans, Lisa Schaefer, Wouter J. Le Roux, Annancietar Gomba, Don Jambo, David Moriah de Villiers, Nadine Lee Lepart, Rabia Johnson, Christo Muller, Natacha Berkowitz, Jay Baghwan, Melinda Suchard for the SACCESS network. Monitoring the third wave: detection and sequencing of SARS-CoV-2 at sentinel wastewater treatment sites, 2020-2021 by the South African Collaborative COVID-19 Environmental Surveillance System (SACCESS) network.
- 3. Kerrigan McCarthy, Said Rachida, Mukhlid Yousif, Nkosenhle Ndlovu, Wayne Howard, Shelina Moonsamy, Gina Pocock, Leanne Coetzee, Janet Mans, Lisa Schaefer, Wouter J. le Roux, Annancietar Gomba, Don Jambo, David Moriah de Villiers, Nadine Lee Lepart, Rabia Johnson, Christo Muller, Natacha Berkowitz, Jay Bhagwan, Melinda Suchard, for the SACCESS Network. A longitudinal view and trends on the detection and sequencing of SARS-CoV-2 at sentinel wastewater treatment sites by the South African Collaborative COVID-19 Environmental Surveillance System (SACCESS) network, 2020-2021. Published in the NICD COVID-19 Special Public Health Surveillance Bulletin. 20 July 2021.

#### **INFORMATION SHEETS AND AWARENESS ACTIVITIES**

The heightened awareness of infection prevention and control led to increased queries related to device testing for Mycobacterium tuberculosis and other airborne microorganisms. Key initiatives are listed below:

 Moulds in the Workplace for Fungal Diseases Awareness Week (20-24 September 2021), video. The aim was to raise awareness and highlight mould in the workplace and the value of early recognition of fungal symptoms and disorders and the importance of diseases caused by exposure to fungi and moulds in the workplace. It also aimed to highlight the importance of preventing exposure to protect workers' health.

- A fact sheet was developed entitled "COVID-19: Wastewater Workers-What you need to know". 15 September 2021. The factsheet was presented at the stakeholder engagement meeting with the City of Tshwane Wastewater Treatment Operations management. The purpose of the factsheet is to raise awareness about ways to minimise wastewater workers' exposure to hazardous biological agents present in wastewater during the COVID-19 pandemic and beyond.
- World TB Day 2022 video. 24 March 2022. The awareness campaign was to highlight airborne TB exposures and the contribution of the ASPIRE laboratory in combating TB in the workplace.

#### **PROFESSIONAL DEVELOPMENT**

Postgraduates enrolled eight (a doctorate of philosophy at the University of Witwatersrand, eight masters in public health at the University of Johannesburg, one master in public health at the University of Cape Town, a master in technology).

#### HONOURS

M Mlamba completed her HPCSA medical scientist internship training.

# CONFERENCE, SEMINAR AND TECHNICAL MEETING ATTENDANCE

**Gomba N**. Assessing the presence of SARS-CoV-2 in wastewater and health implications for wastewater workers and water reuse. Webinar: Poop tells no lies: Progress and developments of wastewater-based epidemiology surveillance in South Africa, hosted by the Water Research Commission on 26 August 2021. The webinar's objective was to share knowledge on the progress that has been made to-date in South Africa in the detection and quantification of the SARS-CoV-2 virus and the emerging variants in wastewater as an early warning tool to track the spread of the virus in communities.

**Duba T**, T Singh, N. Naicker. Occupational respiratory diseases are associated with hazardous biological agents among horse groomers in South Africa. NIOH Research forum. 16 February 2022.

Staff in the Section also presented at various conferences nationally and internationally. These are listed at the end of the review.

# EPIDEMIOLOGY AND SURVEILLANCE SECTION



# EPIDEMIOLOGY AND SURVEILLANCE SECTION

ACTING HEAD: PROF MUZIMKHULU ZUNGU

he epidemiology and surveillance unit (herein referred to as the 'Epi unit') of the NIOH aims to study and/or support (NIOH and/or other OHS stakeholders) the distribution of occupational health and/or safety outcomes and the determinants or occupational exposures, including associated risk factors for health and safety in all workplaces. Surveillance is a core activity in the practice of occupational health, specifically hazard surveillance and health surveillance. To this extent, the Epi unit is working on building from the COVID-19-inspired OHSS to establish a comprehensive surveillance system for occupational health in South Africa. This will inform the planning and management of occupational diseases and injuries in South Africa, as well as assist South Africa in its reporting mandate to the International Labour Organization.

#### SURVEILLANCE AND SERVICES

#### **OCCUPATIONAL HEALTH SURVEILLANCE SYSTEM**

**Collaboration Team:** N Tlotleng<sup>1</sup>, N Naicker<sup>2</sup>, R Naidoo<sup>3</sup>, L Monaiwa<sup>1</sup>, A Jekwa<sup>1</sup>, V Ntlebi<sup>1</sup>, M Rambau<sup>1</sup>, O Samuel<sup>1</sup>, M Zungu<sup>1,4</sup>, S Kgalamono<sup>1</sup>, B Kistnasamy<sup>5</sup>, M Jeebhay<sup>6</sup>. NIOH, a division of the National Health Laboratory Service<sup>1</sup>, University of Johannesburg, South Africa<sup>2</sup>, Discipline of Occupational and Environmental Health, University of Kwa-Zulu Natal<sup>3</sup>, School of Health Systems and Public Health, University of Pretoria<sup>4</sup>, National Department of Health, South Africa<sup>5</sup>, Occupational Medicine Division, University of Cape Town.<sup>6</sup>

The occupational health surveillance system was initiated to monitor COVID-19 infection across workplaces in South Africa, as well as to understand the postinfection and return-to-work outcomes. Over the one-year period of data submission, COVID-19 cases by industry and occupation, commonly reported symptoms across workplaces and employee vulnerabilities by job category in industrial sectors were reported. There were 5 635 employers registered on the OHSS for the period ending March 2022. Reflecting on the provincial distribution in business registration, the majority of employers reporting COVID-19 positive cases were located in Gauteng (48.2%), the Western Cape (18.6%) and Kwa-Zulu-Natal (12.4%). Most COVID-19 positive cases in the first wave were reported from the banking and insurance sectors (57%), followed by the health and social sector (27.3%). The OHSS annual report is available on the NIOH website for stakeholders.

https://www.nioh.ac.za/ COVID-19 -information-resources/occupational-health-surveillance-system-ohss-business-portal/

Noncompliance by workplaces to register and submit COVID-19 data was a huge limitation for OHSS as a reporting tool, with the number of workplaces registered on the OHSS accounting for approximately 12% of registered workplaces in SA. Nonetheless, the OHSS provides the basis for a comprehensive OHS surveillance system.

#### NATIONAL HEALTH LABORATORY SERVICE COVID-19 SURVEILLANCE

#### KS Wilson<sup>1</sup>, D Jones<sup>1</sup>, S Kgalamono<sup>1</sup>.

NIOH, a division of the National Health Laboratory Service, South Africa<sup>1</sup>.

The OHASIS is an online reporting tool for all NHLS incidents, injuries and diseases related to the work environment. From 2021 to 2022, the surveillance focused on COVID-19 exposures and positive cases among NHLS employees. Reports were produced biweekly and monthly to monitor the infection trends in the regions, business units, job types, and type of exposure as well as disease outcomes in COVID-19-positive employees within the NHLS.

#### HOSPITAL SURVEILLANCE ON COVID-19 - NATIONAL HEALTHCARE WORKER ADMISSIONS AND MORTALITY

#### N Tlotleng<sup>1</sup>

NIOH, a division of the National Health Laboratory Service, South Africa<sup>1</sup>.

The NIOH received data from the Daily Hospital Surveillance for COVID-19 Admissions (DATCOV), which was initiated by the National Institute for Communicable Disease on 1 April 2020. Data are submitted by public and private hospitals that have agreed to report COVID-19 admissions through DATCOV surveillance in all nine provinces of South Africa. Health Care Worker data were extracted and analysed, and the trends in admissions, demographic profiles, health outcomes on the severity of disease and vaccine impact on HCW admission and mortality were reported in the monthly surveillance reports.

Reports can be downloaded from https://www.nioh.ac.za/ COVID-19 -occupational-health-surveillance/.

#### NATIONAL HEALTH LABORATORY SERVICE VACCINATION SURVEILLANCE

#### CK Nyuyki<sup>1</sup>, KS Wilson<sup>1</sup>.

The NIOH is a division of the National Health Laboratory Service, South Africa<sup>1</sup>.

The OHASIS of the NHLS provided data on the vaccination status of NHLS staff every month. The data provided monthly updates on the number of staff vaccinated, the type of vaccine, the common side effects, leave information by province and recommendations to maintain a safe work environment. Where possible, breakthrough infection data were also provided. Bimonthly reports were produced for the executive committee of the NHLS.

#### **RESEARCH AND/OR SPECIAL PROJECTS**

The Epidemiology and Surveillance Section conducts primary research, research commissioned by governmental, parastatal and private organisations and secondary data analyses.

#### COVID-19 CASES AMONG MEDICAL LABORATORY SERVICE STAFF IN SOUTH AFRICA, 2020-2021: A COHORT STUDY

#### Collaboration study team: KS Wilson<sup>1</sup>, D Jones<sup>2</sup>, G Chin<sup>2</sup>, N Sanabria<sup>3</sup>, J Jones<sup>3</sup>, N Tlotleng<sup>1</sup>, V Ntlebi<sup>1</sup>, N Naicker<sup>4</sup>.

Epidemiology and Surveillance Section<sup>1</sup>, Safety Health and Environment Section<sup>2</sup>, Toxicology Section<sup>3</sup>, NIOH – a Division of the NHLS<sup>1</sup> Environment and Health Research Unit, South African Medical Research Council<sup>2</sup>.

The OHASIS at the NHLS was used to describe COVID-19 infections in NHLS staff. All positive COVID-19 staff cases were recorded on the OHASIS system. The data were extracted and analysed to explore the role of job type in COVID-19 infection in 2020/21. Job type was found to be a significant risk factor for infection due to complex work and social interactions. Further research is planned in the NHLS to describe COVID-19 experiences, vaccination, and the impact on work of COVID-19 along with the role of OHASIS.

#### EVALUATION OF THE COVID-19 OCCUPATIONAL HEALTH SURVEILLANCE SYSTEM IN SOUTH AFRICA, 1 OCTOBER 2020- 31 OCTOBER 2021

#### Collaboration study team: A Chatika<sup>1</sup>, N Tlotleng<sup>1</sup>, N Naicker<sup>1</sup>, T Zwane<sup>2</sup>, L Kuonza<sup>2</sup>.

Epidemiology and Surveillance Section, NIOH<sup>1</sup>, Public health Surveillance, National Institute for Communicable Diseases,<sup>2</sup> - a Division of the NHLS.

Conducting a surveillance system evaluation has been shown to be an effective means of improving health surveillance systems globally and in South Africa. The project will be undertaken by a field epidemiology student and will aim to evaluate the Occupational Health Surveillance System following the Centres for Diseases and Control (CDC) guidelines. Attributes that may influence the efficient submission of workplace-related COVID-19 data will be evaluated. A report will be compiled and submitted to the South African Field Epidemiology Training Programme (SAFETP) and will be distributed to relevant stakeholders of the systems.

#### MENTAL HEALTH IN HEALTHCARE WORKERS

#### Collaboration study team: KS Wilson<sup>1</sup>, S Kgalamono<sup>2</sup>, A Yassi<sup>3</sup>, J Spiegal<sup>3</sup>, N Mdumbe<sup>4</sup>, G Gemel<sup>4</sup>.

Epidemiology and Surveillance Section<sup>1</sup>, NIOH – a Division of the NHLS<sup>2</sup>, University of British Columbia, Canada<sup>3</sup>, Gauteng Department of Health, Employee Health & Wellness (Wellness Management)<sup>4</sup>.

All healthcare facilities are considered risky during normal and COVID-19 times due to infectious diseases carried by patients. Exposure to risks along with other workplace factors related to mental stress can affect the mental health of employees. A survey of psychological distress in health care workers during the COVID-19 pandemic was conducted in selected Gauteng facilities in 2020 and 2021. Women health care workers were more aware of hazards in the workplace than the men in this survey. Although psychological distress was seen in staff, the average score was below the cut-off for severe stress, while the female staff scored higher. Support from management and supervisors is needed to work through stress and provide understanding.

#### WOMEN IN THE MINING INDUSTRY INJURIES AND FATALITIES

#### KS Wilson<sup>1</sup>, N Naicker<sup>2</sup>.

Epidemiology and Surveillance Section, NIOH - a Division of the NHLS<sup>1</sup>, Environment and Health Research Unit, South African Medical Research Council<sup>2</sup>.

An investigation into injuries and fatalities experienced by women in the mining industry was conducted for the Minerals Council in South Africa. The study found that safety in the mining industry has improved over time, although improvements were slower for women than for men. There was no overall increase in reported accidents involving women, but a description of job titles suggested that few women were involved in the riskiest jobs, suggesting that accidents involving women may increase as women move into riskier jobs. Continued surveillance is required to prevent incidents involving both men and women.

#### INVESTIGATION INTO THE REPORTING OF OCCUPATIONAL INJURIES AND DISEASE IN SOUTH AFRICA

#### KS Wilson<sup>1</sup>, N Tlotleng<sup>1</sup>, M Zungu<sup>2</sup>, O Samuel<sup>3</sup>, M Rambau<sup>3</sup>.

Epidemiology and Surveillance Section<sup>1</sup>, TB HIV Section<sup>2</sup>, Information Technology Section<sup>3</sup>, NIOH – a Division of the NHLS.

The NIOH was commissioned to perform a quick survey on the reporting of occupational injuries and disease data by specific entities in SA. A further objective was to determine if the current reporting by the entities was in line with the international standard of the ILO that can be adopted for South Africa. The report found that data on occupational injuries and diseases are currently collected by the compensation funds of South Africa and that South Africa is able to produce a national occupational injury and disease report.

#### PNEUMOCONIOSIS, LUNG CANCER AND TUBERCULOSIS MORTALITY IN THE NONMINING INDUSTRY IN SOUTH AFRICA

KS Wilson<sup>1</sup>.

Epidemiology and Surveillance Section, NIOH - a Division of the NHLS<sup>1</sup>.

A multicentre project on silicosis prevalence and control measures was commissioned by the Department of Labour. The epidemiology and surveillance unit developed the protocol for the project survey of key industries and produced the report "Pneumoconiosis, Lung Cancer and Tuberculosis Mortality in the nonmining industry in South Africa". The report investigated the role of industry and jobs as a factor in silicosis mortality. This report was presented to key Department of Labour staff along with basic surveillance training to allow for skills transfer.

#### GAUTENG DEPARTMENT OF HEALTH STAFF SATISFACTION REPORTS – 2020/21

#### Collaboration study team: KS Wilson<sup>1</sup>, N Mdumbe<sup>2</sup>, G Gemell<sup>2</sup>.

Epidemiology and Surveillance Section, NIOH - a Division of the NHLS<sup>1</sup>, Gauteng Department of Health, Employee Health & Wellness (Wellness Management)<sup>2</sup>.

Staff satisfaction is a measure of job satisfaction, which is key for productive employees. Reporting on staff satisfaction is a requirement for the Department of Health. The NIOH provides a service to the Gauteng Department of Health, creating a survey tool and producing an overall report for the province and each facility participating. For the 2020/21 financial year, 19 facilities received individual reports. The main areas of satisfaction among staff were supervision and the type of work. Pay and promotion, as well as management communication, rules, and paperwork, were areas of dissatisfaction.

#### **TEACHING AND TRAINING**

The Epi unit provides teaching and training in undergraduate and postgraduate academic programmes at the Universities of Witwatersrand (Wits), the University of Johannesburg (UJ), and the University of Pretoria (UP). In the 2021/2022 financial year, we contributed to the following programmes:

#### POSTGRADUATE

- Participate in lectures in the Field Epidemiology Training Programme (SAFETP).
- Assistance is provided to the School of Public Health (Wits) in facilitating lectures as well as participating in the postgraduate assessors' committees.
- In addition, staff also support students from the NIOH with their project development and analyses of their data.
- The Epi unit presented a lecture on "Overview of the Occupational Health Surveillance System" during a disease surveillance module to SAFELTP students.
- The Epi unit presented a lecture on the Introduction to Epidemiology to students of the Diploma in Occupational Medicine and Health (DOMH) at the University of Pretoria
- The Epi unit was invited as a coordinator during a research development module for MSc students at the School of Public Health, University of the Witwatersrand.

# TRAINING CONDUCTED FOR OCCUPATIONAL HEALTH STAKEHOLDERS

- The Epi unit presented at the NIOH training webinar on Occupational Health Surveillance System on several occasions as OHSS reporting,
- The Epi unit facilitated internal training for NIOH staff on Introductory Epidemiology and Biostatistics.

## POSTGRADUATE (DIPLOMA, HONOURS, MASTERS AND DOCTORAL) RESEARCH SUPERVISION

The Epidemiology and Surveillance Section is currently supervising 10 postgraduate students:

#### FIVE (5) MASTER OF PUBLIC HEALTH (MPH)

- 1. The risk of COVID-19 infection among unvaccinated employees handling medical waste in selected healthcare risk waste (HCRW) facilities in Johannesburg, South Africa.
- 2. Common Mental Disorders of Health Care Workers at Tertiary hospitals in Zimbabwe During COVID-19: A Cross-Sectional Study.
- Factors associated with diarrhoeal disease in children below the age of five years in Uganda, 2021: A cross-sectional study.
- 4. The relationship between eye defects and online learning at a South African University: A cross-sectional study.
- 5. Facilitators and Barriers Associated with the Uptake of Preexposure Prophylaxis (PrEP) among Adolescent Girls and Young Women (AGYW) in Thabo Mofutsanayana District in the Free State Province.

#### FOUR (4) MASTER OF SCIENCE (MSC)

- 6. The relationship between Mental Health and Work Stress in Healthcare Workers during COVID-19 in Gauteng, South Africa (2020).
- 7. The relationship between psychological distress and somatisation in hospital-based healthcare workers in Gauteng during the COVID-19 pandemic in 2020.
- 8 Association between COVID-19-related mental health and job level among healthcare workers from public hospitals in Johannesburg, South Africa.
- 9. Substance use and HIV in adults in 4 sub-Saharan African countries, 2014 2016.

#### (1) DOCTORAL (PHD) STUDENT

10. Workplace health protection through the evaluation of factors affecting respirator fit.

# OCCUPATIONAL HYGIENE SECTION



HEAD: MRS JEANNETH MANGANYI

he primary mandate of the Occupational Hygiene discipline is to anticipate, identify and recognise, evaluate, and control workplace hazards through assessments and the recommendation of practical and cost-effective exposure control measures. The NIOH Occupational Hygiene Section is well positioned within the institution to address occupational health hazards and promote the health and well-being of employees within the institution and external clients. This mandate continues to produce high-level outputs made possible through continuous effort to maintain the quality management system and retain experienced technical staff. In addition to exposure assessments, the section conducts research, training and teaching, nonmedical sample analyses, and provides advisory support to employees and employers. These are functions that contribute to the mandate of the institute.

Exposure assessment at the NHLS laboratory.

#### SERVICES

During the second surveillance assessment in May 2021, the Occupational Hygiene Section was recommended for continued accreditation under ISO/IEC17020 and registration with the Department of Employment and Labour as an Approved Inspection Authority (AIA). The section maintained its status as a Type C Inspection Body to provide occupational hygiene services to the private sector and its parent organisation, the NHLS. Mr Gabriel Mizan and Mr Jonas Shai managed the section's two laboratories, the asbestos and XRD/FTIR laboratories, respectively, which operate under the direction of the section head. The asbestos laboratory continued to participate in the asbestos fibre regular informal counting arrangement (AFRICA) proficiency testing scheme run by the Institute for Occupational Medicine (IOM) in Edinburgh, UK. The laboratory maintained an excellent performance of a "1" rating in both rounds of proficiency testing participation. The XRD/FTIR laboratory participated in the Air and Stack Emissions Proficiency Testing Scheme run by the Health and Safety Laboratory in the UK and administered by the LGC group. The laboratory maintained a



Static asbestos air sampling in a raw asbestos storage room.

"SINCE THE OCCUPATIONAL MEDICINE SPECIALIST CLINIC PROVIDES SPECIALISED SERVICES IN ASSESSING PATIENTS FOR SECOND OPINION, OR FURTHER ASSESSMENTS TO ESTABLISH THE WORK-RELATEDNESS OF THEIR CONDITIONS, THE CLINIC HAD TO REOPEN AND ALLEVIATE THE BACKLOG THAT WAS FELT BY WORKPLACES."



Demonstration of air sampling consumables.



Demonstration of a bulk asbestos sampling technique.

Z score of ±one for more than 95% of the samples for all three methods, indicating satisfactory performance.

#### **EXPOSURE ASSESSMENTS**

The Occupational Hygiene Section is the indicator owner of the NIOH Annual Performance Plan (APP) KPI on occupational health and safety risk and exposure assessments. The section is responsible for compiling exposure assessment reports and collecting them from contributing departments. The section also carried out walkthrough assessments as part of the clinical health assessments, which were then included in the final patient report.

The APP's target of 15 reports was exceeded by one report, resulting in a positive variance. As part of the existing service level agreement, the section continued to provide a service to the Department of Correctional Services and exposure assessments at selected NHLS laboratories. The Immunology and Microbiology section, Occupational Medicine and its Ergonomics Unit were contributing sections for the reporting year.

#### **SAMPLE ANALYSES**

The XRD/FTIR and asbestos laboratories provided analytical services that supported the accredited scope of the AIA work in exposure assessments. Both laboratories analysed nonmedical samples as part of their participation in proficiency testing schemes and to evaluate potential exposure to hazardous substances in the air.

In the asbestos laboratory, eleven samples were analysed as part of service delivery, while 20 samples (two rounds of proficiency participation) were analysed by three staff members who took part in the proficiency testing process. Thirty-one samples (service delivery =15, PTS=16) were weighed gravimetrically before being analysed for respirable crystalline silica using XRD and FTIR equipment.mage 1 (L): Exposure assessment at the NHLS laboratory.
### **RESPIRATOR FIT TESTING**

The section raised awareness of respirator fit testing and provided training in this area. During the 2020-2021 reporting period, the team performed respirator fit testing on 17 employees, and the testing was provided to support the requests for fit testing employees within the NHLS.

### **ADVISORY SUPPORT**

Staff served on various committees and strategic meetings. Participation continued in professional and technical committees, including SAIOH, the Department of Employment and Labour, and SANAS. During the reporting period, the NIOH OHORT remained active in contributing to COVID-19 support requirements, including reviewing training content and responding to queries.

The section staff supported SAIOH PCC, EXCO, Occupational Hygiene Skills Forum (OHSF), Technical Committee and management and conducted oral assessments on upgrading candidates. The section staff continued to support the SANAS Occupational Hygiene STC and conduct technical assessments as part of ISO/IEC 17020 accreditation, a Department of Employment and Labour requirement for AIA.

The section participated in the TC7 workgroup and technical committee that reviewed legislation supporting the Department of Employment and Labour. Staff attended steering and other strategic meetings to discuss the status and challenges of all study work packages as part of the current Department of Employment and Labour study on reducing silicosis in the nonmining sector.

The section responded to many inquiries, which mainly dealt with training, asbestos and COVID-19-related issues. Twenty-one queries were explicitly recorded on the NIOH information query system (Query Nos. QRY00049, QRY00053, QRY00050, QRY00056, QRY00055, QRY00058, QRY00059, QRY00060, QRY00061, QRY00063,

QRY00065, QRY00062, QRY00064, QRY00066, QRY00067, QRY00070, QRY00071, QRY00072, QRY00073, QRY00074, and QRY00075). The section supported and provided technical direction to the Malawi (Lilongwe) Ministry of Mining in establishing a laboratory for gravimetric weighing and respirable crystalline silica analysis, according to an agreement between the NIOH and AUDA-NEPAD.

### RESEARCH

Several previously reported research projects are in the data collection stage, although the pandemic lockdown restrictions negatively impacted the activity. The majority of the research was done as part of academic studies, while some was initiated internally and in collaboration with other sections and stakeholders.

The section developed a research protocol for a Department of Employment and Labour study on silicosis reduction in nonmining sectors, the only project initiated during the reporting period. This initiative is part of a larger research project involving many stakeholders.

### EVALUATION OF RESPIRABLE CRYSTALLINE SILICA EXPOSURE LEVELS IN SELECTED NONMINING SUBSECTORS IN GAUTENG.

This study aims to conduct workplace respirable crystalline silica (RCS) exposure surveys in selected high-risk nonmining subsectors. It will also collect information on occupational factors that influence exposure in potentially exposed employees and describe task-based respirable dust exposure levels.

### **RESEARCH OUTPUT**

Staff members contributed to two publications as part of collaborative efforts initiated by other sections.





 Iobile unit research study walkthrough assessment team.
 NHLS COVID-19 Mobile Testing Laboratory at O.R. Tambo International Airport

 National Institute for Occupational Health | Annual Review 2021/22

### **TEACHING AND TRAINING**

The Occupational Hygiene section supported academic teaching activities, including the Wits MSc (Exposure Science), MPH and Post Graduate Diploma in Occupational Health (PG DOH) students. The section supervised postgraduate students at various universities, reviewed research protocols, and examined a dissertation. Some of the section's employees were involved in peer-reviewing submissions for publication in journals. Occupational Medicine Registrars were given occupational hygiene tutorials on concepts that included risk assessment, legal standards, sampling strategies and instrumentation for a sampling of chemical and physical hazards by the NIOH Occupational Hygiene team.

The staff delivered various internal training sessions as part of the activities required for the ISO 17020 quality management system and presented at the section's journal club as part of staff capacity building. More than 30 delegates from the Department of Health Mpumalanga received online training on respirator selection and quantitative fit testing for staff capacity building at government institutions.

In support of the NIOH OHORT activities, the Occupational Hygiene Section reviewed fact sheets and other training material, delivered presentations, and served as panellists during NIOH training webinars. "What employers need to implement in response to COVID-19," "Principles of health risk assessment," "Ventilation during the COVID-19 pandemic from an Occupational Hygiene perspective," and "Basic ventilation requirements: COVID-19 Directions, National Building Regulations, and other guidelines" were among the topics covered.

As an approved training provider, the Occupational Hygiene Section provided three-week-long training sessions as part of the contract for training primary inspectors from the Department of Employment and Labour. The modules presented were "Measurement of hazardous substances", "Asbestos and other fibres", and Control of hazardous substances". The overall pass rate for all modules was more than 95%.

Staff within the section also attended the following conferences:

- The International Occupational Hygiene Association (IOHA) 12<sup>th</sup> International Scientific Conference (Virtual), 11 - 15 September 2021. Ntlailane L, Singo D, Nthoke T.
- 2. The American Biological Safety Association (ABSA) 64<sup>th</sup> Annual Conference (Virtual), 22 - 27 October 2021. Ntlailane L.
- The Southern African Institute for Occupational Hygiene (SAIOH) Annual Conference (Virtual), 18 October - 05 November 2021. Manganyi J, Mokone M, du Preez K, Singo D, Mizan G, Nthoke T, Makhubele N, Ntlailane L.

### **PROFESSIONAL DEVELOPMENT**

Six postgraduates were enrolled: two PhD candidates in Public Health at Wits University, one MPH student in Environmental and Occupational Health at the University of Pretoria, two MPH students in Occupational Hygiene at Wits University, and one Master's in Medicine (Exposure Science) student at Wits University.

Ms D Sinqo completed the Postgraduate Diploma in Public Health at the University of Pretoria with distinction.



Onsite training of inspectors at the NIOH during the pandemic.



Demonstration of sampling pump calibration to the inspectors during training.

# **QUALITY ASSURANCE DEPARTMENT**



38



## QUALITY ASSURANCE DEPARTMENT

**HEAD: MR BONGINKOSI DUMA** 

he NIOH Quality Assurance department continued to maintain accreditation in all four standards: ISO 15189 (medical laboratories), ISO 17025 (testing laboratory), ISO 17020 (inspection body) and ISO 9001:2015 (quality management). In terms of ISO 17025, the Institute extended the scope of accredited laboratories to include the XRD and FTIR laboratory for crystalline silica analysis within the Occupational Hygiene Section and the Microbiology PCR laboratory for environmental testing within the Immunology and Microbiology Section. The Toxicology and Biochemistry Section underwent a SANAS Preinspection audit for Good Laboratory Practice (GLP) in April 2021 and passed. Due to the resignation of the researcher in the study, the planned site inspection was put on hold. The GLP accreditation is based on the OECD's principles for laboratories that only conduct research on nonmedical samples. The NIOH remains the only institute in South Africa and in Africa to hold an unprecedented four different accreditation standards.

### **SERVICES**

The NIOH QA Section conducts internal audits on an ongoing basis to ensure that the quality management systems remain intact. This process normally includes calibration and quality systematic checks. To this end, monthly accreditation meetings are held with each NIOH Section. It has also provided pre-SANAS internal audits, training and support to NHLS laboratories, including proficiency testing scheme guidance to staff. QA is also responsible for coordinating external audits from SANAS and several other external clients for the NIOH. The department ensures that all NIOH laboratories and other nontechnical areas receive the necessary priority to ensure that quality management systems are implemented, maintained and upheld. The Section also provides support to NHLS laboratories to obtain SANAS approval for their quality management systems and technical competence. These laboratories are assisted with preassessments for SANAS audits, gap analyses, internal audits, Committee for Evaluations and Technical Function (CEFT) evaluations and guality assurance training.

ACCREDITATION	REGION	LAB NO	LABORATORY NAME	DISCIPLINE/SCOPE
IS05189	NIOH	M0276	Analytical Services	Inorganic Chemistry
		M0276	Analytical Services	Organic Chemistry
		M0276	Immunology/Microbiology	Immunology
		M0276	Pathology	Histology
		M0276	Pathology	Cytology
IS017025	NIOH	T0660	Analytical Services	Water testing: mercury
		T0660	Analytical Services	Water testing: aluminium
		T0660	Occupational Hygiene	Environmental methods:
		T0660	Immunology/Microbiology	Microbiology: MTB

Table 4: The NIOH's current test accreditation

#### *The NIOH's current test accreditation (continued)*

ACCREDITATION	REGION	LAB NO	LABORATORY NAME	DISCIPLINE/SCOPE
IS017020	NIOH	OH0079	Occupational Hygiene	Asbestos
		OH0079	Occupational Hygiene	Lead
		OH0079	Occupational Hygiene	Noise-Induced-Hearing-Loss
		OH0079	Occupational Hygiene	Hazardous Chemical Agents
IS09001	NHLS-NIOH	Z19/21021	National Biobank	Biobank

### Table 5: NIOH Proficiency Testing Scheme (PTS) Performance

ACCREDITATION	REGION	LAB NO	LABORATORY NAME
Immunology/Microbiology	Turn-around-time (TAT)	90%	>85%
	External Quality Assurance (EQA)	100%	>80%
	Internal Quality Checks (IQC)	100%	>80%
	Customer Satisfaction (CS)	100%	>95%
Pathology	Turn-around-time (TAT)	93%	>80%
	External Quality Assurance (EQA)	95%	>80%
	Internal Quality Checks (IQC)	88%	>80%
	Customer Satisfaction (CS)	100%	>95%
Analytical Services	Turn-around-time (TAT)	91%	>85%
	External Quality Assurance (EQA)	84.6%	>80%
	Internal Quality Checks (IQC)	95%	>80%
	Customer Satisfaction (CS)	98%	>95%

### **ISO 9001 IMPLEMENTATION PROGRESS**

The COVID-19 pandemic caused some of the progress to slow down during the previous financial year. Now that the situation has improved, there is a resumption of ISO 9001 implementation within NIOH support departments. The Quality Assurance Department ensures that other nontechnical areas receive the necessary attention to ensure quality management systems are implemented within the NIOH. The benefits of ISO 9001 implementation within the NIOH to nontechnical departments include the following:

Departments and sections that have committed to implementing ISO 9001 for the next financial year are Occupational Medicine (including the clinic), Epidemiology and Surveillance, Procurement, and Information Services.

It must be noted that the Epidemiology and Surveillance Section is awaiting a new Head of Section, and the Procurement Department is committed to taking ownership of writing the manual.

National Institute for Occupational Health | Annual Review 2021/22

#### **ISO9001 PROGRESS CHART NIOH**



Figure 7. ISO9001 Progress Chart NIOH

### **SERVICE TO OTHER NHLS ENTITIES**

The NHLS continually requests the expertise of the NIOH's Quality Assurance Department to assist with preparing other laboratories for accreditation. These laboratories, based in other provinces, are assisted with pre-assessments for SANAS audits, gap analyses, internal audits, Committee for Evaluations and Technical Function (CEFT) evaluations and quality assurance training. During the period under review, these services were provided to NHLS laboratories in the Free State (Genetics), as well as the Eastern Cape, Limpopo and KwaZulu-Natal medical laboratories under ISO 15189. The NIOH continued providing support for internal audits and the equipment tender process for the KwaZulu-Natal Public Health Laboratory, as well as assistance to the NICD for ISO 17025 and ISO 9001 implementation, respectively.

### TRAINING

The department conducts internal training to strengthen the quality management systems in place. Some of the training was done online and the others in person. Training conducted during the period under review included the following:

- Document Control
- Risk management
- · Identification of nonconformities
- Root cause analysis
- ISO TC Meetings
- TR28
- Monitoring quality indicators
- Validations

### **PROFESSIONAL DEVELOPMENT**

Courses that staff of the Quality Assurance Department attended as part of their development included the following:

- Project Management
- ISO9001 QMS auditing
- Advanced Excel training
- Q-Pulse orientation
- Data analysis course using Stata
- Scientific writing course
- Office administration
- Procurement and finance

One postgraduate was enrolled: Post Graduate Diploma in Business Management at Wits University.

Ms M Mokolokolo completed her Certificate in Operations Management from Wits University in December 2021.

4

# HIV AND TB IN THE WORKPLACE UNIT



## HIV AND TB IN THE WORKPLACE UNIT

HEAD: PROF MUZIMKHULU ZUNGU

he HIV TB in the workplace unit (hereafter referred to as 'the unit') of the NIOH, a division of the National Health Laboratory Service (NHLS), uses HIV and TB as an entry point into occupational health policy, systems and programme development and implementation. The unit applies the basic principles of public health to promote, maintain and improve occupational health policy systems and programmes for the benefit of workers in formal and informal economies.

All industries are targets of the unit in the past year as a result of the COVID-19 pandemic, the construction, health, mining and municipal services industries, and the informal economy.

### **SERVICE DELIVERY**

### **COVID-19 IN THE WORKPLACE**

The past year was, to a great extent, a continuation of the 2020/2021 financial year, as an unprecedented year for the world due to the COVID-19 pandemic. The unit had to start balancing its resources between the fight against the COVID-19 pandemic and all its other programmes in workplaces. However, we still had most of our projects skewed towards COVID-19, particularly supporting workplace assessments, policy/guidance reviews, teaching and training, and provision of technical advisory expertise, among others:

- National Department of Health's Occupational Health
   Workstream on COVID-19
- The NEDLAC
- The NIOH Occupational Health Outbreak Response Team
- Gauteng Premier's Advisory Committee on COVID-19
   (PACC)
- Gauteng, Limpopo, Mpumalanga and North West Provincial
   Departments of Health

Occupational health policy, systems and programmes, including HIV and TB in the workplace

- Health industry: The unit provided advisory occupational policy, systems and programmes expertise to the Gauteng Provincial Department of Health (GPDoH), Mpumalanga Provincial Department of Health (MPDoH) and the North West Provincial Department of Health (NWDoH). In both GPDoH and MPDoH, the unit supported the implementation of the WHO and the International Labour Organization (ILO)'s HealthWISE Tool, as well as the introduction, implementation and utilisation of the OHASIS. In GPDoH, we provided supervisory and ad hoc Occupational Medicine Practitioner support at Dr George Mukhari Academic Hospital and Chris Hani Baragwanath Academic Hospital.
- Mining industry: The unit acts as one of several technical advisers to the Masoyise Health Programme, whose goal is to reduce the impact of TB, HIV, occupational lung diseases and noncommunicable diseases as occupational health threats in the mining sector.
- **Construction industry:** The unit continues to serve on an advisory basis in the occupational health and safety meetings of the construction industry with Master Builders Association North. Our role in these quarterly meetings to provide support on occupational health issues pertinent to the industry and, where appropriate, advice on new developments related to occupational health for the sector.
- **Transport industry:** The unit, together with the South African Transport and Allied Workers Union (SATAWU) and in collaboration with the ILO, commemorated the 2021 World AIDS Day. The unit working together with SATAWU and the ILO through a partnership with nonprofit organisations provided free HIV counselling and testing services, screening for TB and other diseases and provided HIV and AIDS Information, Education and Communication materials. In addition, COVID-19 coronavirus vaccines were offered on the day by health officials from the National Department of Health.
- **Organisational management:** The unit provided management and strategic support to the NIOH/NHLS and occasionally worked as an Acting Executive Director and participated in the NHLS Executive Meetings.

Annual Review 2021/22 | National Institute for Occupational Health

### **RESEARCH AND/OR SPECIAL PROJECTS**

The Unit has several completed and ongoing research projects, including the following:

#### STRENGTHENING OCCUPATIONAL HEALTH SYSTEMS AND SERVICES FOR HEALTH WORKERS DURING THE COVID-19 PANDEMIC AND BEYOND: THE ROLE OF OCCUPATIONAL HEALTH AND SAFETY INFORMATION SYSTEMS

### Research team: M Zungu<sup>1, 2</sup>, A Yassi<sup>3</sup>, J Spiegel<sup>3</sup>, K Voyi<sup>2</sup>.

NIOH, a division of the National Health Laboratory Service<sup>1</sup>, School of Health Systems and Public Health, University of Pretoria, Pretoria, South Africa<sup>2</sup>, University of British Columbia, Vancouver, Canada<sup>3</sup>.

This study aims to assess the conditions and extent to which the introduction and implementation of OHASIS and the joint ILO WHO-developed HealthWISE interventions will strengthen the occupational health system and/or services in South African health settings. Funded by Canadian Institutes of Health Research/University of British Columbia.

#### INVESTIGATING SOCIAL AND STRUCTURAL DETERMINANTS OF HEALTH INEQUITIES IN HIV PREVENTION AND CARE AMONG FARMWORKERS IN SOUTH AFRICA

#### Study team: N Mlangeni<sup>1</sup>, O Adetokunboh<sup>2</sup>, M Lembani<sup>3</sup>, P Nyasulu<sup>2</sup>.

NIOH, Division of National Health Laboratory Services, Johannesburg<sup>1</sup>, Stellenbosch University, Department of Global Health, Cape Town<sup>2</sup>, University of Western Cape, School of Public Health, Cape Town<sup>3</sup>.

The aim of the study is to investigate social and structural determinants of health impacting equity in HIV prevention, control and care for farm workers. The specific objectives of this study are to conduct a systematic review of HIV prevention and treatment services for farm workers in low- and middle-income countries (LMICs), to determine the spatial distribution of risk factors for HIV infection among farm workers, to explore farm workers' experiences in accessing HIV services and the continuum of care and to assess health workers' perspectives on HIV policies and programmes in the provision of HIV services and treatment to farm workers.

### COVID-19 INFECTION AMONG HEALTH WORKERS IN A TERTIARY HOSPITAL IN TSHWANE: A CASE-CONTROL STUDY

### Study team: N Thunzi<sup>1,2</sup>, T Ledibane<sup>1</sup>, M Zungu<sup>2,3</sup>.

Department of Community Medicine, Sefako Makgatho Health Science University<sup>1</sup>, HIV and TB in the work place unit, NIOH, a division of the NHLS<sup>2</sup>, School of Health Systems and Public Health, University of Pretoria, Pretoria, South Africa<sup>3</sup>.

The study aims to describe the profile of health workers (HWs) infected with the SARS-CoV-2 virus in a tertiary hospital in the Tshwane Health District and to identify the associated risk factors. This is a retrospective case-control study of HWs working in a tertiary hospital. The study will involve reviewing the clinical records of HWs who tested positive for SARS-CoV-2 (cases) and those who did not test positive (controls). The information from this study may be used to influence occupational health guidelines and policies.

### AWARENESS AND ASSESSMENT OF THE HIV AND TB WORKPLACE HEALTH PROGRAMME IN THE CITY OF TSHWANE METROPOLITAN MUNICIPALITY, GAUTENG PROVINCE, SOUTH AFRICA

### Study team: M Malotle<sup>1</sup>, M Zungu<sup>1,2</sup>, M Rammopo<sup>3</sup>, P Chelule<sup>3</sup>, M Huma<sup>3</sup>.

HIV and TB in the workplace unit, NIOH, a division of the NHLS<sup>1</sup>, School of Health Systems and Public Health, University of Pretoria, Pretoria, South Africa<sup>2</sup>, Department of Sefako Makgatho Health Science University<sup>3</sup>.

The aim of this study is to assess the workplace HIV and TB health programmes and to describe the utilisation of the services by employees in the City of Tshwane Metropolitan Municipality (CoTMM). The objectives of the study are to describe the workplace HIV and TB services available to CoTMM employees, determine the level of utilisation of HIV and TB services by employees in CoTMM and determine factors associated with the utilisation of HIV and TB workplace health services in CoTMM. This is a quantitative cross-sectional study. The results will assist the municipality in promoting and strengthening workplace HIV and TB health services for municipality workers.

### MONITORING AND EVALUATION OF OCCUPATIONAL HEALTH SERVICES FOR HIV, TB, SILICOSIS AND SARS-COV-2 IN A MINING HOUSE IN SOUTH AFRICA

### Study team: J Ramodike<sup>1,2</sup>, N Mlangeni<sup>1</sup>, M Zungu<sup>1,2</sup>.

NIOH, a division of the National Health Laboratory Service<sup>1</sup> School of Health Systems and Public Health, University of Pretoria, Pretoria, South Africa<sup>2</sup>.

The study aims to develop a monitoring and evaluation tool for HIV, TB, silicosis and SARS-CoV-2 health services in a South African mine house. This will be a cross-sectional study with the objective of monitoring and evaluating occupational health programmes for mitigating the mentioned diseases and their outcomes. The results will add to the body of knowledge regarding the impact of HIV, TB, silicosis and SARS-CoV-2 diseases on mine workers and will assist in strengthening the provision of workplace HIV, TB, silicosis and SARS-CoV-2 health services.

#### OCCUPATIONAL HEALTH INTERVENTIONS AND EMPLOYEES' ABSENTEEISM IN SOUTH AFRICAN HOSPITALS

#### Study team: M Zungu <sup>1, 2</sup>, J Ramodike<sup>1, 2</sup>.

NIOH, a division of the National Health Laboratory Service<sup>1</sup>, School of Health Systems and Public Health, University of Pretoria, Pretoria, South Africa<sup>2</sup>.

This cross-sectional study aims to determine the OHS interventions implemented in two academic hospitals in Gauteng Province from 2014 to 2018 and to review the absenteeism trends over the same period. The study findings will be useful for planning to ratify OHS interventions that may reduce workplace absenteeism.

### **TEACHING AND TRAINING**

### ACADEMIC QUALIFICATIONS IN PUBLIC AND/OR OCCUPATIONAL HEALTH

The Unit coordinates the DOMH and teaches Occupational Health to undergraduate and postgraduate students on behalf of the School of Health Systems and Public Health (SHSPH), University of Pretoria. The unit was a rotation site for practical training for Public Health Medicine Registrars from the University of Pretoria. The unit contributes to the ongoing training of public health medicine registrars from Sefako Makgatho Health Sciences University.

### PUBLIC HEALTH POSTGRADUATE RESEARCH SUPERVISION

The Unit graduated two Master of Public Health students and 16 DOMH students from the SHSPH University of Pretoria and is currently supervising two Master of Public Health students and one Master of Medicine in Public Health student on their postgraduate research projects and three DOMH research projects.

### **UNDERGRADUATE TRAINING**

The Unit provided undergraduate training to:

- The unit is giving public health lectures to second-(MBCHBII) and fourth-year (MBCHBIV) medical students at Sefako Makgatho Health Sciences University.
- Teaching Occupational Health to University of Pretoria second-year medical students.

### TRAINING OF WORKERS AND MANAGEMENT IN OCCUPATIONAL HEALTH AND SAFETY SHORT COURSES

- The unit provided four training workshops on COVID-19 for the workplace for Gauteng DoH and Mpumalanga DoH.
- The unit conducted two training workshops on the Workplace COVID-19, HIV and TB health programme for employees of the SATAWU. The aim of the training was to empower and guide SATAWU employees on how to design and implement a workplace COVID-19, HIV and TB health programme.

### **PROFESSIONAL DEVELOPMENT**

Four postgraduates were enrolled: one MPH student from the University of Pretoria, one MMed in Public Health Medicine student from the Sefako Makgatho Health Science University and two PhD candidates in Public Health from Stellenbosch University and the University of Pretoria.

### HONOURS

Ms Nosimilo Mlangeni, a PhD candidate, received the NRF Thuthuka grant award for 2022-2024 and the Harry Crossley Foundation research funding award for 2022.

# SAFETY, HEALTH AND ENVIRONMENT DEPARTMENT

National Institute for Occupational Health | Annual Review 2021/22

として



**HEAD: MR DAVID JONES** 

 OVID-19 has continued to be the primary focus of the SHE Department throughout the year under review. No members of the SHE Department worked from home, and they continued to work, providing
 essential service to the NHLS workers.

### **STAFFING**

The past financial year saw the filling of the Safety, Health and Environment Officer based in the Eastern Cape Region that was vacated after the resignation of the previous incumbent. Contracts for the two sessional occupational medicine practitioners and the four occupational health nurse practitioners (OHNPs) also continued throughout the year under review. The contracted OHNPs were primarily involved in responding to COVID-19 screening, assessing the symptoms, referring workers for COVID-19 testing where necessary and assisting the HR Department with Department of Employment and Labour Workers Compensation documents for NHLS workers who contracted COVID-19 in the workplace. In addition, they also attended any other COVID-19-related queries when necessary. The contracts of all workers expired on 31 March 2022, and their assistance will be sorely missed.

### **CLINICAL**

### **OCCUPATIONAL HEALTH**

The year under review continued to bring high levels of COVID-19, with the numbers shadowing that of the caseload trends nationally but with our highest numbers being in the fourth wave at the end of 2021 and beginning 2022. As the Department of Employment and Labour updated legislation and the Department of Health issued new guidelines, the NHLS policies needed to be continuously updated. Staff screening programmes continued, and COVID-19 case management protocols were designed to address transmission risks in the workplace. The SHE Department

occupational health staff continued to provide the necessary support in managing infected and affected staff, working many hours on weekends and public holidays to ensure laboratory operational continuity, which was desperately needed to support the national health response to COVID-19 in South Africa.

Occupational health staff continued to support the NHLS Human Resources (HR) Department to facilitate the reporting of workrelated COVID-19 cases to the Compensation Commissioner, and this remains an ongoing process.

Although much of the focus of the department has been on COVID-19, other occupational health services, including management of TB, hepatitis B virus, Brucella, and ergonomicrelated cases, have continued.

### SPECIAL INVESTIGATIONS AND NIOH SUPPORT

The project with the NIOH Occupational Hygiene Department to measure exposure levels of NHLS employees to formaldehyde and xylene, which was put on hold due to national travel restrictions, commenced again in the latter part of the year under review. It is noted that as of September 2022, the occupational exposure level (OEL) for formaldehyde has been reduced by tenfold, and although it is not currently in force, this new limit will be used as a benchmark for the project.

There was continued expert support from the various departments in the NIOH, including Occupational Hygiene, Occupational Medicine, Immunology, IT, HR and Finance. Examples of expert opinion and guidance related to:

- Case management for occupational incidents and disease investigations
- Compliance with legal requirements regarding medical surveillance
- Consulting with employees and their treating health care professionals who have specific occupational medical concerns has ben proven

- Ergonomic assessments
- Immunology advice
- Ongoing development of OHASIS
- Recruiting to fill vacant posts

### OCCUPATIONAL HEALTH AND SAFETY INFORMATION SYSTEM

### **OHASIS IN THE NHLS**

OHASIS has proven to be an invaluable tool during the year under review. OHASIS has been a source of information for the NHLS EXCO and COVID-19 Compliance Officers, who have used it to provide weekly statistics for continuous monitoring and management decisions.

From a COVID-19 perspective, OHASIS has been used to:

- Record COVID-19 disease and possible exposure
- Provide a platform for employees to screen for COVID-19 symptoms online
- Provide for the notification to an occupational health practitioner of any person who screens positive for a COVID-19 symptom by email

- The OCP in turn consults staff and provides advice and assistance regarding the level of exposure, COVID-19 testing information, special leave, etc.
- Present a summary of COVID-19-related information in dashboards
- Provide for the recording of COVID-19 vaccinations, either as a self-report or a report captured by an occupational health practitioner
- COVID-19 vaccination reports should be provided to EXCO and NHLS management.
- Provide for the recording of COVID-19 tests and results
- Provide for the capturing of COVID-19 health care risk waste (as required by legislation)
- Monitor compliance to COVID-19 regulations in NHLS laboratories using the Audit Checklist module.
- Provide Audit findings to EXCO and management.
- Record COVID-19 and related training in the Workforce Health module.
- Report on training to EXCO and management.

The year under review saw a massive increase in the number of incidents reported into OHASIS because of the COVID-19 pandemic, with the fourth wave affecting more NHLS workers than any of the previous waves.

### YEAR-ON-YEAR REPORTING OF ALL INCIDENTS IN OHASIS



Figure 8: Year-on-year reporting of all incidents in OHASIS for the 2011/12 to 2021/22 financial years.

8

Employees are encouraged to report every incident, no matter how small or insignificant they may think it is. The rationale for this approach is to encourage a culture of reporting and correction rather than the coverup and punishment.

Of the 3193 incidents reported to OHASIS during the year under review, 2856 were COVID-19 related (cases and potential exposures) and only 337 were non-COVID-19 related (Figure 9 on the right). This equates to just over 89% of incidents reported being COVID-19 related.

Of the 3193 incidents reported in OHASIS, 2474 were positive cases of COVID-19, and 382 were incidents reporting potential exposure to the disease.

The 2474 cases of COVID-19-related incidents were spread throughout all regions of the NHLS, as seen from figure 10 below.

**BREAKDOWN OF INCIDENTS REPORTED INTO OHASIS** 



Figure 9: Breakdown of incidents captured into OHASIS for the 2021/22 financial year indicating COVID-19 related as opposed to not COVID-19 related incidents.



**COVID-19 CASES BY REGION** 

Figure 10: Count of COVID-19-positive cases by region from 1 April 2021 to 31 March 2022.

The percentage of reported COVID-19-positive cases that were male was 27%, which is similar to the 31.7% of NHLS employees who were male. OHASIS has proven to be an agile and adaptable health information system. The changes and updates developed at the beginning of the COVID-19 pandemic have been an invaluable source of management information.

### **OHASIS BEYOND THE NHLS**

The rollout of OHASIS to other entities continues. The development of a five-level OHASIS for rollout in the Western Cape Department of Health as well as the Office of the Gauteng Premier is at an advanced stage, and it is intended to commence with the rollout of the software in the organisation in the financial year to come. An instance of the OHASIS software was installed and is operational in one Mpumalanga hospital as a pilot project.



**COVID-19 POSITIVE EMPLOYEES BY GENDER** 

*Figure 11: Count of positive COVID-19 cases in the NHLS by gender from 1 April 2021 to 31 March 2022.* 

### SAFETY, HEALTH AND ENVIRONMENT AUDITS

With the lifting of the heavy lockdown, the SHE Department, through the SHE Officers, was able to commence onsite safety, health and environmental audits again. The full checklist of 283 questions using the audit checklist module in OHASIS was once again used.

NHLS REGIONS	NUMBER OF AUDITS COMPLETED	NUMBER OF NCS RAISED	NUMBER OF NCS CLOSED	PERCENTAGE NCS STILL OPEN
Eastern Cape	1	19	0	0%
Free State and North West	30	575	235	41%
Gauteng	61	142	29	20%
Corporate	13	363	57	20%
NICD	23	186	118	63%
NIOH	14	187	77	41%
SAVP	5	136	7	5%
KwaZulu-Natal	63	725	344	47%
Limpopo and Mpumalanga	60	553	400	72%
Western Cape and Northern Cape	55	453	404	89%
TOTAL	325	3339	1671	50%

Table 6: Summary of SHE audits conducted and NC's raised.

Table 7: Summary of the type of noncompliances raised.

REGIONS	HIGHEST NUMBER OF NC'S	DESCRIPTION	CATEGORY IN THE AUDIT CHECKLIST	NUMBER OF FACILITIES WITH THIS NC	SECOND HIGHEST NUMBER OF NC'S	DESCRIPTION	CATEGORY IN THE AUDIT CHECKLIST	NUMBER OF FACILITIES WITH THIS NC
Free State and North West	F7	Appointed fire wardens have been trained	Training	17	A28	Baseline chest X-rays done	Administrative	11
Gauteng	C1	No Electrical compliance certificate (ECC)	Equipment safety	20	F7	Appointed fire wardens have been trained	Training	12
I&C	F17	Stress Management training	Training	22	F20	COVID-19 training	Training	22
KwaZulu-Natal	C1	No Electrical compliance certificate (ECC)	Equipment safety	29	B8	Lights in good working order and intact	Housekeeping	26
Limpopo and Mpumalanga	С1	No Electrical compliance certificate (ECC)	Equipment safety	42	F22	Standard precautions in the Lab training	Training	30
Western Cape and Northern Cape	F7	Appointed fire wardens have been trained	Training	15	A2	No proof that staff have read SHE policies and procedures	Administrative	12
NHLS	C1	No Electrical compliance certificate (ECC)	Equipment safety	101	F7	Appointed fire wardens have been trained	Training	69

It must be noted that there was only 1 audit done in the Eastern Cape, and the reason for this is that the region did not have an SHE officer from June 2021 to March 2022. The absence of electrical compliance certificates (ECC) is also a matter of huge concern at NHLS facilities, with a total of 101 out of 325 facilities (31%) that are not in possession of an ECC. This is being looked at on a corporate level.

Of the 1668 noncompliances (NCs) still open, it is noted that many are due to structural issues that require construction/ renovation/CAPEX to be closed.

### **RISK ASSESSMENTS**

The onset of COVID-19 brought the need to have all workplaces update their health and safety risk assessments (RA). The SHE Department produced a guidance document to this end and, through the regional SHE teams, monitored and facilitated the process. As of the end of the financial year, 338 out of the 343 facilities have approved health and safety risk assessments that include COVID-19.

#### Table 8: Risk Assessments per region.

REGIONS	NO OF FACILITIES WITH RA	RA APPROVED
Gauteng	61	60
Free State and North West	30	30
Institutes and Corporate	69	68
Limpopo and Mpumalanga	62	61
Western Cape and Northern Cape	58	58
KwaZulu-Natal	63	61
TOTAL	343	338

### HEALTH AND SAFETY REPRESENTATIVE COMMITTEE MEETINGS

To ensure compliance with the relevant legislation, the regional SHE officers of the SHE Department coordinate and monitor the appointment and training of health and safety representatives. Regional SHE teams comprising SHE officers and occupational health nurse managers attend HSC meetings in an advisory capacity. Where they cannot attend, they send input in writing to the committee. The NHLS has 455 active health and safety representatives, of which 449 are trained and serve in the 35 health and safety committees, all of which are active. As per the legal requirement, all health and safety committees are required to meet at least once every three months (four times per year).

REGIONS	WESTERN CAPE AND NORTHERN CAPE	NORTH WEST AND FREE STATE	GAUTENG	LIMPOPO AND Mpumalanga	EASTERN CAPE	NICD	NIOH	CORPORATE	KWAZULU- NATAL	TOTAL
HSR Appointed	65	36	110	61	61	32	15	12	63	455
HSR Trained	65	33	110	60	61	32	15	11	62	449
Percentage Trained	100%	92%	100%	98%	100%	100%	100%	92%	98%	<b>99</b> %
HSC in place	5	3	6	7	5	1	1	1	6	35
HSC Chairpersons appointed	5	3	6	7	5	1	1	1	6	35

Table 9: Health and Safety Representative appointment and training by region.

#### Table 10: Health and Safety Committee activity by region.

REGIONS	WESTERN CAPE AND NORTHERN CAPE	NORTH WEST AND FREE STATE	GAUTENG	LIMPOPO AND Mpumalanga	EASTERN CAPE	NICD	NIOH	CORPORATE	KWAZULU- Natal	TOTAL
FY 2021_22 HSC meetings held	20	26	23	27	19	5	6	7	27	160
FY 2021_22 HSC inactive	0	0	0	0	0	0	0	0	0	0
FY 2021_22 Quarterly meetings missed	0	0	0	1	1	0	0	0	0	2
FY 2021_22 Labour invited	20	25	18	27	17	5	6	6	22	146
FY 2021_22 Labour attended	15	3	7	6	10	4	1	3	18	67

### **HAZARDOUS WASTE**

The Waste Assurance Manager is continuously reviewing the NHLS waste policy, audit checklist and online training course on waste management. This is to ensure that practices are in line with the provisions of the legislation and policy framework on the management of waste and to improve the waste management standards in the NHLS.

Details of generated hazardous waste are continuing to be captured into OHASIS by each of the facilities. The following table provides information on the quantities of health care risk waste generated by the NHLS by waste category over the previous three years.

CATEGORY OF HEALTH CARE RISK WASTE	QUANTITIES OF HEALTH CARE RISK WASTE REPORTED ON OHASIS FROM 01 APRIL 2019 TO 31 MARCH 2020	QUANTITIES OF HEALTH CARE RISK WASTE REPORTED ON OHASIS FROM 01 APRIL 2020 TO 31 MARCH 2021	QUANTITIES OF HEALTH CARE RISK WASTE REPORTED ON OHASIS FROM 01 APRIL 2021 TO 31 MARCH 2022
Anatomical waste	241 339,96 kg	223 935,00 kg	223 456,15 kg
COVID-19 waste	2 612,51 kg	128 285,54 kg	140 053,27 kg
Chemical waste	106 868,95 kg	100 976,81 kg	408 093,81 kg
Infectious waste	1 170 613,84 kg	1 132 599,50 kg	1 313 880,18 kg
Pharmaceutical waste	12 409,15 kg	10 311,85 kg	9 318,20 kg
Sharps waste	388 951,75 kg	343 191,00 kg	401 217,50 kg
Total	1 939 192,45 kg	2 282 723,49 kg	2 501 886,91 kg

Table 11: Comparative quantities of health care risk waste captured into OHASIS over the past three financial years.

Table 12: Quantities of hazardous waste generated in the NHLS by region over the past three financial years.

AREA	QUANTITIES OF HEALTH CARE RISK WASTE REPORTED ON OHASIS FROM 1 APRIL 2019 TO 31 MARCH 2020 PER AREA	QUANTITIES OF HEALTH CARE RISK WASTE REPORTED ON OHASIS FROM 01 APRIL 2020 TO 31 MARCH 2021 PER AREA	QUANTITIES OF HEALTH CARE RISK WASTE REPORTED ON OHASIS FROM 01 APRIL 2021 TO 31 MARCH 2022 PER AREA
Eastern Cape	260 128,15 kg	246 336,83 kg	244 790,09 kg
Free State and North West	179 257,55 kg	182 828,31 kg	181 340.09 kg
Gauteng	532 336,02 kg	516 184,54 kg	468 742,22 kg
Institutes and Corporate	64 117,97 kg	59 060,13 kg	63 010,44 kg
KwaZulu- Natal	499 522,47 kg	497 144,16 kg	561 930,81 kg
Limpopo and Mpumalanga	117 976,41 kg	144 646,15 kg	264 378,13 kg
Western and Northern Cape	279 766,53 kg	293 581,19 kg	303 832,87 kg
TOTAL	1 933 105,10 kg	1 939 781,31 kg	1 906 684,56 kg

The Waste Assurance section continues to engage with the relevant authorities and service providers to ensure that the facilities comply with the provisions of legislation and to keep up to date with the developments in the waste management sector.

### **CONFERENCES AND TRAINING**

### **TRAINING WITHIN THE NHLS**

The SHE Department has continued to coordinate online training of health and safety representatives and managers during the year under review. Two hundred and eight (208) employees took the online training course that was developed. This is being assessed by the SHE Officers and is available on the NHLS intranet. An additional 81 employees completed the online health care risk waste training that was also coordinated by the SHE Department.

The SHE Department also developed two training events. The first addressed COVID-19 vaccinations, and the second celebrated World AIDS Day. Each event consisted of four online training voices over PowerPoint presentations developed and presented by our Occupational Health Nurse Managers and then loaded onto the NHLS intranet for viewing at the convenience of NHLS employees.

The SHE Department was invited by the World Health Organisation to serve on a committee and contribute to the compiling of a new document entitled "Caring for those who care: A guide for the development and implementation of occupational health and safety programmes for health workers".

The SHE Department also continued to contribute to the SABS Technical Committee TC48.

The SHE Department was invited to participate in the NICD project with ASLM – Africa CDC to develop a Regional Training and Certification Programme for biosafety and biosecurity experts, including Biological Waste Management.



# **ANALYTICAL SERVICES**





### ANALYTICAL SERVICES HEAD: DR BOITUMELO KGAREBE

he Analytical Services Section comprises two units, organics and metals, which, together, drive its mandate on the analysis of hazardous substances in biological and environmental media as a means of strengthening the assessment of workplace exposures to comply with the Regulations of Hazardous Chemical Substances. SARS 2 COVID-19 continued to impact several areas in the functions and outputs of the two units. That notwithstanding, the Section has continued to respond to requests for the provision of specialised laboratory tests, advisory services, and the support of private industries, government departments, and academic institutions in occupational and environmental health. Key in monitoring analytical performance and competence in analysing and quantifying biomarkers in specimens, the laboratories continued to participate in PTS/external quality assurance (EQA).

### **SERVICES**

### SPECIALISED LABORATORY TESTING

In the provision of laboratory testing services, the Analytical Services Section achieved an overall average TAT of 82% for the 1649 routine special tests conducted in specified turn-around times in the year under review.

### **ADVISORY SERVICES**

In addition to the routine specialised tests conducted, the Section received numerous requests to render advice and testing services to the private and public sectors. These included the analysis of arsenic and manganese in hair and nails, blood-lead (BI-Pb) and blood-uranium (BI-Ur) analysis in water-polluted mining areas and the analysis of mercury in skin-lightening creams.

The NDoH has continued to engage the Section on "National Regulations Relating to Lead in Paint" as well as on the provision of testing services for Lead in Paint. The Section has continued to provide updates on the progress of planned activities towards the implementation of the paint analysis service plan.

### **TEACHING AND TRAINING**

The Section met its usual teaching and training obligations in the year under review. The annual training of postgraduate students on GLP, analytical techniques, and research methodology, as applied in chemical contaminant detection in the workplace and for biological monitoring, was provided. The Section has continued to host Wits students to familiarise them with various practical aspects of an accredited laboratory. Ms Madiphaphang Lesemela from NHLS Sebokeng completed her year-long Work Integrated Learning with the Section. In the year under review, the training of intern medical scientists for HPCSA registration in the category of clinical biochemistry continued. For the May 2021 assessment cycle, Mr Talulani Marageni successfully obtained approval for registration as a Medical Biological Scientist in Clinical Biochemistry – Independent Practice. This makes 6 successful completions of trainees over the last 9 years.



Mr T Marageni preparing samples in the Organic Chemistry Laboratory.

The delivery of the fifth edition of the course "Introduction to Applied Chemistry in Occupational & Environmental Health" for second-year undergraduate students (the University of the Witwatersrand) in Applied Chemistry was again updated and adapted for virtual delivery in line with COVID-19 protocols; the practical aspect of the course returned to full interactive mode.

### ACCREDITATION AND QUALITY ASSURANCE

The Metals and Organic Units maintained the annual ISO Code 15189 accreditation status. The Section was also audited by SANAS and maintained its second standard ISO/IEC 17025:2005 accreditation status for testing Aluminium and Mercury in water.

Regular internal audits were conducted throughout the year to maintain safety, quality and competence in the laboratory. In line with COVID-19 protocols, SANAS undertook a virtual vertical assessment of activities in our laboratories in year under review.

In terms of Proficiency Testing Schemes for monitoring laboratory analytical performance and competence in analysing and quantifying biomarkers in specimens, the Section continued with its participation in the following External Quality Assurance (EQA) programmes:

- i. NY State Department of Health for arsenic, cadmium, chromium, lead, manganese and mercury in blood and urine and aluminium in serum and water;
- ii. the German EQA programme for mandelic acid, phenol, ocresol, hexanedione, 1-hydroxypyrene and methyl hippuric acid in urine;
- iii. the South African Bureau of Standards, SABS-Water Check Scheme. and
- iv. NMISA Proficiency Testing Scheme for the analysis of ethanol (alcohol).

### HONOURS/RECOGNITION

In January 2022, the Organics Unit of the Analytical Services Section successfully passed the 64<sup>th</sup> intercomparison programme 2020 as a reference laboratory for toxicological analyses in biological materials. The programme is conducted by the German Institute and Outpatient Clinic for Occupational, Social and Environmental Medicine (GEQUAS). This marks the 10<sup>th</sup> consecutive year that Analytical Services has maintained its status as a reference laboratory for the analysis of urine for exposure to hexane.

### **PROFESSIONAL DEVELOPMENT**

Ms Sesitjie Moremi received her accreditation as an ISO/IEC 17025 technical signatory from SANAS for the determination of mercury in drinking water and industrial effluents, making her the fourth technical signatory in the section.



*Ms S Moremi is now a technical signatory in the Section.* 

# TOXICOLOGY AND BIOCHEMISTRY



## TOXICOLOGY AND BIOCHEMISTRY

**HEAD: DR NATASHA SANABRIA** 

uring the second year of the global COVID-19 pandemic, the Section continued to meet targets and emphasise the role of biochemistry-related applications and toxicology in public health via support of the NIOH's public engagement and training outreach programmes. Activities related to COVID-19 focused on guidance related to toxic exposures and associated risks, such as working with the National Department of Health, Department of Employment and Labour, Department of Basic Education, Department of Public Service and Administration (DPSA), and NICD, as well as the NHLS SHE and Labour departments, regarding cleaning and disinfection guidance documents and fact sheets. These were posted on the NIOH website and routinely updated as new information became available. Specific presentations covering various aspects of cleaning workplaces, especially when COVID-19-positive cases have been identified, the responsibilities of employers, and ethical considerations of health and safety personnel in the workplace, were regularly provided throughout the year to various national stakeholders.

The section was also actively engaged in healthcare surveillance and the translation of OHASIS data into usable formats for OHS support and services via regular meetings with the SHE and NIOH Epidemiology Sections. However, the previously established work was also maintained through the following specialised units: namely, the Genotoxicity unit, HRA unit, Nano- and Microparticle Toxicity Unit and Toxicogenomics unit. Similarly, established collaborations with local and international institutions were maintained, which allowed for remote, off-site training and blended learning activities for staff and postgraduate students in the fields of general occupational toxicology and nanotoxicology. The shift to more digital platforms was implemented not only for continued business practices or academic training but also to develop the implementation of computational toxicology studies, i.e., where predictive tools are used to prevent disease. This was supported by the International NanoSolveIT consortium's H2020 EU project, i.e., for the implementation of computational models based on measurements from various research projects. Last, the Section focused on accreditation activities and completed the external preinspection by SANAS for GLP based on OECD principles. Unfortunately, senior toxicologists Prof Gulumian and Dr Vetten parted ways with the NIOH during the year, which had a significant impact at various operational levels.

### **SERVICE DELIVERY**

### **MINE HEALTH AND SAFETY COUNCIL**

Dr Vetten and Dr Sanabria liaised with the Mine Health and Safety Council (MHSC) regarding quarterly reporting for the CytoViva 3-D upgrade throughout the year. The services that the NIOH will offer to the industry are aimed at occupational medical practitioners and occupational hygienists. However, additional services for UNISA have been completed. In addition, validation of the use of specialised dyes for intracellular localisation analyses was initiated by Dr Vetten. Dr Vetten also completed training and competency assessments of staff and students related to the use of the 3-D upgrade software.

### THE NATIONAL RESEARCH FOUNDATION

Dr Sanabria and Dr J Joseph served as reviewers for the South African National Research Foundation (NRF) regarding the competitive support for unrated researchers (CSUR) and Thuthuka grant applications for 2021.

### SOUTH AFRICAN WATER RESEARCH COMMISSION

Dr Sanabria served as a Reference Group Member for one of the research projects funded by the South African Water Research Commission (WRC). Dr Sanabria and Dr Vetten served as reviewers for the WRC regarding numerous proposals submitted during this current funding period.

"SINCE THE OCCUPATIONAL MEDICINE SPECIALIST CLINIC PROVIDES SPECIALISED SERVICES IN ASSESSING PATIENTS FOR SECOND OPINION, OR FURTHER ASSESSMENTS TO ESTABLISH THE WORK-RELATEDNESS OF THEIR CONDITIONS, THE CLINIC HAD TO REOPEN AND ALLEVIATE THE BACKLOG THAT WAS FELT BY WORKPLACES."

The Institute for Nanotechnology and Water Sustainability (iNanoWS).

Dr Sanabria served as an Advisory Board member for the UNISA Institute for Nanotechnology and Water Sustainability (iNanoWS).

### RESEARCH

Dr Sanabria was appointed as the Research Committee Chairperson for the NIOH. This role expands to include service on the NIOH OHORT committee, the NIOH OccuZone newsletter, in addition to the NHLS Research and Development committee and Research and Innovation committees. The Toxicology and Biochemistry section produced eleven publications in scientific journals and one peer-reviewed book chapter, which constitutes approximately 45% of the institute's output during the period under review. The staff also supported public engagement, served as reviewers for international journals and presented their research findings at both international and national conferences, as well as local research days and workshops. Staff members were also recognised for their past research outputs and achievements by being awarded funding grants, where Dr N Sanabria was successful in the NRF CSUR grant award, and Dr J Joseph was successful in the NRF Thuthuka grant award.

### **INTERNATIONAL COLLABORATION**

### BRAZIL, RUSSIA, INDIA, CHINA AND SOUTH AFRICA MULTILATERAL PROJECT

Dr Andraos and Prof Gulumian submitted the final report for the Brazil, Russia, India, China and South Africa (BRICS) project, i.e., "New core-shell hybrid nanostructures: Evaluation of surface coating impact to biosafety and potential therapeutic applications". which is funded by the NRF. The research outputs are being developed for implementation in the departments' service delivery quotas.

### **ENCYCLOPAEDIA OF TOXICOLOGY**

Prof Gulumian is the section editor of the 4<sup>th</sup> edition and has attended numerous meetings to report on progress on the invitation of authors for contributions.

### **EUROPEAN UNION PROJECTS**

EUH2020 research grants were awarded for two projects related to the study of the toxicity and risk assessment of engineered nanoparticles and nanotechnologies. Consequently, Prof Gulumian participated in many meetings with EU partners to discuss current projects, i.e., Gov4Nano and NanoSolveIT. These two projects leverage data sharing within the NanoSafety Cluster from other projects, e.g., NanoSolutions, NanoRigo, RiskGone and NanoCommons.

### **GOV4NANO**

The Gov4Nano EUH2020 project established a Nano Risk Governance Council (NRGC). Prof Gulumian is a PI of the "Meeting the needs of nanotechnology" project and attended collaborator meetings and workshops to discuss the New Approach Methodologies (NAMs), the NRGC mission and goals, and the current and near-future state-of-the-art and further requirements for the establishment of the regulatory aspects of NRGC. Dr Andraos and Prof Gulumian submitted regular progress reports.

Innovative nanoinformatics models and tools: towards a solid, verified and integrated approach to predictive (eco) toxicology (NanoSolveIT)

Dr Sanabria and Prof Gulumian participated in the NanoSolveIT international consortium, i.e., an EU H2020 project. The general assembly (GA) and numerous specific work package meetings were conducted via virtual platforms regularly to account for COVID-19 travel restrictions. Prof Gulumian was given the task of

assessing the quality of data available to be utilised for predictive modelling of the toxicity of nanomaterials. All protocols and results were presented at the Work Package two workshop. Prof Gulumian, Dr Andraos and Dr Sanabria attended another workshop demonstration for small to medium enterprises, regulators and relevant stakeholders focused on the in silico Integrated Approach to Testing and Assessment (IATA). Dr Sanabria submitted the NanoSolveIT Period-2 Technical Report.

### INTERNATIONAL ORGANIZATION FOR STANDARDIZATION

As the head of the delegation of the International Organisation for Standardization (ISO)TC 229 Working Group (WG3), the "Health, Safety and Environmental Aspects of Nanotechnologies" Committee, Prof Gulumian, attended numerous WebEx and teleconference meetings throughout the year. She participated as an expert in these forums.

### INTERNATIONAL UNION OF TOXICOLOGY

The Section liaised with the International Union of Toxicology, which participated in the virtual workshop on Principles and Methods for the Risk Assessment of Chemicals in Food.

### ORGANIZATION FOR ECONOMIC COOPERATION AND DEVELOPMENT

The NIOH contributed to the activities of the OECD Working Party on Manufactured Nanomaterials (WPMN), as well as the OECD National Nanotechnology Initiative (NNI) on Human Exposure, as represented by Prof Gulumian. This work is important for the approval of nanomaterials that are intended for export to many OECD countries, including South Africa. Prof Gulumian was also a reviewer of the OECD AOP144 document entitled "NMinduced liver inflammation".

### WORLD HEALTH ORGANIZATION

Dr Sanabria reviewed documents, compiled progress reports, and attended webinars for the WHO CC regarding various occupational health-related projects. Prof Gulumian is a member of the WHO Chemical Risk Assessment Network.

### NATIONAL COLLABORATION

#### **DEPARTMENT OF SCIENCE AND INNOVATION**

Dr Andraos and Prof Gulumian prepared and submitted technical and progress reports to DSI, with the NIOH as the consortium coordinator. In collaboration with Mintek, North West University, the CSIR and the UP, the Section continued to execute work for two DSI-funded projects, namely:

- "Risk assessment of gold nanomaterials: An OECD sponsorship programme"; and
- "Nanotechnology health, safety, and environment (HSE) risk research platform."

### SOCIETY OF RISK ANALYSIS AFRICA

Prof Gulumian and Dr Andraos liaised continuously with the Society of Risk Analysis Africa (SRA).

### SOUTH AFRICAN COUNCIL FOR NATURAL SCIENTIFIC PROFESSIONS

Prof Gulumian served as a member of the South African Council for Natural Scientific Professions (SACNASP) and provided expert knowledge.

### **TOXICOLOGY SOCIETY OF SOUTH AFRICA**

Prof Gulumian and Dr Vetten continued to serve as Presisedent and Treasurer for the Toxicology Society of South Africa (TOXSA), respectively.

### PATHOLOGY RESEARCH AND DEVELOPMENT CONGRESS

Prof Gulumian served as a member of the Scientific Committee for the Pathology Research and Development Congress (PathReD). Dr Vetten served as a discipline-specific advisory committee member.

### **TEACHING AND TRAINING**

### TRAINING CONDUCTED FOR OCCUPATIONAL HEALTH STAKEHOLDERS

Dr C Andraos presented a training session entitled "Cleaning and disinfection in different workplace settings including handling, storage and transportation" under the NIOH CPD-accredited Zoom Training Course: COVID-19 Workplace Preparedness and Prevention. Dr Andraos presented at the COVID-19 Steering Committee Meeting of the Department of Mineral Resources and Energy (DMRE), i.e., "Guidance on routine and deep cleaning of workplaces when COVID-19 positive cases have been identified". Dr C Andraos updated the "Cleaning and Disinfection Guideline" document, with new guidelines published by the Department of Health. Dr Andraos was invited to serve on the panel during the session on "Health implications of environmental mine dust emissions" in the GCRF (Global Challenges Research Fund) Mine Dust & Health Network Stakeholder Workshop entitled "Mine Dust and Gold Tailings", hosted by the Mine Dust Network of the University of Cape Town. Dr Sanabria presented an "Introduction to Physiology and Toxicology" at the W501 training module for the Department of Employment and Labour inspectors. Dr Sanabria and Dr J Joseph presented the "Biochemical Principles of Bacterial Testing Workshop" to external clients.

### **POSTGRADUATE STUDENTS**

- Dr Andraos trained an MSc student from the UP on the CytoViva Hyperspectral Imaging (HSI) System.
- Dr N Sanabria assisted in training an Intern in the Immunology and Microbiology Section on nucleic acid isolation, quantification and amplification.
- Dr N Sanabria presented an "Introduction to Toxicology" to PG
  Diploma Occupational Medicine and Health students at UP.
- Dr Utembe also presented a module on pesticide classifications, chemistry and acute hazards, a module on concepts for pesticide toxicology and risk assessment, and another module on human risk assessment and management (RAM) to postgraduate diploma students at UCT.
- Dr W Utembe continued to supervise the online Masters in Public Health students at the UJ.
- Prof M Gulumian continued to supervise both Master's and PhD students at multiple institutions. A total of two PhDs (one at Wits, one at UJ), five MScs (four at UJ, one at UP), and one MTech (at TUT) were supervised both onsite and via virtual platforms.

### UNDERGRADUATE STUDENTS AND VISITORS

Dr W Utembe presented an academic lecture at the University of Cape Town (UCT) Pesticide Discussion Forum.

### **PROFESSIONAL DEVELOPMENT**

The section remained relevant in the field by continuously investing in professional development and skills transfer to promote succession planning.

Staff attended numerous training activities, including the following:

- The Summit of Single-Cell Data Analysis, Qiagen Digital Insights presentations (8 April 2021).
- The Genetic Toxicology Association (GTA) 2021 Annual Meeting (3-6 May 2021)
- The Mental Health Resilience for Health Care Workers workshop (4 May 2021)
- NHLS health care waste management training (11 May 2021)
- The Select Science Virtual Cancer and Immunology Research summit (12 May 2021).
- GRACIOUS Workshop: Assessing Quality and Completeness of Nanosafety Data for RA Purposes (28 June 2021).
- NanoSafety Training School (21-25 June 2021).
- "Working from home: OHS policy and reasonable accommodation during COVID-19" webinar (1 July 2021).
- UP Pharmacology Grand Round webinar: Preclinical investigations and RAs of nanoparticles (7 July 2021).
- ToxSA Webinar on "Current Trends in Human, Wildlife and Domestic Animal Poisoning" and "Toxicovigilance for pesticide exposures: The role of the Poisons Information" (14 July 2021).
- Analysis of the SARS-CoV-2 Mpro protein in the presence of evolutionary mutations (20 July 2021).
- Toxicology Society of Kenya workshop: Pesticide Regulatory Environment and Safety" (31 July 2021).
- The Computational Toxicology Specialty Section (CTSS) workshop (5 Aug 2021).
- The Pathology Research and Development Congress (PathReD) workshops (19 August 2021).
- Establishment and Control of Archives that Operate in Compliance with GLP principles (18 October 2021)
- The GLP short course by DNABiotec (25-27 October 2021)
- "Certified Peer Reviewer Course" hosted by Elsevier Researcher Academy to register with Elsevier as a reviewer.

- The "NIH Virtual Seminar of Programme Funding and Grants Administration" (1-4 November 2021).
- "Comprehensive Data Analysis Course Using Stata" (2-25 November 2021).
- Science Forum South Africa 2021: SA National System of Innovation to COVID-19 pandemic, hosted by DSI and cohosted by CSIR (1-3 December)
- "Finance for Non-Finance Managers" (6-9 December)
- "Introduction to reviewing genomic research" Ethics training from Global Health (17 January)
- "Festival of Genomics and Biodata 2022" (25-28 January)
- WHO CRAN Webinar: Human Health Risk Assessment (17 February 2022)
- ISO 17025- 2017 training (7-9 March 2022)

### HONOURS

Prof M Gulumian received the 2021 International Union of Toxicology (IUTOX) Lifetime Achievement Award to honour a distinguished scientist who has made lasting contributions to toxicology in countries where toxicology is underrepresented. Prof Gulumian received a certificate of recognition from the 11<sup>th</sup> Congress of Toxicology in Developing Countries (CTDC11) organisers for the CEC presentation with WHO.

Dr N Sanabria was accepted as an Associate (Government) Member in the American College of Toxicology.

Dr N Sanabria and Dr J Joseph completed the Health and Welfare Sector Education and Training Authority training and were deemed competent as both Assessors and Moderators.



*Ms M Magogotya graduated from Tshwane University of Technology with MTech.* 

Mrs M Magogotya graduated from the Tshwane University of Technology with an MTech in Biotechnology and was appointed as a member of the Advisory board of the Biotechnology and Food-Technology department at the Tshwane University of Technology.

Dr C Andraos was nominated to serve as the NIOH representative on the SABS/ISO TC229 Nanotechnologies Technical Committee.

# NATIONAL BIOBANK





## **NATIONAL BIOBANK**

HEAD: MR BONGINKOSI DUMA

he NHLS' Biobank continues to collect and store samples for short- and long-term research and preservation purposes and operates as a nonprofit organisation, utilising a cost-recovery model. The NHLS Biobank was established as a support infrastructure for internal and external clients both locally and internationally to conduct innovative and relevant research with a focus on patient care. To date, the National Biobank has approximately 1.2 million samples securely stored, with the capacity to store four million samples. The AARMS website added the Biobank under facility use.



NICD Executive Director Prof Adrian Puren visits the National Biobank.

The services provided by the National Biobank include the following:

- Sample collection, processing and short-term or long-term storage
- Material transfer agreements that comply with ethical and legal requirements
- The provision of a wide variety of samples
- Sample logistics and preparation
- Research activities and collaboration

During the period under review, a profile video that markets the Biobank services was added to the website. Additionally, when Biobank services are needed, the NHLS Academic AARMS website is used to log the request and select the Biobank as the facility to be used within the organisation. Visits to the Biobank, which were halted due to the COVID-19 pandemic, also resumed.

### **BIOBANK SYSTEM**

The NHLS' Biobank implemented a system that allows for the coding and tracking of samples. This is a two-dimensional barcoded system and will assist with the storage of samples using the ability to track the biospecimen's whereabouts. It also assists with the easy retrieval of specimens from ultrafreezers, as well as location tracking if the sample is still located in the biobank.

### **BIOBANK QUALITY MANAGEMENT SYSTEM**

It is important for biorepositories to have quality management systems and adhere to a set of standard operating procedures (SOPs), as well as ethical and legal considerations. A quality management system enables the long-term preservation of specimens, stability, quality and confidence in the data of the stored specimens. "SINCE THE OCCUPATIONAL MEDICINE SPECIALIST CLINIC PROVIDES SPECIALISED SERVICES IN ASSESSING PATIENTS FOR SECOND OPINION, OR FURTHER ASSESSMENTS TO ESTABLISH THE WORK-RELATEDNESS OF THEIR CONDITIONS, THE CLINIC HAD TO REOPEN AND ALLEVIATE THE BACKLOG THAT WAS FELT BY WORKPLACES."

The WHO recognises the pivotal role that biobanking plays in society and has proposed a global governance framework for biobanks. The framework encompasses elements of participant confidentiality, ethics, safety, and sample and data quality for biobanks.

The biobank maintained its ISO 9001:2015 accreditation during the period under review. This makes it the only biobank in Africa that is accredited with that standard.

The benefits of the quality processes at the Biobank include the following:

- Saving time and money
- Maintaining high-quality samples and adding value
- Ensuring the necessary biosafety and biosecurity standards
- The ability to map population flows, evolution of disease and sources of epidemics

- Promoting the early development of prevention and treatment strategies through the application of modern technology
- Accelerating opportunities for global collaboration and the secondary use of samples to increase statistical confidence

### **BIOBANK MEMBERSHIP**

To ensure that its operations are aligned with international standards, the NHLS Biobank continues to maintain its membership in the International Society for Biobanking (ISBER) and the European, Middle Eastern and African Society for Biopreservation and Biobanking (ESBB). Mr B Duma continues to participate as a member of the ISBER Standards Committee, which recently developed a new biobanking standard, ISO 20387. This standard will help international biobanks to be audited and obtain accreditation. The Biobank's website can be accessed at www.nationalbiobank.nhls.ac.za



### CONFERENCES

The NHLS Pathology Research and Development Congress (PathReD) was held virtually from 19-22 August 2021. Biobank participated as a virtual exhibitor at this congress and networked with stakeholders and potential clients. The virtual exhibition also provided a platform to market the services provided by the Biobank.

Mr Duma participated in the ESBB Afica Conference 2021, which was held from 7-9 September 2021 online, where he presented on Lessons Learnt in Biobanking. Mr Duma also chaired the African session of the ESBB Conference.

### **PROFESSIONAL DEVELOPMENT**

Three postgraduates were enrolled: one PhD in Ethics at Wits University, one PhD in Biobanking Education and Training for Stakeholders at Stellenbosch University, and one MSc (Biobanking) at the University of Graz in Austria.



Virtual exhibition stand at the Pathology Conference.



ESBB Virtual conference.

# INFORMATION SERVICES AND TRAINING SECTION



## INFORMATION SERVICES AND TRAINING SECTION

HEAD: MS ANGEL MZONELI

nformation Services serves as an enabling partner that supports the NIOH and the NHLS and acts as a gateway to occupational health information, not only for the organisation but also for external clients.

The sections provide support through the following:

- South Africa's national reference library for occupational health (OJ Orenstein Memorial Library), the only specialist reference library in Southern Africa dealing exclusively with occupational health topics, houses an extensive collection of information resources on occupational health both in print and electronic formats;
- A query-handling service that is aimed at responding to and facilitating access to technical and scientific occupational health (OH) information, guidance and expert advisory services offered within the institute;
- An archive aimed at comprehensively collecting, documenting and preserving the character and identity of the organisation and providing evidence of the historical development and changes of the organisation over time;
- The institutional repository is a digital collection of the organisation's intellectual output.
- The training unit is aimed at providing technical OHS training for NIOH stakeholders. This unit plays an integral part of the NIOH as one of the functions of the institute.

In addition, the section provides seamless and consistent access to information resources (electronic and print) throughout the NHLS to support and enable researchers to conduct world-class and innovative research.

The Information Services expands its offerings to include access to the library collections of the NHLS (formally known as the SAIMR Library), located in Braamfontein. The section serves the needs of all NHLS staff, including those located in laboratories and the eight medical schools throughout South Africa, as well as the NICD. The NICD library collections are housed at the NIOH resource centre, and extensive remote information service is provided to the NICD community.

### **SERVICES**

Information services offer knowledge and information to all stakeholders, both internal and external, to support the promotion of good occupational health practices. The section ensures the provision of comprehensive resources and services in support of the research, teaching and training activities of the organisation and aims to be a national resource and service dedicated to the collection, access to and dissemination of information on the prevention of occupational diseases and accidents in workplaces. The primary objective of the service is therefore to collect, access and disseminate information in support of occupational health services and activities throughout South Africa and the SADC region.

In realising this, a wide variety of information resources are provided. These include electronic databases, scientific periodicals and monographs – both in print and electronic formats. The NIOH Library, which deals exclusively with occupational health topics and is the only specialist occupational health reference library in South Africa, continued its principal function of searching, retrieving and disseminating information in support of occupational health services throughout South Africa and the SADC region. Through various library interventions, the skills needed to source information in occupational health were shared with occupational health professionals, university students, workers, management, health and safety representatives and labour union officials.

The Information Services section continued to receive and respond to requests for technical and scientific information on occupational health issues through its query-handling service. In this reporting year, the query-handling service received an unusually high number of queries due to the COVID-19 "SINCE THE OCCUPATIONAL MEDICINE SPECIALIST CLINIC PROVIDES SPECIALISED SERVICES IN ASSESSING PATIENTS FOR SECOND OPINION, OR FURTHER ASSESSMENTS TO ESTABLISH THE WORK-RELATEDNESS OF THEIR CONDITIONS, THE CLINIC HAD TO REOPEN AND ALLEVIATE THE BACKLOG THAT WAS FELT BY WORKPLACES."

pandemic. Although there was a slight decrease in numbers in this reporting year compared to the start of the pandemic in 2020, the numbers were still high compared to other previous years, with a total of 748 queries received and fulfilled. Of the 748 queries, 389 came through the Query-Handling service, and 359 came through the NIOH Library. As expected, the bulk of the queries (295 queries) that came through the query-handling service were COVID-19 related.

The queries included the following:

- Quarantine and isolation periods;
- COVID-19 leave;
- Return-to-work; OHSS Registration;
- COVID-19 results;
- Vaccination.

These queries came from both employers and employees, occupational health practitioners, health and safety representatives and the general public. All these were in addition to our usual queries - requests for Occupational hygiene surveys; requests for training on the handling of asbestos or advice on how best to handle asbestos-containing materials in homes and workplaces; risks related to asbestos-containing materials in homes; referrals to the NIOH clinic; requests for information about the Diploma in Occupational Health and Masters in Public Health; requests for advice from both employers and employees on occupational health-related issues in the workplace; requests for training interventions and many others. It is also worth noting that queries came from all SA provinces, other African countries and other countries outside Southern Africa's borders.

The section maintained its library collections and enabled easy access to full-text scientific journal articles through its subscription to the American Society for Microbiology (ASM) database in support of research activities. This database provided access to full-text articles from various medical journal titles. Open-access electronic resources/databases and a few trial databases were also added to the library collection, which researchers can access through the library page on the intranet. Information Services supported researchers by providing the necessary literature to carry out their research projects.

From the research projects conducted, the NIOH predicted an annual target for publications for the reporting period to be 27, and this was overachieved by three publications, giving a total of 30 publications produced in the reporting year by NIOH researchers. All 30 publications were managed by the section uploaded onto the website for ease of access and disseminated to external stakeholders through the NIOH newsletter, which reaches various stakeholders, including various government departments, researchers from various SA universities, labour organisations and other organisations dealing with occupational health and safety.

### **PROFESSIONAL DEVELOPMENT**

The staff in the section continue to develop academically as many are enrolled in university programmes. In the year under review, one staff member obtained a Masters's Degree in Monitoring and Evaluation from the University of Witwatersrand.

### **TEACHING AND TRAINING**

The training unit continued to provide technical OHS training to NIOH stakeholders. The unit coordinated several training events during the year under review, including a vast number of training sessions on COVID-19 preparedness and prevention response in the workplace.

### TRAINING INTERVENTIONS

The COVID-19 training sessions, delivered under the auspices of the COVID-19 Occupational Health Outbreak Response Team (OHORT), covered a wide range of topics related to various aspects of the COVID-19 pandemic and have recently been dominated by COVID-19 vaccines and the workplace.

In the year under review, 30 online webinars were completed. These sessions reached 11,225 attendees (an average of 387.1 attendees per session). The NIOH stakeholders targeted included occupational medical practitioners; occupational health nursing practitioners; frontline health workers; employees, for example, designated essential services workers; government officials; occupational hygiene practitioners; OHS professionals, advisers and practitioners; employers and management representatives; trade union representatives; safety health and environment, health and safety representatives; environmental health practitioners; employee health and wellness practitioners; and human resource practitioners.

The COVID-19 webinar series has drawn an audience from the public sector and private sector, mainly from within the borders of South Africa, the SADC Region and the African continent, as well as from other continents across the globe. The webinars were conducted on the Zoom and Microsoft Teams platforms. Additional information resources (such as webinar video and audio recordings, presentations and supporting documentation/reports) were subsequently made available on the NIOH website, YouTube channel and Twitter feed. Postwebinar training feedback surveys and online tests for continuous professional development (CPD) accreditation were also circulated.

Below are COVID-19 webinars conducted during the reporting period:

- 1. COVID-19: What are the responsibilities of Employers?
- 2. COVID-19: Long COVID-19 and the Workplace
- 3. COVID-19: Workplace Risk Assessment, Cleaning, Decontamination, Storage and Transportation
- 4. COVID-19: Mental health resilience for health care workers
- Guidance on routine and deep cleaning of workplaces when COVID-19 positive cases have been identified (DMRE COVID-19 Steering Committee)
- 6. Workers' rights in the era of COVID-19 and the workplace
- Occupational Health and Safety, Workplace Systems and COVID-19
- 8. Basic ventilation requirements: COVID-19 directions and national building regulations and other guidelines
- 9. Working from home OHS policy and reasonable accommodation during COVID-19

- 10. "Long COVID-19" and the Workplace An Update
- 11. COVID-19: Occupational Health Surveillance System (OHSS) Update
- 12. COVID-19 and Skin Conditions in the Workplace
- 13. COVID-19: Droplets versus Aerosols and ventilation The role of ventilation in the workplace
- 14. Occupational Health Services for COVID-19 in the health sector
- 15. COVID-19 vaccines in the workplace unpacked (for IDC staff)
- 16. Occupational Health Surveillance System (OHSS): CSV new platform and data submission demonstration
- 17. SASSA Northern Cape: Information Session on COVID-19 Vaccines
- Preventing, Identification and Management of Infections in the COVID-19 work context (Office of the Chief Justice)
- 19. COVID-19 and vaccines in the workplace (MSC Cruises: Session 1 of 2)
- 20. COVID-19 and vaccines in the workplace (MSC Cruises: Session 2 of 2)
- 21. Background on COVID-19 and State of the Pandemic in SA. What does it mean during and after the pandemic?
- 22. COVID-19 and vaccines in the workplace (Session 1 of 2 Road Accident Fund)
- 23. COVID-19 and vaccines in the workplace (Session 2 of 2 Road Accident Fund)
- 24. South African Reserve Bank (SARB) Wellness and Occupational Health Webinar
- 25. Occupational Health Surveillance System (OHSS) Update on reporting
- 26. Gauteng Provincial Government's (GPG) OHS Seminar
- 27. COVID-19 in the Workplace webinar (City of Ekurhuleni)
- 28. Ergonomics and COVID-19: What are lessons learnt?
- 29. COVID-19 vaccines and the workplace
- 30. COVID-19 and vaccines in the workplace (HESAP)

The COVID-19 training webinars drew mainly on NIOH staff expertise as presenters and were increasingly augmented with external specialists and expertise. The internal presenters included representatives from fraternal NHLS divisions and the NICD. Guest/external presenters were drawn from the public, academia and private sectors. These included speakers from national professional bodies, national and provincial government departments/enforcement agencies; academic institutions; national medical, scientific and research bodies; and the National Department of Health's vaccine programme. See the table below for a comparison of the time contributed by both internal and external presenters.

Table 13: 29 online webinars conducted.

(	COMPARISON OF THE TIME CONTRIBUTED BY INTERNAL NIOH AND EXTERNAL TRAINERS/PRESENTERS (AVAILABLE DATA ON 29 ONLINE WEBINARS)								
NO.	WEBINAR TRAINERS/PRESENTER CATEGORIES	%	ONLINE TIME CONTRIBUTED						
1.	Internal NIOH, NICD and NHLS Speakers	58.3	26 hours 50 minutes						
2.	External Speakers	41.7	19 hours 10 minutes						
Total	online time contributed to COVID-19 Webinars	100.0	46 hours 0 minutes						

NIOH staff members contributed to more than half of the presentations during the reporting period. Many of the vaccines in the workplace-related webinars were contributed by the staff of the NIOH's Occupational Medicine Section.

Data available for 29 webinars completed provides insight into the number of workplaces represented by those who attended. Below is the breakdown of workplaces reached during the reporting period for each of the nine provinces in South Africa. A total of 7616 workplaces were reached in the 29 webinars. This involved an average of 262.6 workplaces per webinar.

Table 14: Health and Safety Representative appointment and training by region.

M	NUMBER OF WORKPLACES REACHED THROUGH THE WEBINARS (NATIONAL AND PER PROVINCE) (AVAILABLE DATA FOR 29 WEBINARS)									
26 May 2020 — 25 March 2021	TOTAL	EASTERN CAPE	FREE STATE	GAUTENG	KWAZULU- NATAL	Limpopo	Mpumalanga	NORTH WEST	NORTHERN CAPE	WESTERN CAPE
Number of workplaces	7 616	604	313	3′397	802	164	330	203	331	1 472
Percentage of total	100%	7.9%	4.1%	44.6%	10.5%	2.2%	4.3%	2.7%	4.3%	19.3%
Number of webinars	29	29	29	29	29	29	29	29	29	29
Average number of workplaces per webinar	262.6	20.8	10.8	117.1	27.7	5.7	11.4	7.0	11.4	50.8

Below are the numbers of participants per province for 29 webinars that had the relevant data available. Gauteng Province led with the highest percentage of attendees at 49.0%. The available records are for the webinars that ran from 1 April 2021 to 31 March 2022. The attendance is dominated by the more urbanised regions rather than the rural regions.

Table 15: Health and Safety Representative appointment and training by region.

PROVINCIAL BREAKDOWN OF WEBINAR ATTENDEES FOR 46 WEBINARS (AVAILABLE PROVINCIAL DATA FOR 29 WEBINARS)				
No.	PROVINCE	NUMBER OF ATTENDEES	%	AVERAGES
1.	Gauteng	5′343	49.0	184.2
2.	Western Cape	1′925	17.6	66.4
3.	KwaZulu-Natal	1′094	10.0	37.7
4.	Eastern Cape	691	6.3	23.8
5.	Mpumalanga	516	4.7	17.8
6.	Free State	433	4.0	14.9
7.	Northern Cape	403	3.7	13.9
8.	North West	278	2.5	9.6
9.	Limpopo	232	2.1	8.0
Total attendees (for 29 webinars)		10′915	100.0	376.4
Total average of 376.4 narticinants per webinar				

Total average of 376.4 participants per webinar
Almost two-thirds of the webinar attendees were female. Below is a table providing some insight into the gender representation for 19 of the COVID-19 webinars that contained the relevant data. A total of 63.6% of the participants were female, and 36.4% were male.

THE NUMBER OF WOMEN AND MEN REACHED THROUGH THE WEBINARS (AVAILABLE DATA FOR 19 WEBINARS)		
Gender	NUMBER	%
Female	6′211	63.6%
Male	3 560	36.4%
Total	9′771	100%

Table 16: The number of women and men reached through the Webinars

The COVID-19 training webinars were augmented with a variety of OHS information resources disseminated through a number of channels, e.g., the NIOH website, OccuZone newsletter, Twitter, the YouTube channel, COVID-19 Hotline and NIOH Info mailbox. The COVID-19 resources included government regulations and directions, posters and factsheets, information graphics, guidelines, videos, etc. The online training was delivered free of charge to the NIOH's stakeholder communities. Additional value-adding postwebinar support services were offered to the webinar attendees. The webinar presentation slides, information resources, video and audio resources were made available on the NIOH website, and the links to these resources were circulated to the registered attendees. A general certificate of attendance was provided to all attendees. Moreover, online postwebinar surveys were disseminated to secure attendees' feedback on the training interventions and suggestions for future additional and new topics.

The non-COVID-19 training interventions listed below were delivered by internal NIOH sections for external stakeholders coordinated and supported by the training unit.

- Biochemical principles for bacterial testing
- NIOH Standardisation of Spirometry update 2019 course- Evaluation of Spirometry regarding repeatability, acceptability, usability and grading for occupational medicine practitioners
- Risk of TB/HIV in the public transport sector for SATAWU representatives

Moreover, the NIOH provided support in coordinating and facilitating webinars for partner organisations for the following events

- DEL Virtual Launch: New "Regulations for Hazardous Chemical Agents" 2021
- Occupational Health Sites National COVID-19 Vaccination Rollout fos SASOHN, SASOM and other OHS Stakeholders
- ILO Workshop on Standardised Reporting
- DEL Virtual Launch: South Africa State of Occupational Health and Safety Report
- SAIOH: 2021 Virtual Annual Scientific Conference
- DEL Virtual Launch: South Africa State of Occupational Health and Safety Report.

In addition to these training sessions, the Section hosted a virtual tour of the libraries and information services for the final year of University of Limpopo Information Studies students. The tour in the form of a webinar was aimed at providing an opportunity for students to gain workplace knowledge in the field of information management. This method replaced the onsite experiential learning programme, which was offered in previous years as practical training to final-year information science students in a quest to balance theoretical knowledge with hands-on experience in information science and information training. The libraries further provided training to NIOH, NHLS, and NICD researchers and staff on various information search tools, such as ASM, PubMed, ERJ Open Research, Research Gate, Imedpub, and Journal of Cancer and Genetics in Medicine, Springer Nature, and Wolters Kluwer (Ovid).



# INTERNATIONAL LIAISON



### INTERNATIONAL LIAISON

MANAGER: DR NATASHA SANABRIA

### THE NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH

The National Institute for Occupational Safety and Health (NIOSH) is the United States federal agency responsible for conducting research and making recommendations for preventing work-related injury and illness. NIOSH is part of the Centres for Disease Control and Prevention (CDC) and mirrors the duties that NIOH performs in South Africa. We are currently renewing the MoU between NIOH and NIOSH, which forms the foundation for collaborative work. Projects should follow the annual solicitation themes and relate to one or more of the current National Occupational Research Agenda (NORA) priority themes. The NIOSH Research Programme Portfolio supports NORA through its 10 sector programmes and seven cross-sector programmes. NIOSH uses the Burden, Need and Impact (BNI) method to identify its research priorities. The NIOSH Priority Goals for Extramural Research fill research gaps that are currently not being addressed by NIOSH intramural or internal research. The extramural research goals below align with the work conducted at NIOH, namely:

- Reduce occupational cancer, cardiovascular disease, adverse reproductive outcomes and other chronic diseases.
- Reduce occupational hearing loss.
- Reduce occupational immune, infectious, and dermal disease.
- Reduce occupational musculoskeletal disorders.
- Reduce occupational respiratory disease.
- Improve workplace safety to reduce traumatic injuries.
- Promote safe and healthy work design and well-being.

#### WORLD HEALTH ORGANIZATION PROJECTS

The NIOH is a WHO CC in occupational health. The Global Network of WHO Collaborating Centres' aim is to stimulate networking between participating institutions and international partners to provide a substantial contribution to the WHO's goal of "occupational health and safety for all". The WHO estimates that only approximately 10 to 15% of workers worldwide have some kind of access to occupational health services, which must be improved. The African region has been represented by Dr Joseph Caboré, who reported that there are 28 CCs in Africa and that these CCs are not evenly distributed, whereas 18 CCs are located in South Africa, i.e., there is an imbalance in regions and topic focus areas. Additional problems reported were the complex requirements to become a CC and, after becoming a CC, the fact that the organisation can no longer receive funding from the WHO or be eligible for other funding due to certain donor clause restrictions. Therefore, there is a need for clear "Terms of Reference", which must be regularly updated. Our participation in the network is vital to ensuring decent work for all, where Dr Sanabria compiled and submitted the annual report for NIOH. The projects listed below are currently in the third year of progress:

"SINCE THE OCCUPATIONAL MEDICINE SPECIALIST CLINIC PROVIDES SPECIALISED SERVICES IN ASSESSING PATIENTS FOR SECOND OPINION, OR FURTHER ASSESSMENTS TO ESTABLISH THE WORK-RELATEDNESS OF THEIR CONDITIONS, THE CLINIC HAD TO REOPEN AND ALLEVIATE THE BACKLOG THAT WAS FELT BY WORKPLACES."

#### LEAD: DR MUZIMKHULU ZUNGU (PROJECT 28609)

#### In support of WHO's work on occupational health and safety of health workers, to identify and analyse lessons learnt from the development and implementation of the national programme for occupational health of health workers in South Africa

The SARS-CoV-2 pandemic has continued to disrupt most activities. However, work continued within the health sector to improve the occupational health of health workers through a National Audit of the Occupational Health Services, as well as Health and Safety Committees in the health sector, with a specific emphasis on COVID-19. A technical report was prepared for the South African National Department of Health. This report is still embargoed at this time while the Ministry of Health is consulting stakeholders. One article was published (Moodley et al., 2021. doi:10.1186/s12879-021-05812-6), and another was submitted on the organisational factors associated with health worker protection analysed four provinces of South Africa.

#### LEAD: DR MUZIMKHULU ZUNGU (PROJECT 28610)

#### Provision of technical inputs to support WHO's work towards the development of the WHO/ILO global report on occupational health of health workers

Previously, the training and implementation of HealthWISE were agreed to by the Mpumalanga Department of Health, in addition to the Gauteng Department of Health. Since then, a quasi-experimental study utilising a mixed methodological approach has compared changes in OHS systems (policy, leadership, and coordination; financing; human resources; infrastructure, technology and medicine; information management; and services) in health facilities, following the concurrent implementation of two interventions (the OHASIS and HealthWISE). The study has three phases: (one) preintervention baseline research, (two) intervention and (three) postintervention. To date, all sites have submitted preintervention data, which will be analysed during the next reporting period.

#### LEAD: DR NISHA NAICKER (PROJECT 28612)

#### To support WHO's, work on informal economy, focusing on research and policy development

There have been very few studies that have compared health outcomes between informal economy and formal economy workers. Thus, the NIOH has developed projects to address this gap. The informal economy survey has been completed, and the results have been published. Waste pickers working on landfill sites in Johannesburg were interviewed, and occupational hygiene (walkthrough) risk assessment was completed. The formal economy study (workers at waste recycling buy-back centres) was approved by ethics, and approval was obtained by selected buy-back centres. However, due to COVID-19 national lockdowns, data collection was continuously delayed. The second phase of the project will assess formal workers at waste recycling buy-back centres in Johannesburg. Funding was obtained to support the fieldwork, which commenced after the COVID-19 lockdown was lifted. Other deliverables will follow the completion of data collection for the formal economy. The outcomes from this project will provide an evidence base for policy development relating to the provision of and access to occupational health services for the informal economy.

#### LEAD: DR TANUSHA SINGH AND DR NISHA NAICKER (PROJECT 28614)

#### To provide technical inputs in support of WHO's activities towards providing guidance and policy options for action by the health sector to improve the health and safety of poor informal economy workers

Monthly meetings were held with the core NIOH team and scheduled meetings with WHO technical officers. A systematic review of health service uses and health outcomes among workers in the informal economy was published (Naicker et al., 2021. DOI: 10.3390/ijerph18063189).

#### LEAD: PROF MARY GULUMIAN (PROJECT 22071)

#### WHO Risk Assessment Network

Prof Gulumian is a member of the WHO RA Network, where she contributes to discussions on exposure assessment, biomonitoring, biomarkers, key needs and/or other strategic aspects for developing countries, as well as computational and experimental toxicology.

### ORGANISATION FOR ECONOMIC COOPERATION AND DEVELOPMENT PROJECTS

Prof Gulumian, the Head of the South African delegation, attended meetings of the OECD WPMN for the Steering Group on Testing and Assessment. She reviewed the OECD Adverse Outcome Pathways AOP144 document.

#### **EUROPEAN UNION PROJECTS**

#### INNOVATIVE NANO INFORMATICS MODELS AND TOOLS: TOWARDS A SOLID, VERIFIED, AND INTEGRATED APPROACH TO PREDICTIVE (ECO) TOXICOLOGY

Prof M Gulumian and Dr N Sanabria represent South Africa in this NanoSolvelT international consortium. The project has been divided into work packages, where WP-1 focuses on NanoSolvelT Knowledge Infrastructure, that is, open science approaches and FAIR data management plans for computational data and experimental datasets. WP2 focuses on the design of experiments for data gap filling to support the in silico model. WP5 focuses on predictive nanoinformatics modelling using AI methodologies for nanodescriptors, image analysis and grouping approaches based on OMICS-data. All collaborative meetings strengthen research activities by engaging in discussion of data, sharing of information for skills transfer and capacity building, maintaining, and increasing networks. For example, joint meetings are held with other EU groups, including NanoCommons, RiskGone and Gov4Nano.

#### **GOV4NANO**

Prof M Gulumian and Dr C Andraos continued to be involved in this EU-funded project, i.e., Work Plans 2, 4 and 7, which collaborate with the French Centre for Research and Teaching in Environmental Geoscience. This project aims to develop a future-proof operational Nano Risk Governance Model (NRGM) that addresses the needs of the transdisciplinary field of nanotechnology.

### INTERNATIONAL ORGANIZATION FOR STANDARDIZATION

Prof M Gulumian worked with other ISOTC229 experts regarding Workgroup 3: Health, Safety and Environmental Aspects of Nanotechnologies.

#### TECHNICAL GUIDELINES AND REPORTS – INTERNATIONAL

#### **OECD TECHNICAL REPORT**

Prof M Gulumian reviewed an OECD document entitled "Nanotechnologies – NM-induced liver inflammation".

#### **ISO TECHNICAL REPORT**

Prof M Gulumian, as an expert in nanotechnologies, was active in the following ISO documents:

- "Nanotechnologies Lung burden measurement of nanomaterials for inhalation toxicity tests";
- ISO/TS 5094 (Nanotechnologies Assessment of peroxidaselike activity of metal and metal oxide nanoparticles);
- ISO 19337 (Nanotechnologies Characteristics of working suspensions of nano-objects for in vitro assays to evaluate inherent nano-object toxicity).

## **COVID-19 OCCUPATIONAL HEALTH OUTBREAK RESPONSE TEAM**



### **COVID-19 OCCUPATIONAL HEALTH OUTBREAK RESPONSE TEAM**

he NIOH OHORT committee braced for another year of COVID-19 lockdown and continued to provide leadership in occupational health to both internal and external stakeholders to equip workplaces with knowledge and tools to respond to the ensuing pandemic challenges. The key focus of the committee was to develop, review and update technical documents, guidelines, procedures and processes related to COVID-19; support policy development; develop occupation-specific prevention material; provide training on various COVID-19-related matters to different cadres of employees in various industries; develop the new vaccine module on the existing OHASIS; and continue to encourage research. All relevant and credible information continued to be available for free via the Institute's zerorated website (www.nioh.ac.za). The occupational health advisory service through our toll-free hotline (0800 212175) centred around COVID-19 gueries from workers, employers and occupational health professionals. The team maintained the COVID-19 Occupational Health Surveillance System and managed the queries received. Members participated in the Occupational Health Workstream meetings. We remain grateful for the ongoing support from the occupational health community and stakeholder beneficiaries. Some of the committee's highlights are reported below.

#### **SURVEILLANCE**

#### **OCCUPATIONAL HEALTH SURVEILLANCE SYSTEM (OHSS)**

The OHSS has grown since the previous reporting cycle, although the number of new businesses has trickled in. This is possibly due to the abatement of the disaster management act and, as such, submission to OHSS by companies is on a voluntary basis. At the end of the reporting cycle, 5653 registrations were recorded, accounting for approximately 20% of the formal workforce in South Africa. Training initiatives continued to improve awareness of the importance of reporting cases to the OHSS. The OHSS Annual Report on data reported from 1 October 2020 to 30 October 2021 has been published on the NIOH webpage. However, funding and human resources remain a challenge to the sustainability of the programme.

"SINCE THE OCCUPATIONAL MEDICINE SPECIALIST CLINIC PROVIDES SPECIALISED SERVICES IN ASSESSING PATIENTS FOR SECOND OPINION, OR FURTHER ASSESSMENTS TO ESTABLISH THE WORK-RELATEDNESS OF THEIR CONDITIONS, THE CLINIC HAD TO REOPEN AND ALLEVIATE THE BACKLOG THAT WAS FELT BY WORKPLACES."

#### THE OHSS IN SOUTH AFRICA



Figure 12: Illustration of the OHSS live dashboard.

#### DAILY COVID-19 HOSPITAL ADMISSIONS (DATCOV)

Statistical support was also given to the healthcare worker admissions weekly reports available on the NIOH website. Week 50 was reported for the year ending 2021, and week eleven of 2022 was reported for the financial year ending March 2022.

#### **COVID-19 TRAINING**

The committee enhanced its training efforts to impart knowledge of COVID-19 in workplaces across various sectors (public and private). The webinars drew mainly on internal NIOH staff expertise but were increasingly augmented with external specialists' and expertise, contributing to several hours of free expert time. The training webinars were attended by approximately 49 000 attendees (including occupational medical practitioners; occupational health nurses; frontline and essential workers; government officials; occupational hygiene practitioners; health and safety professionals, employers and management representatives; trade union representatives; EH practitioners: employee health and wellness practitioners; and HR practitioners). The majority of the participants were from Gauteng, the Western Cape and KwaZulu-Natal, Therefore, most effort will be focused on the other provinces in the next cycle. Through the training, the committee contributed to continuing professional developments where relevant topics are accredited with the HPCSA, the South African Institute for Occupational Hygiene (SAIOH), the South African Dental Association (SADA), the South Africa Institute for Occupational Safety and Health (SAIOSH), and Stellmed. In the reporting year, the team has been developing the technical content for the two skills programmes: workplace preparedness and risk control assistant and workplace preparedness and risk control officer, which were accredited by the Quality Council for Trades and Occupations (QCTO). It is envisaged that these two courses will be launched in 2022-2023. Furthermore, in April 2022, a target of 50 000 attendees and 100 webinars will be reached, marking a significant milestone for the Institute, which will be marked by a COVID-19 centenary webinar. The full list of webinars conducted during the period under review is available in the Information Services and Training Section report.

#### **COMMUNICATIONS AND MARKETING**

One of the profound challenges during the pandemic was the infodemic, which shaped how people understood and responded to the pandemic and sometimes undermined public and occupational health responses. Over the last year, the team has positioned the NIOH website portal as a critical "touchpoint" for quality OHS guidance and information dissemination. Through our educational content, we were effective in reaching stakeholders and workers from across the world. The NIOH website recorded increased unique page views amidst many returning viewers, which is an indicator of trust and reinforcement of our brand identity. Across all social media platforms, there was a sustained growth of subscribers and impressions, with increased engagement rates noticed on Twitter.

#### **FACT SHEETS**

Effective communication is perhaps the essential element among the lessons learnt, as it can either hamper or facilitate a good response. Given risk perception as a result of misconceptions, complacency, and a lack of knowledge, advocacy and awareness became mainstream, and the team



#### NIOH COVID-19 WEBINARS: PROVINCIAL DISTRIBUTION

Figure 13: The provincial distribution of attendees and workplaces.

prioritised enhancing access to reliable information to curb misinformation and disinformation through dissemination via various channels and platforms, such as email, YouTube and Twitter. The committee endeavoured to disseminate reliable sector-specific information. This initiative resulted in the review of several of the forty fact sheets developed to address South African workplace settings and needs. The fact sheets are freely available on the NIOH website. Renewed efforts are underway to translate many of the fact sheets into common indigenous languages. Some of these sheets were transformed into posters and infographics as well. The team is compiling a COVID-19 compendium comprising all the fact sheets as well as an acknowledgement to all contributors to information and training material. The compendium will be made available in the 2022-2023 financial year to mark the COVID-19 Centenary Webinar event.

#### **ADVISORY SERVICES**

The team continued to manage the NIOH Hotline. While the number of queries decreased from the previous year, the service was useful in identifying key topics that informed the training webinars for workplaces and occupational health professionals. Many of the queries informed our frequently asked questions (FAQs) that were regularly updated on the website. Figure 14 below shows the pattern of calls received. In general, the numbers peaked when COVID-19 waves peaked or when regulations or directives were amended due to uncertainty regarding implementation or compliance in workplaces.

#### RESEARCH

The committee identified potential research projects and supported several research studies related to SARS-CoV-2, including the following:

- COVID-19 surveillance in a Health Care Worker Population: Use of Information Systems, the experience of COVID-19 and vaccine uptake and hesitancy, Epidemiology and Surveillance (K Wilson).
- Mental health in HCWs during the COVID-19 pandemic in Gauteng, Epidemiology and Surveillance (K Wilson).
- Evaluation of the OHSS for the monitoring of workplacerelated COVID-19 cases in South Africa, October 2020 -October 2021, Epidemiology and Surveillance (N Tlotleng).
- Rapid Appraisals for the healthcare workers, TB/HIV Unit (N Mlangeni).
- Validation of decontamination methods for filtering facepiece respirators, Immunology and Microbiology, (T Singh).
- Assessing the presence SARS-CoV-2 in wastewater and implications for workers' health at three WWTPs in Gauteng, South Africa, Immunology and Microbiology (N Gomba).
- Skin disorders associated with PPE use during COVID-19, Immunology and Microbiology (A Fourie).

These studies are elaborated in the various departmental annual reports.

In conclusion, funding remains a challenge for the OHORT response team initiatives. Human resources remain a threat to the committee, as we have lost key senior officials and that members are now fully absorbed into their routine work activities. A subcommittee has been established to investigate ways to attract funding.



#### STATUS OF OCCUPATIONAL MEDICINE FACT SHEETS FROM 1 APRIL 2021 TO 31 MARCH 2022

Figure 14: Percentages of queries received on the NIOH hotline.

# PUBLICATIONS 2021/22



- Anand, K., Vadivalagan, C., Joseph, J.S., Singh, S.K., Gulati, M., et al. A novel nanotherapeutic using convalescent plasma-derived exosomal (CP<sup>Exo</sup>) for COVID-19: A combined hyperactive immune modulation and diagnostics. Chemico-Biological Interactions 344 (2021) 109497
- Ehrlich, R., Akugizibwe, P., Siegfried, N., Rees D. The association between silica exposure, silicosis and tuberculosis: a systematic review and meta-analysis. Ehrlich et al. BMC Public Health (2021) 21:953 <u>https://doi.org/10.1186/s12889-021-10711-1</u>
- Gulumian, M., Andraos, C., Afantitis, A., Puzyn, T., Coville, N.J. Importance of Surface Topography in Both Biological Activity and Catalysis of Nanomaterials: Can Catalysis by Design Guide Safe by Design? Int. J. Mol. Sci. 2021, 22, 8347. https://doi.org/10.3390/ijms22158347
- Gulumian, M., Cassee, F.R. Safe by design (SbD) and nanotechnology: a much-discussed topic with a prudence? Particle and Fibre Toxicology (2021) 18:32 <u>https://doi.org/10.1186/s12989-021-00423-0</u>
- Joseph, J. and Fagbohum, O.F. Exercise Increases the Expression of Glucose Transport and Lipid Metabolism Genes at Optimum Level Time Point 6h Post-Exercise in Rat Skeletal Muscle. Comparative Clinical Pathology <u>https://doi.org/10.1007/s00580-022-03318-4</u>
- Kaonga, C.C., Kosamu, I.B.M., Utembe, W. A review of metal levels in urban dust, their methods of determination, and risk assessment. Atmosphere 2021, 12, 891. <u>https://doi.org/10.3390/atmos12070891</u>
- Made, F., Kandala, N.B., Brouwer, D. Compliance testing and homogenous exposure group assessment in the South African coal mining industry. Annals of Work Exposures and Health, 2021; wxab030, <u>https://doi.org/10.1093/annweh/wxab030</u>
- Made, F., Nonterah, E.A., Tlotleng, N., Ntlebi, V., Naicker, N. Ten-year risk of fatal cardiovascular disease and its association with metabolic risk factors among waste pickers in South Africa. BMC Cardiovasc Disord (2021) 21:336 <a href="https://doi.org/10.1186/s12872-021-02150-y">https://doi.org/10.1186/s12872-021-02150-y</a>
- Made, F., Utembe, W., Wilson, K., Naicker, N., Tlotleng, N., et al. Impact of level five lockdown on the incidence of COVID-19: lessons learned from South Africa. *Pan African Medical Journal*. 2021;39:144. [doi: 10.11604/pamj.2021.39.144.28201]
- Maseme, M. Challenges and Opportunities in Ensuring Ethical Research in Africa. African Journal of Inter/Multidisciplinary Studies Volume 3 (2021a Special Issue), 74-85 <u>https://doi.org/10.51415/ajims.v3i1.977</u>
- Maseme, M. Commodification of biomaterials and data when funding is contingent to transfer in biobank research. Source: Medicine, Healthcare and Philosophy, 20 July 2021 <u>https://doi.org/10.1007/s11019-021-10042-3</u>
- Matatiele, P., Southon, B., Dabula, B., Marageni, T., Poobalan, P., Kgarebe, B. Assessment of Quality of Alcohol Based Hand Sanitizers Used in Johannesburg Area During the COVID-19 Pandemic. Scientific Reports (2022) 12:4231.

https://doi.org/10.1038/s41598-022-08117-z

- Matuka, D.O, Duba, T., Ngcobo, Z., Made, F., Muleba, L., Nthoke, T., and Singh, T.S. Occupational Risk of Airborne Mycobacterium Tuberculosis Exposure: A Situational Analysis in a Three-Tier Public Healthcare System in South Africa. Int. J. Environ. Res. Public Health 2021, 18, 10130. <u>https://doi.org/10.3390/ijerph181910130</u>
- Mlangeni, N., Du Preez, K., Mokone, M., Malotle, M., Kisting, S., Ramodike, J., Zungu, M. HIV and TB Workplace Program for Street Vendors: A Situational Analysis. NEW SOLUTIONS: A Journal of Environmental and Occupational Health Policy 1–10
- Muvhali, M., Singh, T. Pet groomer's occupational exposures: An under-researched group of workers in a growing pet-care industry. Current Allergy and Clinical Immunology; June 2021 Vol 34, No 2
- Mwanga, H.H., Baartjies, R., Singh, T., and Jeebhay, M.F. Asthma Phenotypes and Host Risk Factors Associated with Various Asthma-Related Outcomes in Health Workers. Frontiers in Allergy. October 2021 | Volume 2 | Article 747566. doi: 10.3389/falgy.2021.747566
- Mwanga, H.H., Baatjies, R., Singh, T., Jeebhay, M.F. Work-related allergy and asthma associated with cleaning agents in health workers in Southern African tertiary hospitals. American Journal of Industrial Medicine 2022;1–14
- Sanabria, N.M., Gulumian, M. The Use of HRM Shifts in qPCR to Investigate a Much Neglected Aspect of Interference by Intracellular Nanoparticles. PLOS ONE | <u>https://doi.org/10.1371/journal.pone.0260207</u> December 7, 2021
- Singh T., Bello B., and Jeebhay MF. Characterizing Inflammatory Cell Asthma Associated Phenotypes in Dental Health Workers Using Cytokine Profiling. Frontiers in Allergy. November 2021 | Volume 2. Doi: 10.3389/falgy.2021.747591
- Sonday, Z., Adams, S., Singh, T., Ratshikhopha, E., Jeebhay, M.F. Occupational Rhinitis and Asthma Due to Lentil and Split Pea Allergy in a Food Handler. Current Allergy and Clinical Immunology | March 2022 | Vol 35, No 1
- Thobela, M.S., Maseme, M.R., Duma, B.M. An overview of the National Biobank of the National Health Laboratory Service: A South African national treasure for biological resources. J Lab Med 2022. <u>https://doi.org/10.1515/labmed-2021-0101</u>
- Thwala, M.M., Afantitis, A., Papadiamantis, A.G., Tsoumanis, A., Melagraki, G., Dlamini, L.N., et al. Using the Isalos platform to develop a (Q)SAR model that predicts metal oxide toxicity utilizing facet based electronic, image analysis based, and periodic table derived properties as descriptors. Structural Chemistry https://doi.org/10.1007/s11224-021-01869-w

- Tlotleng, N., John, J.M., Nyembe, D.W., Utembe, W. Green synthesis of nanoparticles and their antimicrobial efficacy against drug-resistant *Staphylococcus aureus*. Eds. Green Synthesis in Nanomedicine and Human Health. CRC Press, CRC press, ISBN 9780367710811
- Tlotleng, N., Naicker, N., Mathee, A., Todd, A.C, Nkomo, P., Norris, S.A. Association between Bone Lead Concentration and Aggression in Youth from a Sub-Cohort of the Birth to Twenty Cohort. Int. J. Environ. Res. Public Health 2022, 19, 2200. <u>https://doi.org/10.3390/ijerph19042200</u>
- Utembe, W., Gulumian, M. Issues and Challenges in the Application of the IEUBK Model in the Health Risk Assessment of Lead: A Case Study from Blantyre Malawi. Int. J. Environ. Res. Public Health 2021, 18, 8207. <u>https://doi.org/10.3390/ijerph18158207</u>
- Utembe, W., Tlotleng, N., Kamng'ona, A.W. A Systematic Review on the Effects of Nanomaterials on Gut Microbiota. Current Research in Microbial Sciences (2022), doi: <u>https://doi.org/10.1016/j.crmicr.2022.100118</u>
- Utembe, W., Yusuf, R.A., Rathebe, P.C. Study Protocol to Determine Association between Environmental Triggers and Asthma among Children in King Williams Town. Methods Protoc. 2021, 4, 64. <u>https://doi.org/10.3390/mps4030064</u>
- Williams, H., Ehrlich, R., Barker, S., Kisting-Cairncross, S., Zungu, M., Yassi, A. The Utility of Length of Mining Service and Latency in Predicting Silicosis among Claimants to a Compensation Trust. Int. J. Environ. Res. Public Health 2022, 19, 3562. <u>https://doi.org/10.3390/ijerph19063562</u>
- Wilson, K., Kootbodien, T., Made, F., Mdleleni, S., Tlotleng, N., Ntlebi, V., Naicker, N. Men and Women Waste Pickers on Landfills in Johannesburg, South Africa: Divergence in Health, and Socioeconomic Status. International Archives of Occupational and Environmental Health <u>https://doi.org/10.1007/s00420-021-01787-8</u>
- Zungu, M., Voyi, K., Mlangeni, N., Moodley, S.V., Ramodike, J., et al. Organizational factors associated with health worker protection during the COVID- 19 pandemic in four provinces of South Africa. BMC Health Services Research (2021) 21:1080. https://doi.org/10.1186/s12913-021-07077-w

#### **NON-PEER-REVIEWED ARTICLES**

- Lynch, I., Nymark, P., Doganis, P., Gulumian, M., Yoon, T.H., Martinez, D.S.T., Afantitis, A. Methods, Models, Mechanisms and Metadata: Introducing the Nanotoxicology Collection at F1000Research. F1000 Research 2021, 10:1196. (Not reported on APP)
- Tlotleng, N., Jassat, W., Cohen, C., Made, F., Kootbodien, T., Masha, M., Naicker, N. National COVID-19 hospital admissions and mortality among healthcare workers in South Africa, 2020-2021. COVID-19 Special Public Health Surveillance Bulletin, Vol 18. Supplementary Issue 10 (Not reported on APP)

#### **TECHNICAL REPORTS**

- Hoyi, Z., Nkosi, B. Report of an ergonomic risk assessment conducted at the Gauteng Department of Education head office and warehouse. March 2022. Report no. 03/21.
- Makhubele, N., Singo, D., Mokone, M. Bulk sampling for identification of suspected asbestos-containing material conducted at the Department of Correctional Services Voorberg management area. August 2021. Report no. OH19/21.
- Makhubele, N., Singo, D., Mizan, G. Occupational health risk assessment conducted at Department of Correctional Services, Voorberg management area. August 2021. Report no. OH18/21.
- Maso, H., Ndaba, N. Medical report. August 2021. File no.2021/4672.
- Matuka, D.O., Ngcobo, Z., Singh, T. Evaluation of ThornBiovac HVAC 2x55W device in reducing airborne Mycobacterium Tuberculosis (MTB H37Ra) in a laboratory testing facility. October 2021. Report no. 011/21-22.
- Matuka, D.O., Muleba, L., Singh, T. Evaluation of Nano Anion water in reducing surface SARS-Cov-2 in a laboratory testing facility. March 2022. Report no. IM016/21-22A.
- Mokone, M., Singo, D., Du Preez, K. An evaluation of the effectiveness of the local exhaust ventilation systems at the NHLS Tshwane Academic Division, histology and cytology laboratories. February 2022. Report no. OH09/21.
- Naome Mberi, M., Volmink, O. Medical report. December 2021. File no. 2021/4686.
- Ndaba, N., Khoza, C. Medical report. March 2022. File no. 2021/4690.
- Ntlailane, L., Du Preez, K., Mizan, G. *Exposure assessment of hazardous chemical agents at the NHLS CMJAH histology laboratory*. March 2022. Report no. OH07/21.
- Ntlailane L., Mokone, M. Occupational hygiene exposure assessment conducted at NHLS Braamfontein cytology laboratory. July 2021. Report no. OH14/21.

Nyantumbu-Mkhize, B. Determination of suitable working height of sitting workstations for workers in a National Health Laboratory Service Laboratory in Garankuwa, Gauteng. November 2021. Report no. 01/20

Nyantumbu-Mkhize, B., Milanzi, L. Walkthrough at Target Mine in Allanridge, Free State province. December 2021. Report no. 01/21.

- Nyantumbu-Mkhize, B. An ergonomics case report of a worker with Fibromyalgia in a National Health Laboratory Service Laboratory in Johannesburg, Gauteng. January 2022. Report no. 02/21.
- O Elimi, I., Mokone, M., Rangongo, D., Bilankulu, A., Mizan, M., Van Reenen, T. A ventilation assessment conducted at the NIOH, Tony Davies auditorium, Braamfontein. October 2021. Report no. OH11/21.

Sepirwa, E.K., Ndaba, N. Medical report. December 2021. File no. 2021/4680.

#### **SURVEILLANCE REPORTS**

- Buffell, G., Ntlebi, V., Ndaba, N. Occupational Medicine Clinic Surveillance Report: Demographics and Disease Data for April 2019 to March 2020. Report no 1/2022
- Fourie, A., Ratshikhopha, E., Muvhali, M., Singh, T., Willson, K., Ntlebi V. The annual surveillance report on occupational allergies: 2020. Report no. IM 019/21-22.
- Malotle M, Zungu M. The National Health Laboratory Service Tuberculosis Surveillance Report, 2020-2021. March 2021. Report no. 3/2021
- Mhlongo, L., Wilson, K., Kgokong, N., Govind Lakhoo, D., Vorajee, N., Linden, J., McCusker, C., Fassom, D., Gildenhuys, A., Murray, J. Annual pathology disease surveillance report– 2019. Report no. 1/2021

#### **BOOK CHAPTERS**

Vetten M., Gulumian, M. Chapter 13: Sterility Evaluation of Targeted Nanoparticles. In: Drug Delivery with Targeted Nanoparticles: In Vitro and In Vivo Evaluation Methods (1<sup>st</sup> ed.). Çapan, Y., Sahin, A., & Tonbul, H. (Eds.). Jenny Stanford Publishing. https://doi. org/10.1201/9781003164739

#### **CONFERENCE PRESENTATIONS: ORAL PRESENTATIONS INTERNATIONAL**

Gulumian M. Nanorisk Governance Council (NRGC): Perspective from a developing country. Joint NMBP-13 Conference, 14-15 April 2021.

- Gulumian M. Evolving International Methodologies and Tools for Chemicals Risk Assessment. CTDC11 congress in collaboration with WHO the CEC1 workshop, 13 June 2021, Online.
- Singh T, Duba T, Muleba L, Matuka O, Glaser D, Ngcobo Z, Naicker N, Ratshikhopha E, Kirsten Z, van Reenen T, Masuku Z, Sinko D, Ntlailane L, Nthoke T, Jones D, Ross M, du Toit P. A comparative empirical analysis of low-cost decontamination methods for filtering facepiece respirators to address stock shortages during the COVID-19 Pandemic. 33<sup>rd</sup> International Congress on Occupation Health (ICOH 2022). 6-10 February 2022. Safety and Health at Work; 13:S116, 2022.
- Singh T. Overview of biorisk management: reality to resilience. Safety and Health at Work; 13:S81, 2022. Dr Singh co-chaired special session 54 at the ICOH conference entitles. Printed in Safety and Health at Work, Singh, T.; Ross, M. Biorisk Management in the workplace: beyond the tick box.13:S81, 2022.
- Wilson KS. Surveillance of COVID-19 cases among medical laboratory staff in South Africa. The Scientific Committee on Epidemiology in Occupational Health (EPICOH) Conference (EPICOH) 2022. https://oem.bmj.com/content/78/Suppl\_1/A135.2.
- Zungu M, Yassi A, Voyi K, Ramodike J, Kgalamono S, Senabe S, Jones D, Naicker N, Thunzi N, Okpani A, Grant J. *Occupational health information systems for health workers during the COVID-19 pandemic in South Africa*. 33<sup>rd</sup> International Congress on Occupation Health (ICOH 2022). 6-10 February 2022.Safety and Health at Work; Jan 1;13:S211-2.

#### **CONFERENCE PRESENTATIONS: ORAL PRESENTATIONS NATIONAL**

- Andraos C, Dekker K, Gulumian M. Ambient PM10 and Respirable Dust Levels Near Gold Mine Tailings Storage Facilities in South Africa. NHLS Pathology Research and Development Congress (PathReD), 19-22 August 2021, Online.
- Andraos C, Gulumian M. *The Toxicity of Respirable South African Mine Tailings Dust in Relation to their Physicochemical Properties*. NHLS Pathology Research and Development Congress (PathReD), 19-22 August 2021, Online.
- Andraos C. Work conducted during PhD project and suggestions as to how tailings emission could be mitigated. National Association for Clean Air Conference, Technical Session on Mine Dust and Gold Tailings, 7 Oct 2021.

- Andraos C. Hazard Identification and Exposure Assessment of Dust Emissions from South African Gold Mine Tailings Sites. Webinar by the Southern African Institute of Mining and Metallurgy (SAIMM) and the Department of Chemical Engineering, Minerals to Metals (MtM) Initiative and Hydrometallurgy Research Division, UCT, 3 Nov 2021.
- Dabula B, Matatiele P, Southon B, Marageni T, Poongavanum P, and Kgarebe BV. Monitoring the quality of alcohol-based hand sanitizers used in Johannesburg area during the covid-19 pandemic. NHLS Pathology Research and Development Congress (PathReD), 19-22 August 2021, Online.
- Duma B. The Importance of Quality in Biobanking. NHLS Pathology Research and Development Congress (PathReD), 19-22 August 2021, Online.
- Gulumian M. Plenary talk: Interplay between the disciplines of Occupational Toxicology and Occupational Hygiene to reduce risk to the workplace. SAIOH national virtual conference 2021 navigating occupational hygiene in uncharted waters, 20 October 2021.
- Gulumian M. *Risk Assessment of Nanomedicines*. UP Pharmacology Grand Round: Preclinical investigations and risk assessment of nanoparticles, 7 July 2021.
- Gulumian M. *Paving a Successful Research Career*. NHLS Pathology Research and Development Congress (PathReD), 19-22 August 2021, Online.
- Joseph J. Evaluation of phytochemicals, antioxidants, trace elements in Kigelia Africana fruit extracts and chemical profiling analysis using UHPLC-qTOF-MS 2 spectrometry. NHLS Pathology Research and Development Congress (PathReD), 19-22 August 2021, Online.
- Kgarebe BV. Environmental and Biological Monitoring in the Workplace: A 10-year South African Retrospective Analysis. NHLS Pathology Research and Development Congress (PathReD), 19-22 August 2021, Online.
- Kgarebe BV. *Biological monitoring a complimentary technique to support air sampling in determining exposure.* "Navigating Occupational Hygiene in unchartered waters" SAIOH Annual Conference, 18 October 15 November 2021, Online.
- Matuka DO, Duba T, Ngcobo Z, Made F, Muleba L, Nthoke T, Singh T. *Occupational exposure risk to airborne Mycobacterium tuberculosis in a three-tier public healthcare system*. NHLS Pathology Research and Development Congress (Pathred), 19 22 August 2021, Online. (Abstract PRC21-737).

Mbanga O. *Dissolution of silver nanoparticles in simulated biological and environmental fluids*. Wits Postgraduate Affairs 12<sup>th</sup> Cross Faculty Symposium, 26-28 July 2021.

- Mchaki L, Poongavanum P, Okonkwo J, and Kgarebe BV. *Mercury levels in skin lightening creams available in local Johannesburg Markets*. NHLS Pathology Research and Development Congress (Pathred), 19 22 August 2021, Online.
- Poopedi E, Kwenda S, Singh T, Gomba A. *A potential occupational exposure to enteric and respiratory pathogens at wastewater treatment plants: A preliminary study.* NHLS Pathology Research and Development Congress (Pathred), 19-22 August 2021, Online. (Abstract number: PRC21-1221).
- Sanabria N, Kgokong N, Vorajee N. Detection and confirmation of non-small cell lung carcinoma mutations from cases collected over a *decade*. NHLS Pathology Research and Development Congress (PathReD), 19-22 August 2021, Online.
- Tlotleng N. *Translating Public Health Research into Policy*. NHLS Pathology Research and Development Congress (Pathred), 19-22 August 2021, Online.
- Utembe W, N Sanabria and M Gulumian. *Nanomaterials in the treatment of COVID-19: Prospects and challenges*. NHLS Pathology Research and Development Congress (PathReD), 19-22 August 2021, Online.
- Vetten M. Introduction to Nanomedicine and Nanotoxicology. UP Pharmacology Grand Round: Preclinical investigations and risk assessment of nanoparticles, 7 July 2021.
- Vetten M. CytoViva Hyperspectral Imaging (HSI) system and 3D imaging technology: Previous and Potential Applications. NHLS Pathology Research and Development Congress (PathReD), 19-22 August 2021, Online.
- Utembe W and N Sanabria. The roles of toxicology and chemical risk assessment in integrated environmental management, sustainable economic growth and decent work in South Africa. Virtual IAIAsa21 Conference, 17-19 August 2021.

#### **CONFERENCE PRESENTATIONS: POSTER PRESENTATIONS INTERNATIONAL**

- Jambo D, Singh T, Gomba A. SARS-CoV-2 detection and fate at wastewater treatment plants in Gauteng, South Africa: Implications for workers' health and water reuse. 33rd International Congress on Occupation Health (ICOH 2022). 6-10 February 2022. e-Poster.
- Naicker N. Development and challenges of a National Occupational Health Surveillance System for COVID-19 in the workplace. The Scientific Committee on Epidemiology in Occupational Health (EPICOH) Conference (EPICOH) 2022. http://dx.doi.org/10.1136/OEM-2021-EPI.237
- Poopedi E, Kwenda S, Singh T, Gomba A. Potential occupational exposure to respiratory and gastrointestinal bacterial pathogens at wastewater treatment plants, South Africa. 33<sup>rd</sup> International Congress on Occupation Health (ICOH 2022). 6-10 February 2022. e-Poster (One of the top five runners-up out of 41 student posters).
- Sanabria NM, Gulumian M. *Review of nanoparticle-based strategies to combat COVID-19*. Select Science Virtual Biopharmaceutical Summit, 9 Nov 2021.
- Tlotleng N. National Occupational Health Surveillance System for Monitoring COVID-19 disease in South African workplaces. 33rd International Congress on Occupational Health (ICOH 2022). 6-10 February 2022.

#### **CONFERENCE PRESENTATIONS: POSTER PRESENTATIONS NATIONAL**

- Andraos, C. *Basic methodologies for human health risk assessment based on data from the Phongolo case study*. Virtual Workshop on Principles and Methods for the Risk Assessment of Chemical in Food, 26-29 January 2021.
- Andraos C, Gulumian M. *The Role of Nanotechnology in Disinfection and Sanitisation*. NHLS Pathology Research and Development Congress (PathReD), 19-22 August 2021, Online.
- Andraos C, Gulumian M. Interference: A Much-Neglected Aspect in High-Throughput Screening of Nanoparticles. NHLS Pathology Research and Development Congress (PathReD), 19-22 August 2021, Online.
- Jambo D, Singh T, Gomba A. Assessing the presence of SARS-CoV-2 and health implications for wastewater treatment plant personnel at three WTTPS in Gauteng, South Africa. NHLS Pathology Research and Development Congress (Pathred), 19-22 August 2021, Online. (Abstract number: PRC21-1443).
- Joseph J. Nanotechnology and COVID-19 vaccine development. NHLS Pathology Research and Development Congress (PathReD), 19-22 August 2021.
- Joseph J. Trace element and chemical composition analyses in the leaf extracts of Kigelia Africana. NHLS Pathology Research and Development Congress (PathReD), 19-22 August 2021.
- Joseph J. Role of exercise-induced CAMKII activation in the regulation of omega-6 fatty acids and lipid metabolism genes in rat skeletal muscle. NHLS Pathology Research and Development Congress (PathReD) 19-22 August 2021, Online.
- Muleba L, Van-Wyk R, Pienaar J, Ratshikhopha E, Singh T. Assessment of antibacterial effectiveness of hand sanitisers commonly used in South Africa. NHLS Pathology Research and Development Congress (Pathred), 19-22 August 2021, Online. (Abstract PRC21-734)
- Singh T, Duba T, Muleba L, Matuka O, Glaser D, Ngcobo Z, Ratshikhopha E, Kirsten Z, van Reenen T, Masuku Z, Ross M, du Toit P. *Efficacy* of SARS-CoV-2 reduction from filtering facepiece respirators using three decontamination methods. NHLS Pathology Research and Development Congress (Pathred), 19-22 August 2021, Online. (Abstract PRC21-1420).
- Vetten M. Overcoming the challenge of interference of gold nanoparticles in in vitro endotoxin detection assays. NHLS Pathology Research and Development Congress (PathReD), 19-22 August 2021, Online.




#### **Contact Details**

25 Hospital Street Constitution Hill Johannesburg South Africa, 2001

PO Box 4788 Johannesburg South Africa, 2000

Tel: +27 11 712 6400 Fax: +27 11 712 6545 / 6532 Email: info@nioh.ac.za

www.nioh.ac.za

RP157/2022 ISBN: 978-0-621-50385-2