NATIONAL INSTITUTE FOR OCCUPATIONAL HEALTH

Division of the National Health Laboratory Service

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Annual Review

2018-19

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LIST OF ABBREVIATIONS

16S rRNA	16S Ribosomal Ribonucleic Acid
AAS	African Academy of Sciences
ABSA	American Biological Safety Association
ACM	Asbestos-Containing Material
AESA	Alliance for Accelerating Excellence in Science in Africa
AFRICA	Asbestos Fibre Regular Informal Counting Arrangement
AIA	Approved Inspection Authority
AIMS	Asbestos in Materials International Quality Assurance Scheme
ALK	Anaplastic Lymphoma Kinase
AMRC	Asia Monitor Resource Centre
AOP	Adverse Outcomes Pathway
aOR	Adjusted Odd Ratio
APHL	Association of Public Health Laboratories
AR	Annual Report
ARAOH	African Regional Association for Occupational Health
ART	Asbestos Relief Trust
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers
AU	African Union
BOHS	British Occupational Hygiene Society
BRICS	Brazil, Russia, India, China and South Africa
BTech	Bachelor of Technology
CC	Collaborating Centre
CDC	Centers for Disease Control and Prevention, US
CEI	Cumulative Exposure Index
CHBH	Chris Hani Baragwanath Hospital
CEO	Chief Executive Officer
CKDu	Chronic Kidney Disease of Unknown Origin
CMD	Common Mental Disorder
CMJAH	Charlotte Maxeke Johannesburg Academic Hospital
CMSA	Colleges of Medicine of South Africa
CoBNeST	First Conference of Biomedical and Natural Sciences and Therapeutics
CoJ	City of Johannesburg
COPD	Chronic Obstructive Pulmonary Disease
COSATU	Congress of South African Trade Unions
CPD	Continuing Professional Development
CSIR	Council for Scientific and Industrial Research
CXR	Chest X-ray
DAFF	Department of Agriculture, Forestry and Fisheries
DCS	Department of Correctional Services
DEFF	Department of Environment, Forestry and Fisheries
DEL	Department of Employment and Labour
DIY	Do-it-yourself
DMRE	The Department of Mineral Resources and Energy
DoH	Department of Health

DOH	Diploma in Occupational Health
DOHM	Diploma in Occupational Health and Medicine
dsDNA	Double-stranded Deoxyribonucleic Acid
DST	Department of Science and Technology
DUT	Durban University of Technology
EHWP	Employee Health and Wellness Programme
EOC	Emergency Operations Centre
EQA	External Quality Assurance
ESBB	European, Middle Eastern and African Society for Biopreservation and Biobanking
EU	European Union
FIOH	Finnish Institute for Occupational Health
FTIR	Fourier Transmission Infrared Spectroscopy
GEMP	Graduate Entry Medical Programme
G-EQUAS	German External Quality Assessment Scheme
GLP	Good Laboratory Practice
HBA	Hazardous Biological Agent
HCAI	Healthcare Associated Infection
HCW	Healthcare Worker
HIV	Human Immunodeficiency Virus
HOSPERSA	Health & Other Services Personnel Trade Union of South Africa
HPCSA	Health Professionals Council of South Africa
HRA	Health Risk Assessment
HSE	Health, Safety and Environment
HSL	Health and Safety Laboratory, UK
HTS	High-throughput Screening
IAEA	International Atomic Energy Agency
IAP	International Academy of Pathology
ICOH	International Commission on Occupational Health
ICP-MS	Inductively-coupled Plasma Mass Spectrometry
ICTXV	International Congress of Toxicology
ILO	International Labour Organization
IPC	Infection Prevention and Control
ISBER	International Society for Biological and Environmental Repositories
ISO	International Organization for Standardization
IT	Information Technology
IUTOX	International Union of Toxicology
KRT	Kgalagadi Relief Trust
LAMP	Lead and Multi-element Proficiency Program, CDC
LIS	Laboratory Information System
MBA	Master Builders Association
MBOD	Medical Bureau for Occupational Diseases
MHSC	Mine Health and Safety Council
MMed	Master of Medicine Degree
MMPA	Mine Medical Professionals Association

MN	Manufactured Nanomaterials
MoU	Memorandum of Understanding
MPH	Masters in Public Health
MRC	Medical Research Council
MSc	Master of Science
MTech	Master of Technology
NCR	National Cancer Registry
NEPAD	New Partnership for Africa's Development
NGO	Nongovernmental organisation
NHLS	National Health Laboratory Service
NICD	National Institute for Communicable Diseases
NIOH	National Institute for Occupational Health
NIOSH	National Institute for Occupational Safety and Health (US)
NMISA	National Metrology Institute of South Africa
NMMU	Nelson Mandela Metropolitan University
NPCA	NEPAD Planning and Coordinating Agency
NRF	National Research Foundation
NUM	National Union of Mineworkers
NWIP	New Work Item Proposals
OCSA	Occupational Care South Africa
OECD	Organisation for Economic Co-operation and Development
OEHS	Occupational and Environmental Health and Safety
OHASIS	Occupational Health and Safety Information System
OHN	Occupational Health Nurse
OHS	Occupational Health and Safety
OHTA	Occupational Hygiene Training Association
OMP	Occupational Medicine Practitioner
OPS	Optical Particle Sizer
PATHAUT	Pathology Disease Surveillance Database
PathRed	Pathology Research and Development Congress
PCM	Phase Contrast Microscopy
PCR	Polymerase Chain Reaction
PHASA	Public Health Association of South Africa
PhD	Doctor in Philosophy
PPE	Personal Protective Equipment
PTS	Proficiency Testing Scheme
QA	Quality Assurance
QC	Quality Control
QMS	Quality Management System
qPCR	Quantitative Polymerase Chain Reaction
R&D	Research and Development
RSR	Railway Safety Regulator
RW	Reclaimed Water
SABS	South African Bureau of Standards

SACNASP	South African Council for Natural Scientific Professions
SADC	Southern African Development Community
SAFCEC	South African Forum of Civil Engineering Contractors
SAFETP	South African Field Epidemiology Training Programme
SAGS	South African Genetics Society
SAIMR	South African Institute for Medical Research
SAIOH	Southern African Institute for Occupational Hygiene
SAMHS	South African Military Health Services
SAMRC	South African Medical Research Council
SANAS	South African National Accreditation System
SANDF	South African National Defence Force
SAMRC	South African Medical Research Council
SANTACO	South African National Taxi Council
SASBi	South African Society for Bioinformatics
SASOHN	South African Society of Occupational Health Nursing Practitioners
SASOM	South African Society of Occupational Medicine
SATIBA	South African Tissue Bank
SDG	Sustainable Development Goal
SDS	Safety Data Sheet
SETAC	Society of Environmental Toxicology and Chemistry
SFSA	Science Forum South Africa
SG8	Steering Group 8
SGTA	Steering Group on Test Guidelines
SHE	Safety, Health and Environment
SHSPH	School of Health Systems and Public Health
SIA	Safe Innovation Approach
SKA	Square Kilometre Array
SLA	Service Level Agreement
SMME	Small, Medium and Micro-sized Enterprise
SMP	Scanning Mobility Particle
SOC	State-owned Company
SOP	Standard Operating Procedure
SOT	Society of Toxicology
SPT	Skin Prick Testing
SRA	Society of Risk Analysis
TAT	Turnaround Time
TB	Tuberculosis
THRIP	Technology and Human Resources for Industry Programme
TUT	Tshwane University of Technology
UBC	University of British Columbia
UCT	University of Cape Town
UJ	University of Johannesburg
UK	United Kingdom
UL	University of Limpopo

UN	United Nations
UNGA	United Nations General Assembly
UP	University of Pretoria
URL	Uniform Resource Locator
USA	United States of America
UVGI	Ultraviolet Germicidal Irradiation
VBA	Visual Basic for Applications
WHO	World Health Organization
WHWB	Workplace Health Without Borders
Wits	University of the Witwatersrand
WPMN	Working Party on Manufactured Nanomaterials
WRC	Water Research Commission
WWTP	Wastewater Treatment Plant
XRD	X-ray Diffraction

**Throughout this Annual Review the NIOH is using the current nomenclature for all Government Departments.*

EXECUTIVE DIRECTOR'S OVERVIEW

EXECUTIVE DIRECTOR'S OVERVIEW

Sophia Kisting
Executive Director
(term ended 31 December 2018)

Muzimkhulu Zungu
Acting Executive Director
(January to March 2019)

Under the leadership of the NHLS, the NIOH had a particularly rewarding year in Occupational and Environmental Health and Safety (OEHS). The diverse and multi-disciplinary teams of the NIOH participated in a large number of challenging OEHS engagements in both the public and private sectors. These ranged from cutting edge research at a national and global level, to supporting innovative programmes to reduce workplace violence. In the process, NIOH worked alongside a large number of world of work role players locally, nationally and internationally. NIOH staff members were enriched by these experiences and remain committed to continue to excel in the coming years in an effort to work towards greater prevention in all workplaces.

Prevention of occupational and environmental diseases and injuries

The multi-disciplinary teams of the NIOH continued to collaborate with government departments, the private sector, trade unions and employer organisations to focus on a culture of prevention in workplaces. This supports the NIOH mission to help reduce the national and global burden of disease through workplace interventions and contributes significantly to the realisation of the Sustainable Development Goals (SDGs), especially health, decent work and gender equity. The success of this collaboration underscores the importance of each department in the NIOH having its own unique expertise, yet being able to leverage the skills and interdependence for the institute to achieve its collective mandate of being a critical national resource.

The changing world of work

The NIOH made significant efforts to integrate the local, regional and global changes that impact OHS through teaching and training initiatives. This includes aspects such as changes in the arrangement of work, technology (digitalisation and ICT, platform work, artificial intelligence, automation and robotics), globalisation and climate change, all of which are drivers that have a profound impact on OEHS. There are also the persistent traditional and re-emerging OEHS risks (TB, silica, asbestos, occupational allergens, cancer, occupational stress, etc.) across continents and between developing and developed countries which require new approaches for worker and community health and safety. The emergence of new technologies and innovations provide golden opportunities for sustainable preventive practices in OEHS.

Gender and the world of work

During the previous financial years, the institute, through a review of OEHS systems, identified an important gap, specifically regarding gender concerns in the world of work. To find appropriate solutions, the NIOH continued to work on the findings of the participatory gender audit, which was supported by national and international gender experts and the very active NIOH Gender Committee. With support from government departments, trade unions, employer organisations and international agencies, the NIOH celebrated the third

anniversary of the launch of the NIOH's Gender@Work Programme on 8 March 2018. Achievements towards greater gender equity during the past years were celebrated with support from the NHLS and the broader world of work. One of the important national and global themes that NIOH is providing input on, is the major challenge of workplace violence in its many different formats.

Specialised and other services

The NIOH and its partners in government and in the private sector continued with a comprehensive range of activities to address OEHS needs in different sectors of the economy. These activities cover OEHS policy advice, teaching and training, technical support to several government departments, trade unions and employers; research and different aspects of OEHS surveillance and information services, as well as the provision of specialised laboratory services. The NIOH further strengthened the understanding and practice of workplace ethics for OEHS professionals and will continue to emphasise this.

The NIOH continues to provide discipline-specific information to many industrial sectors and government departments. Its laboratory services include asbestos identification and counting; diagnostic lung pathology; analytical chemistry (e.g. for biological monitoring of specimens); the identification of components of dusts (respirable crystalline silica in particular); microbial air sampling; allergy diagnostics; nanoparticles and in vitro risk assessments. Discipline-specific services include occupational medicine, ergonomics, occupational hygiene, occupational toxicology, immunology and microbiology, and occupational epidemiology. Information services are a core service of many national institutes of health around the world, partly due to the scarcity of sources of information elsewhere, as is the case in South Africa. The unique national occupational health library continues to provide support and information well beyond the borders of South Africa.

The Biobank, housed within the NIOH, grew significantly in the year under review, and is successfully housing thousands of specimens from different government departments. The Workplace HIV and TB Unit continues to make important contributions to both scientific research and service delivery, especially in the mining and health sectors, in close collaboration with the WHO and the International Labour Organization (ILO). This included support for health workers through the rollout of training in different countries in Southern Africa on the WHO/ILO HealthWISE Programme.

The Graphics, Marketing and Communication Section continued to raise the profile of the institute through strengthening engagement with OEHS programmes nationally and internationally, and coordinating the development of a new website, as well as through thought-leader and editorial placement in many publications. The Finance and General Services Section ensured the strategic and careful upgrading of the NIOH building in line with health and safety standards continued during the period under review.

The Safety Health and Environment (SHE) and Information Technology (IT) Departments made significant strides in the pioneering of the Occupational Health and Safety Information System (OHASIS). This user-friendly information system supports compliance with OEHS legislation, enables online training and provides information for research analysis. The OHASIS is increasingly being rolled out to centres beyond the NHLS and NIOH, as well as in neighbouring countries. This bodes extremely well for the much-needed strengthening of OEHS information systems for research and evidence-informed workplace interventions. The successful roll-out to Namibia and Gauteng DoH is encouraging and planning has begun for Mpumalanga, the Western Cape Departments of Health and the Lesotho DoH.

Research

The NIOH aims to continue to generate new knowledge through the rigour of good scientific research on key OEHS issues, especially those that affect South Africa and the rest of the African continent. Collectively, the research projects are testimony to the many OEHS issues that require new knowledge. It is also important to grow the scope of the institute's research efforts and to strategically increase engagement of younger researchers. This was especially evident in the presentations by young researchers at the NIOH biennial Research Day. It is notable that the research focus of the NIOH has increasingly broadened to include aspects of environmental health, gender concerns and reproductive health, informal economy, problems related

to coal workers, climate change, as well as important policy concerns. Stemming from this research, the NIOH published 32 articles in peer-reviewed journals, authored 34 technical reports and generated 4 annual surveillance reports during the period under review. The scientific publications demonstrate a focus on many of the priority OEHS issues with which our country is faced. Among the topics covered, were asbestos in schools and in homes; preventing TB in individuals with silicosis; TB prevention in healthcare workers; noise-induced hearing loss and hearing conservation; occupations and lung cancer; water quality in hospitals; health effects in populations living around gold mine tailings; pesticides; and nanoparticles and health.

International collaboration

The annual report details the institute's extensive collaboration with neighbouring countries in Africa, including joint work with the Africa Union (AU) and the New Partnership for Africa's Development (NEPAD). The NIOH participated with the AU and NEPAD in a TB side event when the United Nations (UN) General Assembly adopted the declaration of the first-ever UN high-level meeting on ending TB. It is envisaged that through NHLS and the International Commission on Occupational Health (ICOH), the NIOH will continue to support the active role of workplaces towards the implementation of this declaration.

Through active participation in the committees and sub-committees of the century old ICOH, the institute has excellent collaboration with colleagues and OSH institutes across the globe. Members of the NIOH are often also the lead in these committees. The institute works extensively also with different departments in the ILO to provide research and service delivery, as well as teaching and training in Southern Africa.

As a WHO Collaborating Centre, the NIOH collaborates with many of the 44 WHO Collaborating Centres, including those from the Brazil, Russia, India, and China (BRICS) countries. The NIOH is leading also as a coordinating centre for the global project on the informal economy and vulnerable workers.

Key public health reports

The NIOH is proud to be associated with the collaborative development of reports, which we trust can be the catalysts for ongoing collaboration and implementation of more systematic OHS services for health workers. This includes a road map for OHS for health workers in South Africa, a situational analysis of OHS in one of the provinces and a position paper for the ICOH on TB in health workers.

The future

Looking to 2019 and beyond, the NIOH will continue to help reduce the decent work deficit in our country, support ongoing efforts to reduce workplace inequality and strengthen the protection of human rights. Given the heavy burden of disease, it is incumbent upon the institute to help nurture a culture of greater prevention of OEHS diseases and injuries and to urgently find ways to continue to support greater OEHS awareness.

Health challenges, such as hypertension, diabetes, TB and stress, which are very often exacerbated by poor conditions of work, will also be addressed. Important areas that will require more attention relate to OEHS gender concerns, and OEHS for migrant workers, subcontracted workers, young workers and workers with disabilities.

It is the aim of the institute to systematically contribute to specific areas of work such as the end of TB by 2030 and support for the SDGs. The NIOH staff members and the City of Johannesburg made concerted efforts on a voluntary basis throughout the year to provide workers in the fields of security, cleaning and gardening services with training. This involved skills ranging from fire-fighting and first aid competency, to basic computer training. More strategic efforts are however required to reach more workers in precarious work.

Conclusion

The NIOH invites the actors of the world of work and the broader South African public to participate in the journey to build on our collective strength to utilise the potential of all workplaces for better OEHS, for decent jobs and happier workplaces, and for the protection of human rights, greater productivity, greater equity and ultimately for sustainable economies.

PATHOLOGY DIVISION

PATHOLOGY DIVISION

Dr Naseema Vorajee
Head

The origins of the Pathology Division lie in the Pneumoconiosis Research Unit that was founded in 1953 to conduct research into dust-induced lung diseases in mine workers. While working at this unit, Dr J C Wagner discovered the causal link between crocidolite asbestos and malignant mesothelioma of the pleura. The work of the Pathology Division traditionally focused on occupational lung disease and continues to provide an autopsy service to assist with the compensation of the families of deceased mine workers.

Through expertise gained in lung pathology, the Division has become a referral centre for lung biopsies obtained at surgery. In 2018, the Pathology Division continued with its appointment as a provider of pathology services to the Centre of Pulmonary Excellence (Lung Laboratory Research and Intervention Centre). The Division has been assisting with diagnostic surgical pathology services for the Limpopo Province. In addition to these pathology services, the Division offers analytical electron microscopy services.

The service work of the Division provides data and material for teaching, research and surveillance purposes. The quality of the work in the laboratories of the Section is maintained through participation in external quality assurance (EQA) schemes and accreditation with the South African National Accreditation System (SANAS), in accordance with the recognised International Organization for Standardization (ISO) ISO 15189:2007.

DIAGNOSTIC SERVICES

Autopsies

In terms of the Occupational Diseases in Mines and Works Act: Act 78 of 1973, the Pathology Section continues to execute the statutory requirement of examining the cardiorespiratory organs of deceased miners. A pathology report of this examination is sent to the mines' Medical Bureau for Occupational Diseases (MBOD) to assist with the compensation process for families of deceased mine workers.

To promote the use of the autopsy service, to raise awareness and educate our clients about the services provided by the National Institute for Occupational Health (NIOH), a number of presentations and workshops were conducted for stakeholders. Despite these efforts, the number of autopsies continue to decline. In the 2018 calendar year 772 autopsies were performed, which is a decrease from 801 performed in the previous year. While this may reflect the decreasing number of miners working in the industry, there is a recognised need to facilitate access to the compensation system, particularly for ex-miners who die at home in the labour sending areas of the Eastern Cape or neighbouring Southern African Development Community (SADC) countries.

The autopsy service generates substantial information from the examination of lungs. Approximately 200 items of information are carefully recorded by the examining pathologists. This information is entered into the Pathology Disease Surveillance Database (PATHAUT). This database is a national resource and contains unique information about diseases in the mining industry. The database has been and continues to be used extensively for research in collaboration with local and international collaborators and over 150 peer reviewed publications were produced through the use of this data. The database 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. Annually, the PATHAUT database is used to produce detailed disease surveillance reports that indicate demographic data and disease rates. These are made available in the public domain through the NIOH website at the following URL: http://www.nioh.ac.za/wpcontent/uploads/2019/02/2017-PATHAUT.pdf

Surgical pathology

The Division has vast experience of 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. During 2017, the Centre of Pulmonary Excellence requested that the NIOH Pathology Division provides pathology expertise and services for the newly established centre, which officially opened in April 2018.

Due to a lack of capacity at the National Health Laboratory Service (NHLS) laboratories, the NIOH Pathology Division accepted the request in October 2017 to be the service provider for general surgical pathology to Limpopo Province. This resulted in an improved pathology service to the province. The general surgical pathology specimens received from Limpopo Province affords an opportunity for the pathologists at the NIOH to examine a broad range of general pathology. A total number of 15064 biopsies was received from Limpopo and 540 biopsies, including referral cases for consultation, were received from Gauteng.

Electron microscopy

The Electron Microscopy Unit forms part of the Pathology Division and supplements its services by determining the asbestos fibre concentrations in lung tissue to assist with diagnoses of asbestos-related diseases. The Unit is headed by Prof JI Phillips, who is a National Research Foundation (NRF)-rated scientist. During the third quarter of the period under review, Prof Phillips retired from the NIOH after 25 years of service in the Pathology Division. His contribution to the Division was significant and included mentorship to young researchers, research assistance through the Research Committee of the NIOH as well as teaching and training.

Electron Microscopy Unit conducts qualitative and quantitative analyses for the presence of asbestos fibres. Analyses are conducted on bulk materials and air samples, which are obtained from filters. These analyses are performed for other Sections of the NIOH and external clients, including national, provincial and local government, nongovernmental organisations (NGOs), universities and private businesses. The Unit participates in an external quality assurance (EQA) scheme and maintained its satisfactory rating in the Asbestos in Materials International Quality Assurance Scheme (AIMS) that is coordinated by the Health and Safety Laboratory (HSL), in the United Kingdom (UK).

The service to analyse samples for asbestos was first offered in 2003. Since then, data generated from the samples and submitted for analysis, has been stored and entered into a database. This database is the only one of its kind in South Africa and its interrogation provides unique information about the legacy of asbestos in the country. To date, the database contains over 3000 entries with information regarding the type of sample, where it originates from and the type of industrial sector, as well as the activity that was performed, such as the renovation of a structure that contains asbestos. This information was used to produce an annual surveillance report, which is available in the public domain through the NIOH website, at the following URL: http://www.nioh.ac.za/wp-content/uploads/2018/03/Asbestos-surveillance-report-2018_Final1.pdf

RESEARCH

Research relevant to the health of South African workers is executed by members of the Pathology Division staff. Material and data from the services rendered by the Division provide a substantial quota of information for research projects. Current areas of interest focus on diseases of the lung in mine workers caused by exposure to silica dust or asbestos fibres. We have collected data on women employed in mining since 2005 and this data is currently being analysed.

Staff in the Division co-authored six articles in scientific journals. The Division also produced the PATHAUT annual report (AR) on autopsy examinations executed in 2017. This report is of great value for researchers in the mining industry.

Prof Phillips chairs the NIOH Research Committee and chaired the NIOH monthly Research Forum until his retirement in November 2018. He was the Vice Chairperson of the NHLS Research Development Committee and represented the NIOH on the NHLS Research and Innovation Committee throughout the period under review.

Dr Naseema Vorajee is currently registered for a Postgraduate Diploma in Occupational Health at the University of the Witwatersrand (Wits). This is her second year of study.

Ms N Kgokong is registered for a Master of Science (MSc) degree at Wits.

The Pathology Division collaborates with other Sections within the NIOH and assists with projects that involve the enumeration and identification of asbestos. Relationships are cultivated with relevant local and international institutions, which currently includes:

- The Centre for Scientific and Industrial Research (CSIR);
- Wits: Schools of Pathology, Public Health, Clinical Medicine and Archaeology;
- University of Johannesburg (UJ): Faculty of Health Sciences;
- The Health and Safety Laboratory (HSL),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;
- Environmental and Occupational Health Sciences; and
- The School of Public Health, Chicago, Illinois.

The Division also receives visitors from these local and international institutions throughout the year.

TEACHING AND TRAINING

The Division conducts teaching and training through workshops, presentations and formal lecturing to professional bodies, universities and teaching hospitals. Prof J Murray is an Associate Professor at the School of Public Health and Prof J I Phillips was a Visiting Professor at UJ, where he chaired the Academic Advisory Committee and was a moderator for honours examinations. He was an invited speaker at the Pathology Research and Development (PathRed) Congress Innovation Summit which was held at the NHLS PRF Auditorium in Johannesburg, from 1 - 3 August 2018.

During the year, Mr D Africa and Dr N Vorajee conducted presentations to representatives from the mining industry, including organised labour. Mr D Africa assists laboratory aids, medical technicians and technologists to prepare for their National Board Examinations by providing tuition once a week.

Staff members participate in the mentoring, teaching and supervision of 11 Masters students at Wits and UJ. Teaching is also provided to Diploma in Occupational Health (DOH) students, medical students and allied healthcare students from Wits.

Figure 1: Multiple foci of necrosis, with areas of confluent necrosis - Tuberculous bronchopneumonia.

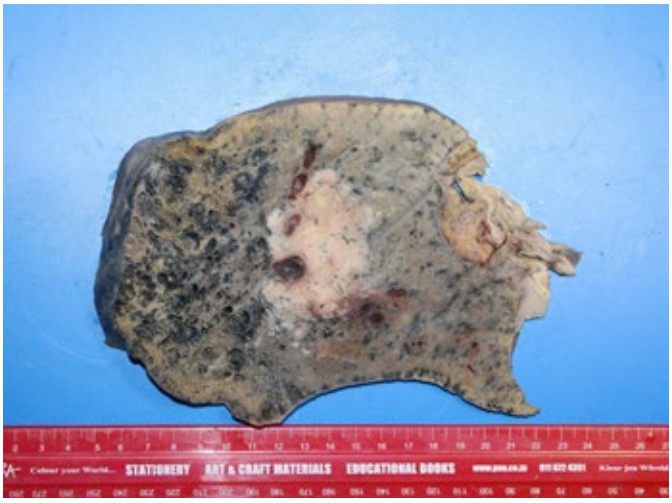


Figure 2: Centrally based tumour involving the right lung, with pulmonary fibrosis - Squamous cell carcinoma with asbestosis.

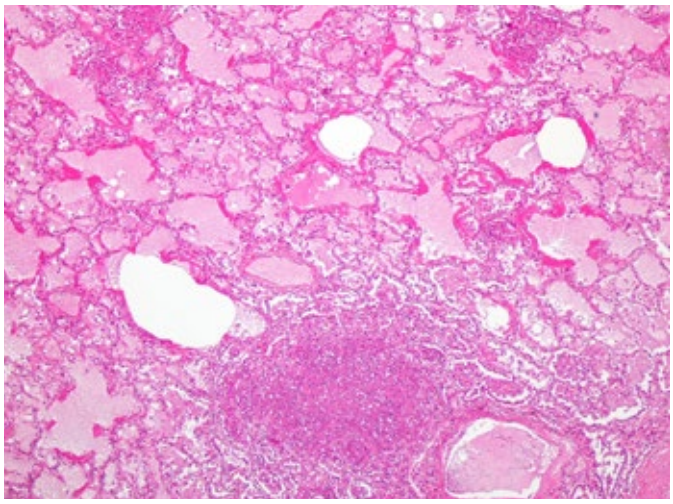


Figure 3: Suppurative inflammation and necrosis within the alveolar parenchyma.

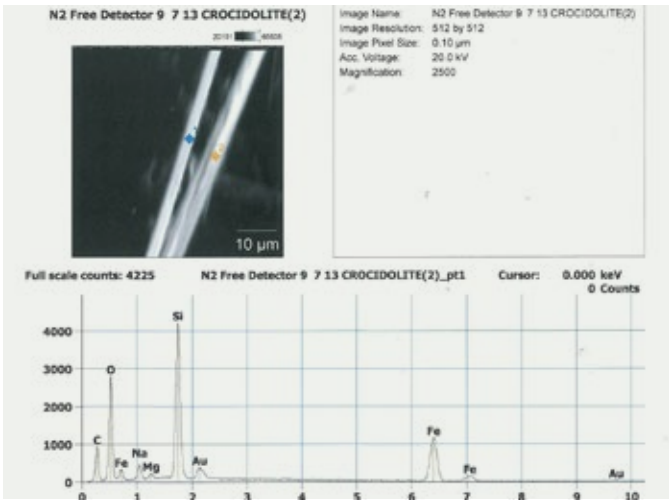


Figure 4: A scanning electron micrograph of crocidolite asbestos.

Drs Linden and Lakhoo are joint staff members at Wits and lecture undergraduate students from the Faculty of Health Sciences.

Drs Vorajee, Lakhoo and Linden actively participate in, and present cases at regular clinical pathology meetings with doctors from the Johannesburg teaching hospitals. Specialised training is provided to small groups of healthcare professionals, mineworkers, organised labour, and mortuary and funeral parlour staff. In collaboration with trade unions, members of the Pathology Division also conducted workshops that focused on lung disease.

Ms Kgokong presented the research findings on Women in South African Mines at the Public Health Association of South Africa (PHASA) conference in Parys on 10 September 2018, and at the UJ Biomedical Symposium that took place in Johannesburg from 10 - 12 September 2018.

Drs Lakhoo and Linden participated in and presented posters at the South African International Academy of Pathology (IAP) Congress held in Cape Town from 16 - 18 August 2018.

OCCUPATIONAL MEDICINE AND EPIDEMIOLOGY DIVISION

OCCUPATIONAL MEDICINE AND EPIDEMIOLOGY DIVISION

Prof David Rees
Head

The Section comprises three Sections, namely:

- Occupational Medicine;
- Immunology and Microbiology; and
- Epidemiology and Surveillance.

The Sections' reports follow this brief introduction, which focuses on notable aspects of the Sections' work in the reporting year.

As reported by Dr Spo Kgalamono, Head of Occupational Medicine, an important aspect of the Section's work in 2018/2019, was the substantial contribution to a roadmap for Occupational Health and Safety (OHS) for health workers in the provincial and national Departments of Health. The roadmap was requested by the DoH, and the work was undertaken by the NIOH as a whole. The roadmap serves to identify the OHS challenges that health workers within the public health sector are faced with and to formulate interventions to improve OHS services in the sector.

After a situational analysis which was conducted in collaboration with the provincial Departments of Health, recommendations were developed to address the challenges and gaps identified. Subsequently, a draft document on key steps that are required to improve OHS services for public sector health workers, and to comply with OHS legislation was submitted to the DoH.

The Section participated in a number of significant workplace evaluations and surveys, amongst others at the central offices of the national DoH. Data from two substantial field surveys was analysed and based on this, scientific publications were prepared. These projects are novel to South Africa. One addresses chronic kidney disease of unknown origin (CKDu) in sugarcane workers, and the other analyses respiratory health effects that are associated with residence in close proximity to gold mine dumps. Both projects were supported by the Epidemiology and Surveillance Section.

An impressive programme of teaching and training was a key feature of the Immunology and Microbiology Section's work this year. Dr Tanusha Singh, the Section's head, and the staff of the Section made a substantial contribution to this aspect of the NIOH's work through high quality courses and workshops on issues that are directly relevant to improving occupational health practice.

As described by Dr Singh in her report, nine training initiatives were conducted during the year to raise awareness of occupational allergies and infectious diseases. These unique training events were conducted in no less than four provinces, namely: Gauteng, Free State, Mpumalanga and KwaZulu-Natal. Through the training, 307 workers were empowered to effect positive change in their workplaces. The training sessions covered the following topics:

- Occupational health, safety and wellness: street waste recyclers;
- Reclaimed water workshop;
- Allergies in the workplace: a diagnostic approach (two workshops);
- Fungal disease in the workplace – awareness week;
- Workplace Biorisk Management Course;
- Global Handwash Day; and
- Hand hygiene and infection control.

Dr Singh was appointed as the Chairperson of the NIOH's Research Committee in recognition of her substantial contribution to the NIOH research, her mentorship and supervision of early researchers and her exceptional organisational abilities.

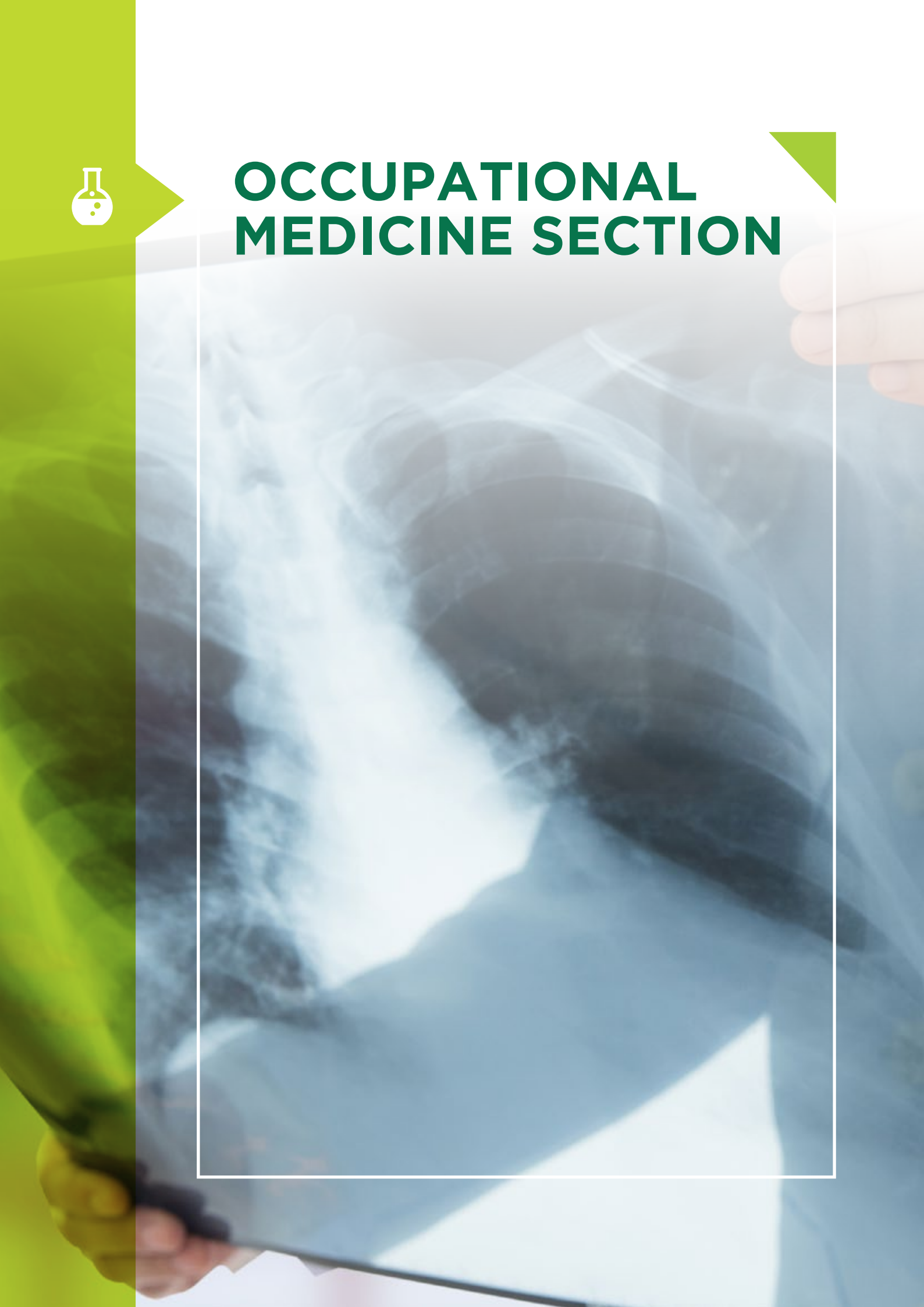
As noted previously, the World Health Organization (WHO) identified vulnerable workers as an occupational health priority. The informal economy contains a substantial number of the world's vulnerable workers, and it is therefore appropriate that the Epidemiology and Surveillance Section and its Head, Dr Nisha Naicker, have become increasingly active in OHS in informal work.

The Section recently undertook a research project on working conditions and health outcomes of caddies working on golf courses in the City of Johannesburg (CoJ). A report on this project with recommendations was published in February 2019. For information or comments, please contact NishaN@nioh.ac.za.

Future research areas that were identified include pesticide exposure and interventions to reduce it; and follow up post ergonomic interventions, to reduce musculoskeletal disorders. The Section collectively commenced with a systematic review of health outcomes and access to health services of informal workers in collaboration with the WHO. The Heads of all three Sections are involved in the project. The review should be completed by the end of 2019.

A significant amount of data was collected during the reporting period on informal waste recyclers (also known as waste pickers) to identify risks to their health and ways to ameliorate them. Publications based on the findings are in preparation.

OCCUPATIONAL MEDICINE SECTION



OCCUPATIONAL MEDICINE SECTION

Dr Spo Kgalamono
Head

The Occupational Medicine Section comprises the Occupational Medicine Referral Clinic and the Ergonomics Unit. The Section plays a fundamental role in building capacity in occupational health for occupational health nurses (OHNs) and doctors (OMPs) nationally, including the neighbouring SADC countries, in both the public and private sectors. This is achieved through training, research, advice on occupational health issues, ergonomic risk assessments and medical assessments of employees that are referred by trade unions and health professionals.

The Section's engagements and priorities within South Africa remain focused on capacity building for occupational health practitioners, strengthening of relations with governmental departments, surveillance and conducting research that supports the development of policy and legislation. This overview covers the activities of the Occupational Medicine Section for the period under review.

DIAGNOSTIC SERVICES

Diagnostic services conducted by the Section include clinical assessments and special investigations of cases referred to the Occupational Medicine Referral Clinic as well as other services offered to private and public entities such as the national DoH.

The clinic, which is the largest of the three specialist occupational medicine clinics in the country, receives referrals from South Africa and its neighbouring countries. It contributes to preventative initiatives through comprehensive case evaluations that include advice on workplace hazard control measures.

The clinic attended to 236 clinical cases from different industries. The majority of patients referred to the Occupational Medicine Clinic between April 2018 and March 2019, were from Gauteng (n=138, 58.47%), followed by Mpumalanga (n=71, 30.08) and North West (n=18, 7.63%). Limpopo (n=7, 2.97%), Free State (n=1, 0.42%) and KwaZulu-Natal (n=1, 0.42%) only contributed to a marginal number of patients referred.

Figure 1 below illustrates the health outcomes of the cases assessed during this period.

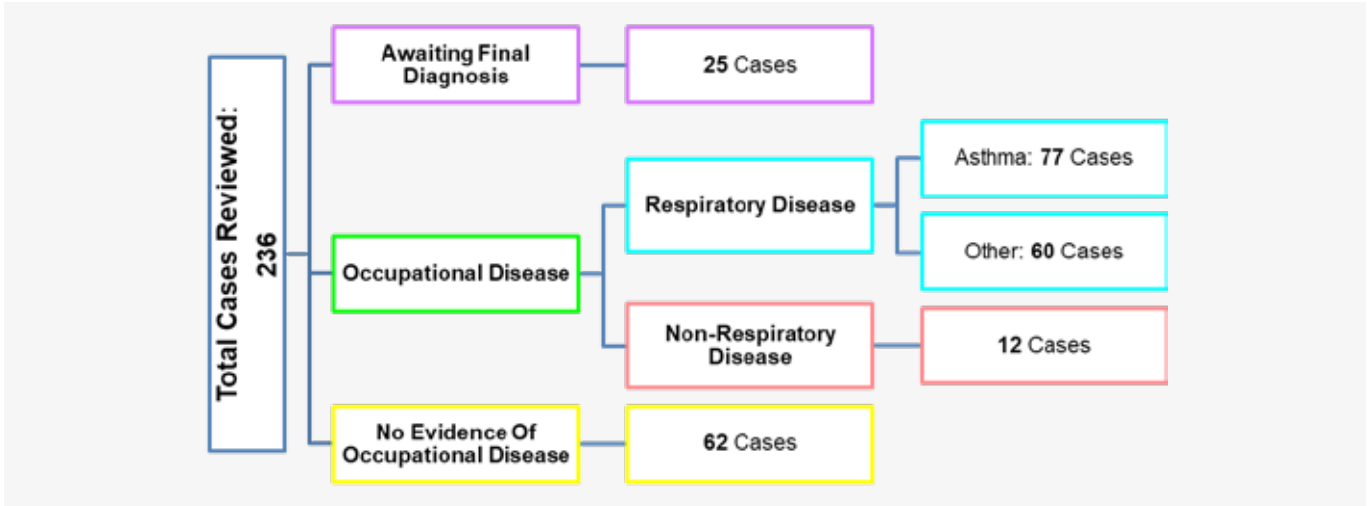


Figure 1: Cases reviewed at the National Institute for Occupation Health Occupational Medicine Referral Clinic, from April 2018 – March 2019.

From the cases confirmed as occupational diseases, 77% were diagnosed as occupational asthma. Chronic obstructive pulmonary disease (COPD) accounted for 11% of cases, whilst pneumoconiosis were confirmed in 8% of cases. The remainder consisted of musculoskeletal disorders, connective tissue diseases, etc.

The majority of cases originated from the mining, utilities and manufacturing industries as shown in figure 2 below. These industries have good occupational health services in place to improve employee health.

Figure 2: Top 5 Industries Represented

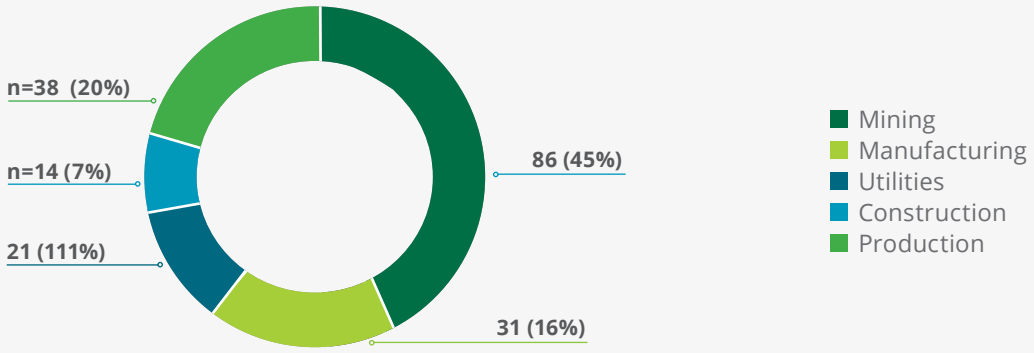


Figure 2: Top five industries represented.

SUPPORT TO GOVERNMENT ENTITIES

The Section provided support to national government departments and provinces. The nature of support provided included:

- Capacity building;
- Guidance on development of policies;
- Assistance with legislative reforms and compliance; and
- Fulfilment of statutory duties.

The Medical Bureau for Occupational Diseases (Reviewing Authority)

The four occupational medicine specialists in the Section executed functions and services as part of the Medical Bureau for Occupational Diseases (MBOD) Medical Reviewing Authority for Occupational Diseases, appointed by the Minister of Health, as per Section 40 of the Occupational Diseases in Mines and Works Act of 1973 (Act 78 of 1973) as amended by (Act 208 of 1993). These services include:

- Reviewing appeals from cases certified by the certification panel;
- Gathering evidence and necessary details on cases;
- Determining the validity of the appeal; and
- Where necessary, escalating the cases to the Joint Committee for final adjudication.

As a spin-off from rendering this service, the Section identified several training opportunities and refresher courses for continuing professional development (CPD).

National Department of Health roadmap on occupational health

The national DoH requested the assistance of the NIOH in the provision of a roadmap or overarching strategy for OHS for health workers. The roadmap aims to provide insights into the OHS challenges of health workers within the public health sector.

The NIOH, in collaboration with the provincial departments of health, conducted a situational analysis that identified challenges and gaps in the provision of OHS services provided for health workers.

Recommendations were developed to address these challenges and gaps. In addition, the Section submitted a draft roadmap to the DoH, which included key steps that are required to improve OHS for public sector health workers and compliance with legislation.

National Department of Labour and others

Several staff members form part of the Department of Employment and Labour (DEL) technical committees who are currently amending OHS legislation, particularly the medical surveillance aspect of specific regulations. The Section also supports the strengthening of occupational health services by working closely with other governmental entities like the Department of Environment, Forestry and Fisheries (DEFF) and The Department of Mineral Resources and Energy (DMRE).

Support to organised labour

The Section supports organised labour on any issue pertaining to occupational health. Labour representatives refer employees to the clinic for a second opinion on diagnoses, compensation outcomes, and fitness for duty disputes between medical practitioners and employees. During the year, the Section successfully addressed 32 cases and identified that shop stewards should be empowered through knowledge on occupational health legislation. Several topics were presented to trade union members by Drs Volmink, Iyaloo, Magombo and Kgalamono.

In addition, the Section finalised a two-year project with one of the mining houses, that stemmed from a query from the trade unions. The query involved employee complaints of contracting occupational diseases due to hazardous exposure in some sections of the mine. The Section issued a final report to the company with recommendations for improvement of OHS in the work environment.

RESEARCH

Key research projects conducted within the Section were mainly postgraduate research projects as part of academic qualifications for the three registrars in the Section, as well as supervision of postgraduate students who are completing their academic qualifications at various tertiary institutions. The key projects completed by the Section are summarised below.

Respiratory Health in a Community Living in Close Proximity to Gold Mine Waste Dumps, Johannesburg, South Africa

Collaborative study team: S Iyaloo,[1,2] T Kootbodien,[3] N Naicker,[2,3,4] S Kgalamono, [1,2] D Rees,[1,2,3]

[1]Occupational Medicine Section, National Institute for Occupational Health, National Health Laboratory Service, Johannesburg, Gauteng Province, South Africa; [2]School of Public Health, Faculty of Health Sciences, University of the Witwatersrand, Johannesburg, Gauteng Province, South Africa; [3]Epidemiology and Surveillance Section, National Institute for Occupational Health, National Health Laboratory Service, Johannesburg, Gauteng Province, South Africa; [4]Environmental Health Department, Faculty of Health Sciences, University of Johannesburg, Johannesburg, Gauteng Province, South Africa; [5]Environment and Health Research Unit, South African Medical Research Council, Johannesburg, Gauteng Province, South Africa

The results of the Riverlea dust study revealed that there were no participants with radiological features of silicosis. The high relative to the low exposure group had significantly elevated adjusted odds ratios (aORs) for upper respiratory (aOR: 2.76, 95% CI: 1.28, 5.97) and ocular symptoms (aOR: 4.68; 95% CI: 1.87, 11.68), chest wheezing (aOR: 3.78; 95% CI: 1.60, 8.96) and spirometry-diagnosed COPD (aOR: 8.17; 95%CI: 1.01, 65.85). These findings were similar for the high relative to medium exposure group, but no significant associations were found for the medium versus low exposure group. Chronic bronchitis and tuberculosis risks did not differ significantly among the groups. CEI and exposure groups produced similar results. In conclusion, those residing <500m from mine dumps had elevated risks of respiratory health effects. Both measures of exposure (exposure groups and CEI) yielded similar results.

Kidney function changes in sugarcane workers in the South Coast, KwaZulu-Natal, South Africa.

Collaborative study team: M Magombo,[1,2] L Barregard,[3] S Kgalamono,[1,2] F Made,[1,2] T Snyman, J George,[2] S Naicker,[2] E Dorkin,[4] C Wesseling,[5] D Rees[1,2]

[1]Occupational Medicine Section, National Institute for Occupational Health, National Health Laboratory Service, Johannesburg, Gauteng Province, South Africa, [2]School of Public Health, Faculty of Health Sciences, University of the Witwatersrand, Johannesburg, Gauteng Province, South Africa, [3]Occupational and Environmental Medicine, Sahlgrenska University Hospital and University of Gothenburg, Sweden, [4]Epidemiology and Surveillance Section, National Institute for Occupational Health, National Health Laboratory Service, Johannesburg, Gauteng Province, South Africa, [5]Department of Chemical Pathology, University of Witwatersrand, Johannesburg, Gauteng Province, South Africa, [6]Department of Chemical Pathology, National Health Laboratory Service, University of Witwatersrand, Johannesburg, Gauteng Province, South Africa, [7] Department of Internal Medicine, School of Clinical Medicine, University of Witwatersrand, Johannesburg, Gauteng Province, South Africa, [8]Faculty of Health Sciences, Family Medicine, University of Natal, Durban, Kwa-Zulu Natal Province, South Africa, [9]Unit of Occupational Medicine, Institute of Environmental Medicine, Karolinska Institute, Stockholm, Sweden

Repetitive dehydration consequent on strenuous work in heat is postulated to be the cause of chronic kidney disease of unknown cause (CKDu) occurs among sugarcane workers. Kidney function biomarkers were examined for 37 cane cutters and 36 referents.

Overall, the study found evidence of effects on kidney function after 10 weeks of cane cutting, but milder than those reported in hotter and lower altitude settings.

Collaborative research

The Section is collaborating with several NIOH departments on key research projects. Dr Kgalamono is currently involved in a WHO systematic review project on informal workers, together with the Epidemiology and Surveillance, and Immunology and Microbiology Sections.

Dr Ndaba, Dr Kgalamono and Miss Buffel, in collaboration with the Epidemiology Section, are involved in a study on health outcomes of waste pickers. Staff also presented a paper on "Asbestos in Sub Saharan Africa" at the International Commission on Occupational Health (ICOH), held in Dublin, Ireland, from 29 April - 4 May 2018.

TEACHING AND TRAINING

The Occupational Medicine Section provides a rich academic and intellectual environment for university students, staff and occupational health practitioners across the country. Through a biweekly clinical case discussion session, doctors come together to discuss complicated cases and learn from external and internal experts about the management of employees suffering from occupational diseases.

The Section is actively involved in capacity building for occupational health and non-occupational health practitioners. This involves formal training through lectures and training programmes, informal training through training and supervision of registrars and experiential learning of NHLS registrars rotating through the Section.

In the 2018/19 financial year occupational medicine registrars and public health medicine registrars from the Universities of Pretoria UP, Stellenbosch and Wits rotated through the Section. The Section also has qualified specialists who assist the Colleges of Medicine of South Africa (CMSA) with the final examination process.

The Section offers formal training and teaching sessions to undergraduate and postgraduate students through the universities of Witwatersrand, Free State and Pretoria, and through professional bodies, as well as other key stakeholders in the occupational health sphere. Formal training activities conducted are shown in figure 3 below.

Undergraduate teaching

Our staff provided several lectures for undergraduate medical students at Wits, on the topic of "Introduction to Occupational Health and Tuberculosis among Healthcare Workers." Training undergraduates is important in grooming the next level of possible entrants in this new speciality.

Postgraduate teaching and training

Activities within this category were provided to postgraduate diploma programmes offered by the universities of Wits, Free State and Pretoria. The Section also supported Masters programmes namely, the Master of Public Health (MPH) degree in Occupational Hygiene offered by Wits and the Master of Medicine (MMed) degree in Public Health and Occupational Medicine offered by UP and Wits. Postgraduate training includes the supervision of research projects of students who are studying towards their Masters and PhDs.

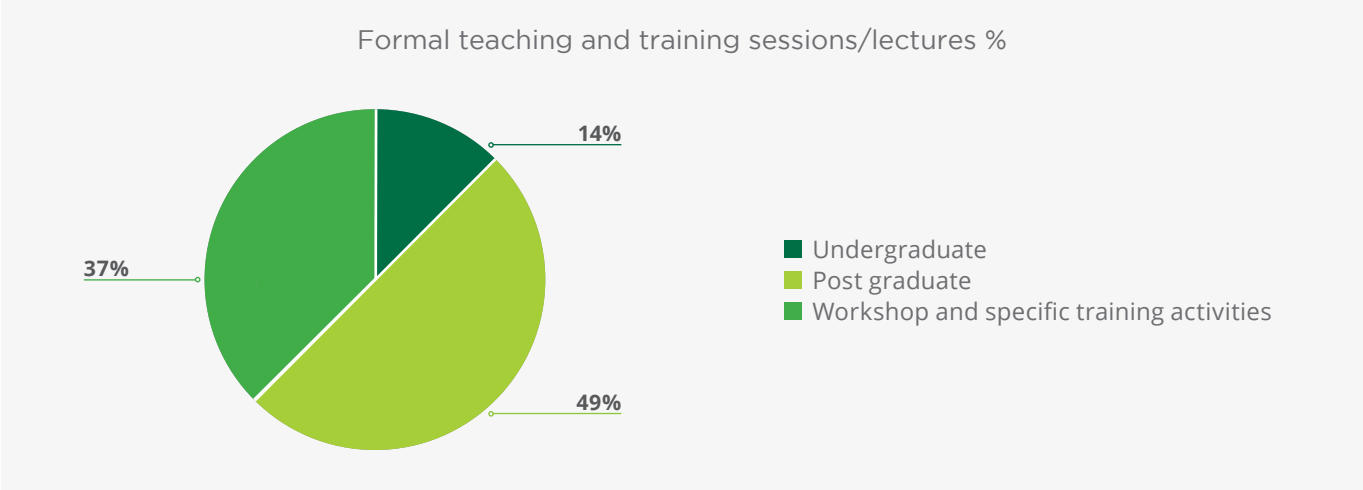


Figure 3. Formal teaching activities through lectures conducted from April 2018 - March 2019.

Other teaching and training activities

The Section participated in various training programmes organised within the NIOH and other external stakeholder fora, through presentations at academic days and workshops. Some of the training activities included presentations to the South African Society of Occupational Health Nursing Practitioners (SASOHN) during their academic day, training of labour representatives in various industries, as well as safety officers and specific courses to occupational medicine doctors on interpretation of lung functions, audiometry and chest x-rays (CXRs).

In collaboration with the Marketing and Communications Section, and through the New Partnership for Africa's Development (NEPAD) office, the Section coordinated a five-day training programme for Malawi delegates from 7 - 11 May 2018. Training presentations were conducted by staff from different Sections of the NIOH, with each day facilitated and moderated by occupational medicine staff, over and above presentations offered on the day.

The delegates interacted with presenters, engaged in discussions and gained from participating in practical sessions, including visiting different Sections of the NIOH to gain an understanding of its mechanics and dynamics.

Image 4 and 5: Participants from Malawi attending the NEPAD training at NIOH.

PROFESSIONAL DEVELOPMENT

Of the five postgraduate candidates in the Section, four were enrolled for MMed degrees in Occupational Medicine. One of the four successfully completed specialist examinations in July 2018 and graduated as an occupational medicine specialist in November 2018. One postgraduate student passed the examinations for a Bachelor of Technology (BTech) degree in Occupational Health Nursing, from the Tshwane University of Technology (TUT). Two occupational medicine registrars are completing their training programme and are scheduled to complete their final examinations in the latter half of the new financial year.

ERGONOMICS UNIT

The activities of the Ergonomics Unit encompass services offered to South African workplaces, research, and capacity building activities for occupational health professionals and workers. The services mainly comprise ergonomic risk assessments and cover both independent and collaborative research, as well as the supervision of postgraduate students' research projects.

The Unit identified a gap in the levels of prevention in occupational health and is leading a new initiative on "Work Disability Management" in South African workplaces to address this gap.

Teaching and training act as a conduit to capacitate occupational health professionals and workers in ergonomics. As this type of training cannot be commonly found, the Unit develops train the trainer materials for specific groups of occupational health professionals, to increase the coverage of ergonomics training. In recognition of the importance of guidance on the application of regulations, the Unit participated in the development of ergonomic guidelines, which will accompany the Ergonomics Regulations at the time of its promulgation.

SPECIALISED SERVICES

Ergonomic risk assessments

This service encompasses the identification and assessment of ergonomic hazards in the workplace, as well as evaluation of the risk it poses to the workers. Recommendations are then formulated from the risk assessment findings, which are compiled into a comprehensive report to assist with mitigation or control of the identified risks.

The majority of the assessments performed by the Unit during the period under review, were for the NHLS, except for one assessment that was conducted in a state-owned company (SOC). The type of work environment assessed were predominantly laboratories, with some computerised workstations and a manufacturing plant.

The ergonomic tool developed by the Ergonomics Unit for use in a computerised office environment was found to be effective upon review. This offers confidence and assurance about the validity of the results to the OHNs responsible for OHS, who use this tool in the different regions of the NHLS across South Africa.

RESEARCH

In the year under review, the Unit conducted research activities relating to "Work Disability Management", supervision of postgraduate students' research projects, assessment of research proposals of postgraduate students and organising the NIOH 2018 Research Day.

The Unit recognised that a tool is necessary to identify workers who are at high risk of work disability. As such, an existing tool was sourced which was developed in the United States of America (USA) and that was effectively piloted in European countries. The Unit conducted its own pilot study on the use of this tool among occupational medicine clinic patients of European descent and found the tool to be suitable. The practical implication is that the tool can now also be used in the same group of patients by other researchers in SA.

The Unit values collaborative research and conducted meetings with the Rehabilitation Unit of the Compensation Commissioner's office, to establish a collaborative relationship on projects of mutual interest.

The Unit supervised three students' research who are studying towards their MPH in Industrial Hygiene and one of these students graduated in December 2018. In addition, the research proposals of these three students were assessed in two assessors' group meetings.

The Unit also reviewed five abstracts submitted for oral and/or poster presentations, in preparation of the NIOH Research Day, and participated in the evaluation and judging of the "Best Poster" category on the day. Finally, two articles were reviewed for publication in peer reviewed journals and one article was published in an international peer reviewed journal.

TEACHING AND TRAINING

Teaching and training activities on ergonomics were offered to different groups from various companies and organisations. In addition, train the trainer materials on ergonomics were developed to cover the NHLS employees in the different regions in South Africa.

Two training activities were executed for different stakeholders and workers in the construction industry. Another training activity was offered to delegates from Malawi under the auspices of the NEPAD.

Other groups who received training were OHNs from Occupational Care South Africa (OCSA), forensic pathology service workers, postgraduate students comprising occupational health doctors from two universities, workers from the three NHLS laboratories and representatives from the Northern Cape Office of the Premier.

Finally, training was offered to the NHLS OHN managers with the view to impart knowledge on their responsibility to the wider NHLS regions.

PERFORMANCE TARGETS

Figure 1 shows the performance of the Ergonomics Unit in the 2018/2019 reporting cycle. Ten ergonomic risk assessments were completed, one research article was published, and sixteen teaching and training activities were performed. The teaching and training activities shown in the graph were over and above the activities required, that is, developing train the trainer ergonomic materials for the NHLS OHN managers and training them on using these materials. This means that the Ergonomics Unit performed above expectation in teaching and training activities.

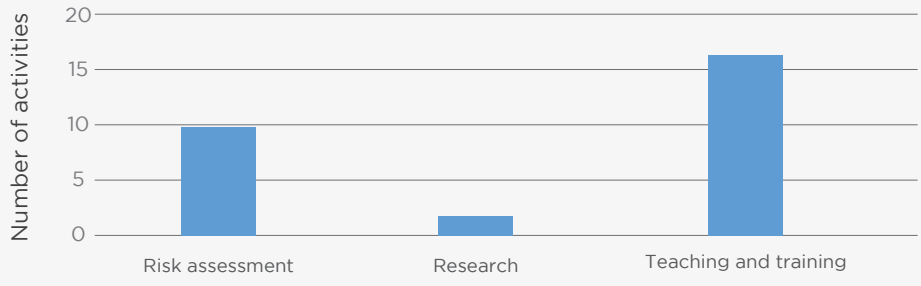


Figure 1: Ergonomics Unit performance in 2018/2019.

PROFESSIONAL DEVELOPMENT

One staff member is completing a postgraduate certificate in ergonomics at Rhodes University.

IMMUNOLOGY AND MICROBIOLOGY SECTION

IMMUNOLOGY AND MICROBIOLOGY SECTION

Dr Tanusha Singh
Head

The Section focuses on airborne and waterborne infection prevention and control (IPC), which is a challenge in many workplaces, and particularly in healthcare facilities, agriculture, and wastewater treatment plants. The implementation and sustainability of mitigation strategies remains a key determinant in the prevention of diseases.

The Section also focused on occupational allergies by providing tailored diagnostics to manage clinical workers' allergies. One of the main focus areas of the year was the promotion and awareness of occupational allergies and infectious diseases through teaching and awareness campaigns.

Staff participated in stakeholder forums with entities such as the DEL, DoH, CSIR and academia, that culminated into programmatic approaches to address various occupational health matters.

DIAGNOSTIC SERVICES

The Section strived to provide specialised testing for occupation-related respiratory and skin diseases and continued to maintain the occupational allergen bank. This service provides useful information on the common occupational allergies suffered by workers. It also highlights the industrial sectors where exposure to allergens may be problematic.

The Section was involved in outbreak response, supporting the outbreak response teams of the National Institute for Communicable Diseases (NICD). The Section provided the following services during the period under review:

- Sterility testing of nanoparticle samples; and
- Microbial indoor air quality assessments, after worker complaints were reported in different settings, predominantly in office buildings.

The laboratory was audited by the SANAS and was recommended for ISO 15189 of 2012 accreditation. This marked the 12th consecutive year of accreditation, which reinforces the quality of our testing service to clients. Our staff also addressed various queries related to occupational allergies and workplace infections.

RESEARCH

Research is a priority and the research agenda focused on prevention of workplace exposure with specific reference to hazardous biological agents (HBAs) that cause infections and allergies. The research conducted involved Section-supported and collaborative projects with stakeholders across various disciplines, including occupational medicine, infection control, engineering and architecture.

Other research activities included protocol, portfolio and manuscript reviews and staff attendance at various scientific forums. Dr T Singh was also appointed as the Chairperson of the NIOH Research Committee. The ongoing projects that the Section is involved in, are described below.

Ultraviolet germicidal irradiation (UVGI) in controlling transmission of Mycobacterium tuberculosis (TB) in healthcare settings

Collaborative study team: T Singh,[1,2] O Matuka,[1,2] T Duba,[1] Z Ngcobo,[1] L Muleba,[1] T Nthoke,[1] P de Jager,[3] T van Reenen,[3] W Leuschner,[4] R Stolper,[3] V Ntlebi,[1] F Made[1]

[1]National Institute for Occupational Health, [2]University of the Witwatersrand, [3]CSIR, [4]University of Pretoria

Background: *Mycobacterium tuberculosis* (TB) poses a huge concern for healthcare workers (HCWs) with 8.8 million new active TB cases worldwide every year and nearly 2 million TB deaths. Significant investments have been made in UVGI, in an attempt to reduce airborne transmission. This study will assist by informing policies

on preventative measures for TB transmission and contribute to implementation of effective infections control strategies. The main aim of this study is to determine the effectiveness of UVGI in reducing the levels of airborne TB bacteria in preventing transmission in public sector health facilities. Method: A cross sectional study involving mapping of the public health facilities in various provinces currently using UVGI units as well as identification of high risk facilities without any engineering intervention. Air samples were collected and tested to ascertain the TB load over an 8-hour shift. Progress: The research team has captured all data collected and have been analysing it during the reporting year. The reports will be completed in 2019 – 2020.

Evaluation of health risks associated with occupational exposures to biological and chemical contaminants at wastewater treatment plants and recycled water use sites

Collaborative study team: N Gomba,[1] L Singh,[1] T Singh,[1,2] T Duba,[1] P Matatiele,[1] P Moodley,[3] I Arshad,[4] T Barnard[5]

[1]National Institute for Occupational Health, [2]University of the Witwatersrand, [3]Golder Associates Africa Pty Ltd, [4]National Institute for Communicable Diseases, [5]University of Johannesburg

Wastewater treatment plants (WWTPs) play an extremely important role in shaping modern society's health and environmental well-being through the safe disposal of various wastewater streams. Wastewater naturally contains both microbial and chemical contaminants that can result in a wide range of adverse health effects when inhaled, ingested or absorbed through the skin. The use of reclaimed water (RW) carries health risks, as several studies have confirmed RW systems as important reservoirs of pathogens including *Legionella, Pseudomonas aeruginosa, non-tuberculous Mycobacteria, Acanthamoeba* spp., Staphylococcus aureus, and protozoa. The proposed project aims to characterise microbiological and chemical hazards present at WWTPs and along RW distribution systems, especially as they may affect the health of the worker and the general community. The study also seeks to conduct health assessments of workers potentially exposed through various activities at WWTPs and reuse sites. In addition, the proposed research seeks to pilot/test these evidence based water quality guidelines and validate its application for RW. The project will be conducted under four main focus areas to be addressed by various researchers and experts in water, microbiology, analytical chemistry and human health disciplines. Focus 1: Screening, selection, and prioritisation of microbiological and organic contaminants for further study. Focus 2: Occurrence and concentration levels of microbiological and organic chemical contaminants at wastewater treatment plants. Focus 3: Environmental fate of microbiological and chemical contaminants along RW distribution systems from point of entry to point of use. Focus 4: Human health risk assessment at WWTPs and recycled water use sites. The main goal for the reporting year was soliciting funding for the study. The study will be funded by the Water Research Commission. The sampling will being in the next financial year.

Assessment of antibacterial efficacy of hand sanitisers commonly used in South Africa

Collaborative study team: L Muleba,[1] T Singh,[1,2] J Pienaar,[3] R Van Wyk,[3] D Matuka[1]

[1]National Institute for Occupational Health, [2]University of the Witwatersrand, [3]University of Johannesburg

Hand sanitisers are designed for application to the hands for reducing the number of viable microorganisms; they are the alternative to hand washing with soap and water (Centre for Disease Control and Prevention, 2002). Various types of hand sanitisers are commercially available to the public and industries, each with different ingredients with the major ingredients being isopropanol, ethanol, n-propanol, or povidone-iodine (Oke et al., 2013). Previous studies have reported an increase in the number of bacteria in handprints impressed on agar plates after applying hand sanitiser (*Jain et al.*, 2016; Ochwoto et al., 2017). Whilst data on the effectiveness of the hand sanitiser is essential, its availability in South Africa is absent. Therefore, this study will investigate the effectiveness of the hand sanitisers that are commonly used in hospital settings, and commercially available to the public. The hand sanitiser will be tested for minimum inhibitory concentration and minimum bactericidal concentration. Results obtained from this study may inform end-user choices as well as provide information for the development of procurement specifications.

TEACHING AND TRAINING

Teaching and training of various occupational health professionals such as occupational and public health registrars, occupational health practitioners, occupational health nurses, occupational hygienists, scientists and trade unions remained a key focus in the reporting period.

Support for training of medical intern scientists of the Health Professionals Council of South Africa (HPCSA) continued. The Section also contributed to the occupational health curricula for various universities and stakeholders (e.g. DoH for the Universities of North West, Pretoria and the Witwatersrand). Nine training initiatives were executed during the year, to raise awareness of occupational allergies and infectious diseases.

The unique training included one- to five-day events which were conducted in four provinces, namely: Gauteng, Free State, Mpumalanga and KwaZulu-Natal. Through the training, 307 workers were empowered to effect positive change in their workplaces. A list of key events, presentations and activities that were executed are highlighted below.

Occupational Health, Safety and Wellness Workshop for street waste pickers, 5 May 2018

In celebration of the World Day of Health and Safety at Work (28 April), the Section hosted the "Occupational Health, Safety and Wellness Workshop" for street waste pickers, which was hosted at the community hall in Pageview.

Reclaimed water workshop, 22 May 2018

The workshop, which was conducted at the NIOH, explored the water challenges that the South African workforce is faced with, through presentations from leading experts in the field and served to advance our knowledge of potential microbial health risks to workers in different industries; and burdens associated with the implementation and use of RW.

Allergies in the workplace: a diagnostic approach – Mpumalanga, 6 June 2018

Occupational allergies and asthma are a concern in the workplace, as it is often under recognised, under diagnosed, under reported and under compensated. For these reasons, we conducted this workshop in collaboration with the Occupational Medicine Section. The workshop provided an overview of workplace exposure and clinical symptoms that can lead to occupational allergies (respiratory and skin) and asthma. Practical demonstrations were conducted and cases on the clinical diagnosis approach were discussed.

Allergies in the workplace: a diagnostic approach – Bloemfontein, 15 August 2018

Occupational allergies and asthma are a concern in the workplace. This is due to numerous workplace agents that can cause or aggravate allergies and asthma. It is therefore important to diagnose the worker's condition, which can inform preventative measures to reduce exposure as well as clinically manage the worker. This workshop was conducted in collaboration with the Occupational Medicine Section and was very similar to the mentioned workshop conducted in Mpumalanga.

Fungal Disease in the Workplace – Awareness Week, 1 – 5 October 2018

The CDC, US commenced with an initiative in 2017 to raise awareness of fungal diseases. We therefore saw this as an opportunity to expand on the initiative and raise awareness of fungal diseases in the workplace; and the importance of preventing exposure with the aim to protect and improve workers' health. Exposure is associated with allergies and infections, as well as neurologic- and toxic effects. This was an online and social media initiative for which we utilised the NIOH website and Twitter platforms.

Workplace Biorisk Management Course, 1 – 5 October 2018

The Workplace Biorisk Management Course is the Section's flagship annual event. We were fortunate to have a panel of local experts from various disciplines to deliver different aspects of the course. The course was delivered in the format of an intense learning week and was designed to enhance the understanding of HBAs and how to recognise, assess and mitigate the risks as required by the HBA Regulations.

Forty-one delegates from various disciplines (scientists, doctors, nurses, environmental health practitioners, occupational hygienists, etc.) attended the training, which contributed to the robust discussions and debates. Delegates conducted risk assessments at four healthcare facilities, namely: Charlotte Maxeke Johannesburg Academic Hospital (CMJAH), Johannesburg Forensic Mortuary, Hillbrow Community Clinic, and Chris Hani Baragwanath Hospital (CHBH).

Global Handwashing Day – King Dinuzulu Hospital Complex and Clairwood Hospital, KwaZulu-Natal, 15 – 16 October 2018

Healthcare associated infections (HCAIs) remains a concern despite several interventions globally. HCWs can carry many types of microorganisms on their hands, which can be a source of contamination to patients and themselves. Despite the health benefits, hand hygiene remains a challenge in many settings due to poor access to clean water, inadequate numbers of sinks or towels, lack of awareness of the pivotal role of good hand hygiene, and a lack of resources to address the abysmally low levels of compliance. The objective of the awareness workshop was therefore to reinforce the basic principles of effective handwashing, as a key mitigation strategy in IPC.

Image 1: Biorisk Management Course participants at Emoyeni Hotel.

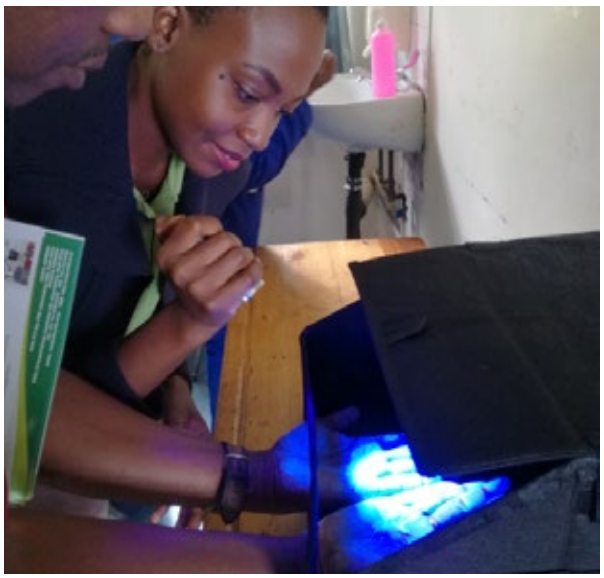


Image 2: Hand hygiene practical.

Image 3: Skin prick testing practical demonstration.

Hand hygiene and infection control – Hillbrow Public Health Clinic, Gauteng, 5 December 2018

HCWs can become infected during patient care, through direct contact with the patient's skin or contaminated environmental surfaces, etc. Damaged skin (contact dermatitis and eczema) is more likely to be colonised by pathogenic gram-negative bacteria, *Staphylococcus aureus, Enterococci spp*. and fungi, in comparison to intact normal skin. The recent threat of the drug-resistant fungus called Candida auris, is of concern in healthcare settings as it spreads rapidly. The objective of the workshop was also to reinforce the basic principles of effective handwashing.

PROFESSIONAL DEVELOPMENT

Five postgraduates were enrolled: three for MTech degrees at UJ, and two for MPH degrees at Wits. One postgraduate student graduated with an MSc degree from UP.

HONOURS

Ms Anna Fourie obtained a postgraduate diploma in health sciences education during the period under review. Dr Tanusha Singh received an NRF rating.

EPIDEMIOLOGY AND SURVEILLANCE SECTION

EPIDEMIOLOGY AND SURVEILLANCE SECTION

Dr Nisha Naicker
Head

The Epidemiology and Surveillance Section studies and analyses the patterns, causes, and effects of exposure on morbidity and mortality in occupational settings. This is important in establishing the burden of occupational-related diseases over time, and allows for appropriate allocation of funds for preventative measures as well as interventions.

SERVICES

The Section provides epidemiological and biostatistical support to Sections within the NIOH, various government entities, parastatals and private organisations.

Research support

Technical research support is provided to all the NIOH Sections and external clients and stakeholders in the public sector (national, provincial departments, parastatal departments, and science councils) and the private sector.

Assistance is provided for study design, sample size determination, project management, data collection, data entry, data analyses and scientific writing. In the reporting year, the Epidemiology and Surveillance Section provided support to the following Sections within the NIOH:

- Occupational Medicine;
- Occupational Hygiene;
- Immunology and Microbiology;
- Safety, Health and Environment (SHE);
- Pathology;
- and HIV and TB in the Workplace Unit

In 2018/2019, the Section assisted the Gauteng DoH with a number of projects. The Gauteng staff satisfaction survey is an annual survey conducted by the Employee Health and Wellness Programme (EHWP) Directorate. Staff from the directorate were trained on how to enter data into the Epi Info statistical software programme. The data entered was then analysed by the Epidemiology Section staff, and reports were produced for the directorate, per facility. Recommendations on how to improve the response rate by making changes to the questionnaire and methodology of the study were provided.

The Section assisted the Gauteng DoH with the development of the Mental Health and Happiness Index project that will involve all employees in the Gauteng DoH. The study will assess the mental wellbeing of staff, identify occupational risk factors for mental ill health and provide recommendations. The University of British Columbia (UBC) and the Wits Department of Psychiatry are collaborators on this project. This study is still in its development phase and is awaiting ethics approval.

The North West DoH and national DoH requested an overview and roadmap of OHS for health workers. This project was undertaken by the NIOH, and the Epidemiology and Surveillance Section assisted in the development and completion of the report.

The Q(h)ubeka Trust requested the development of a predictive model for assessing the probability of silicosis in deceased miners without medical- or health information. Based on analyses of the data available for miners with occupational and medical information, a final predictive model was developed. A silicosis probability tool was then produced using visual basic applications (VBA) in Microsoft Excel.

Surveillance programme

South Africa does not have an optimally functioning national occupational health surveillance programme. However, since 2017/2018, this Section has conducted consultations with several stakeholders to incorporate occupational health histories in current longitudinal surveillance programmes, or in new surveillance programmes that are being established.

In collaboration with the National Cancer Registry (NCR), the Section developed a tool to assess occupational risk factors in patients diagnosed with cancer that reside in the Ekurhuleni District. A pilot study will be conducted from 1 May 2019 – 31 October 2019 in the following six hospitals:

- Far East Rand Hospital;
- Pholosong Hospital;
- Tambo Memorial Hospital;
- Tembisa Hospital; and
- Two referral hospitals, namely: CMJAH and CHBH.

Data obtained via the study will assist with the creation of a national occupational cancer surveillance programme.

The Occupational Health and Safety Information System (OHASIS) is an online reporting tool for all the NHLS injuries and diseases related to the work environment from 2012. Ongoing analyses of this data set has commenced and will form part of the internal NHLS surveillance programme.

In addition to the above, collaborative relationships will be established with DEL, DMRE, the MBOD and the Office of Health Standards Compliance to access relevant occupational health data for annual ongoing surveillance.

RESEARCH

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

PRIMARY RESEARCH

Informal economy

Work on the working conditions and health outcomes of workers in the informal economy continued in 2018/2019. These workers have little control over their work environment and have received virtually no training in OHS, which results in a higher health risk profile. The working environment is usually unregulated and often unsafe, and there is little or no protection available. Research of the health outcomes (mental and physical) in the informal sector is limited. To address this public health challenge, the Epidemiology and Surveillance Section initiated a series of studies that focus on the informal economy workers, that are outlined below.

The health and healthcare access of landfill waste recyclers in Johannesburg, South Africa study

This study was conducted in collaboration with Pikitup and the Occupational Medicine and Occupational Hygiene Sections of the NIOH, and fieldwork commenced in March 2018. The study was aimed at generating knowledge on the working conditions (exposure) and health outcomes, as well as healthcare access, associated with waste recycling at two landfill sites in Johannesburg.

Three hundred and sixty-one workers were interviewed, and a basic health screening assessment (height, weight, blood pressure, heart rate, temperature, cholesterol and glucose levels) was conducted. The UJ students took hand wipes for bacteriological assessment. Cuts and lacerations (82%) were the most common type of injury reported, followed by falling on the sites (39%) and needle sticks (20%). Sunburn was reported by 62% of participants.

Muscle aches and upper respiratory tract symptoms were prevalent. Over 20% of participants reported gastrointestinal symptoms of diarrhoea and vomiting. A comparison between self-reported mental disability and the WHO Common Mental Disorders (CMD), anxiety and depression screening score, indicated that 37% of participants had a positive score for CMD, but only 1% reported a mental disability.

Healthcare utilisation was around 45%. The main barriers to accessing healthcare were the long waiting times at the clinic, inability to take time off from work, and a lack of transport to the clinics. A detailed report with recommendations was compiled and submitted to Pikitup for comments.

Image 1 and 2: Waste recyclers at work.

Assessment of working conditions and health outcomes of caddies working on golf courses in Johannesburg

This study commenced in November 2018 and involved conducting of a cross-Sectional survey in six golf clubs with a total of 323 participants (249 caddies and 74 non-caddies). A structured questionnaire was administered by trained fieldworkers. Health screening assessments (heights, weight, blood pressure, heart rate, temperature, cholesterol and glucose levels) were conducted, and urine was collected for pesticide analyses. Analyses of the study are currently in progress.

Image 3 and 4: Caddies at work.

Occupational hazards and health outcomes in petrol station attendants in Johannesburg, South Africa

The increased use of petroleum products in automobiles and industry led to the deterioration of air quality and human health. These products contain some toxins that are considered to be carcinogenic to humans. Exposure to petrol is known to contribute to neurological-, haematological-, inhalation-, and teratogenic disorders. For this reason, biomonitoring of exposure in workplaces gained importance in the evaluation of human health hazards. This study thus serves to determine the occupational hazards and health outcomes associated with working as a petrol attendant.

Systematic review of the health outcomes and healthcare utilisation of the informal economy workers

The aim is to systematically review, and meta-analyse evidence from any quantitative studies on health services use and health outcomes among informal economy workers, compared with formal economy workers, published between 01 May 1998 and 30 June 2018.

The sources of asbestos exposure in patients with malignant mesothelioma in South Africa

This is a two year national study involving tertiary and academic hospitals in South Africa that will conclude on 31 December 2019. The study describes occupational and non-occupational asbestos exposure in patients diagnosed with malignant mesothelioma.

The study will describe the sources of non-occupational exposure due to living in a house with an asbestos cement roof, exposure due to do-it-yourself (DIY) activities and hobbies that may have resulted in the handling of asbestos-containing materials (ACMs). The study will provide valuable information on the current sources of occupational and non-occupational asbestos exposure in South Africa, especially as this was last described almost 30 years ago. Based on the outcome, the NIOH will develop guidelines on the safe management of domestic ACMs. The study will also provide evidence that could inform policy decisions regarding the control of asbestos exposure in the country.

Moringa project

The Epidemiology and Biostatistics Section also provides epidemiological and statistical support for a randomised clinical trial in collaboration with Sefako Makgatho Health Sciences University, the South African National Defence Force (SANDF) and the NIOH Biobank Section. The study is in progress and will assess the impact of use of the Moringa plant in HIV positive patients.

Lead exposure and cognitive impairment in older people living in communities located near mine tailings in Johannesburg.

Exposure from mining activities and mine tailing dumps may result in poor health outcomes of people within the communities surrounding the mines. Lead is one of the contaminants that have serious but preventable neurological effects. Data collection for this study was completed, and analyses of the data are in progress. Collaborators on this project include the South African Medical Research Council (SAMRC), the Environmental and Health Research Unit and Mount Sinai University, New York, USA.

SECONDARY RESEARCH

Ongoing analyses of the Occupational Health and Safety Information System data

The Wits Medical Human Ethics Research Committee provided the necessary ethics approval to analyse data collected from 2012 to date. Data for three papers are currently analysed and captured as follows:

- Evaluation of the OHASIS database;
- Prevalence and trends of reported injuries; and
- TB incidence and work-related risk factors.

Statistics South Africa tuberculosis mortality by occupation in South Africa for the years 2011 to 2015

The Statistics South Africa (Stats SA) paper on TB mortality in SA for 2011 – 2015 was published. This paper indicates that 13% of deaths reported by occupation was due to TB. Age standardised mortality rates for TB mortality, decreased from 165.9 - 88.8 per 100,000 population over the five years. An increased risk of death by TB was observed in agricultural labourers (MORadj = 3.58, 95% Confidence Interval (CI) 2.96–4.32), cleaners (MORadj = 3.44, 95% CI 2.91–4.09), and refuse workers (MORadj = 3.41, 95% CI 2.88–4.03), among workers exposed to silica dust (MORadj = 3.37, 95% CI 2.83–4.02), and among skilled agricultural workers (MORadj = 3.31, 95% CI 2.65–4.19). High risk TB occupations can thus be identified from the mortality data. This paper highlights the need to prioritise TB prevention and treatment policies in these occupations.

The usefulness of occupation and industry information in mortality data in South Africa from 2006 to 2015

The usefulness of occupation and industry information in mortality data in South Africa from 2006 to 2015 paper was submitted for final review. The paper indicates that mortality data can be a useful source of occupational disease information for surveillance, especially where active surveillance systems do not exist, such as in South Africa. The findings indicated that significant associations were found between occupational disease and industry.

TEACHING AND TRAINING

The Section continues its teaching and training activities for undergraduate and postgraduate academic programmes within the NIOH and at Wits, UJ and the UP South African Field Epidemiology Training Programme (SAFETP). Assistance is provided to the Wits School of Public Health Medicine through facilitating lectures in the Graduate Entry Medical Programme (GEMP) programme, as well as to the DOH, by participating in the postgraduate assessors committees.

Our staff also supports academic institutions as examiners for theses of students studying for their Masters and PhD degrees. In addition, lectures are provided for the SAFETP run by UP. The Section is currently hosting a Masters student from the programme from March 2018 to December 2019. The student is mentored by several staff members and will be trained in epidemiology and biostatistics during her time in the Section.

Our staff currently supervises four PhD students and more than seven Masters students from Wits, UP and Nelson Mandela Metropolitan University (NMMU). In addition, our supports students from the NIOH with their project development and analyses of their data.

A workshop on Epi Info statistical software and data entry was conducted. The NIOH staff also conducted training for the Gauteng DoH Employee Health and Wellness team on 7 June, with the aim to develop capacity within the department.

PROFESSIONAL DEVELOPMENT

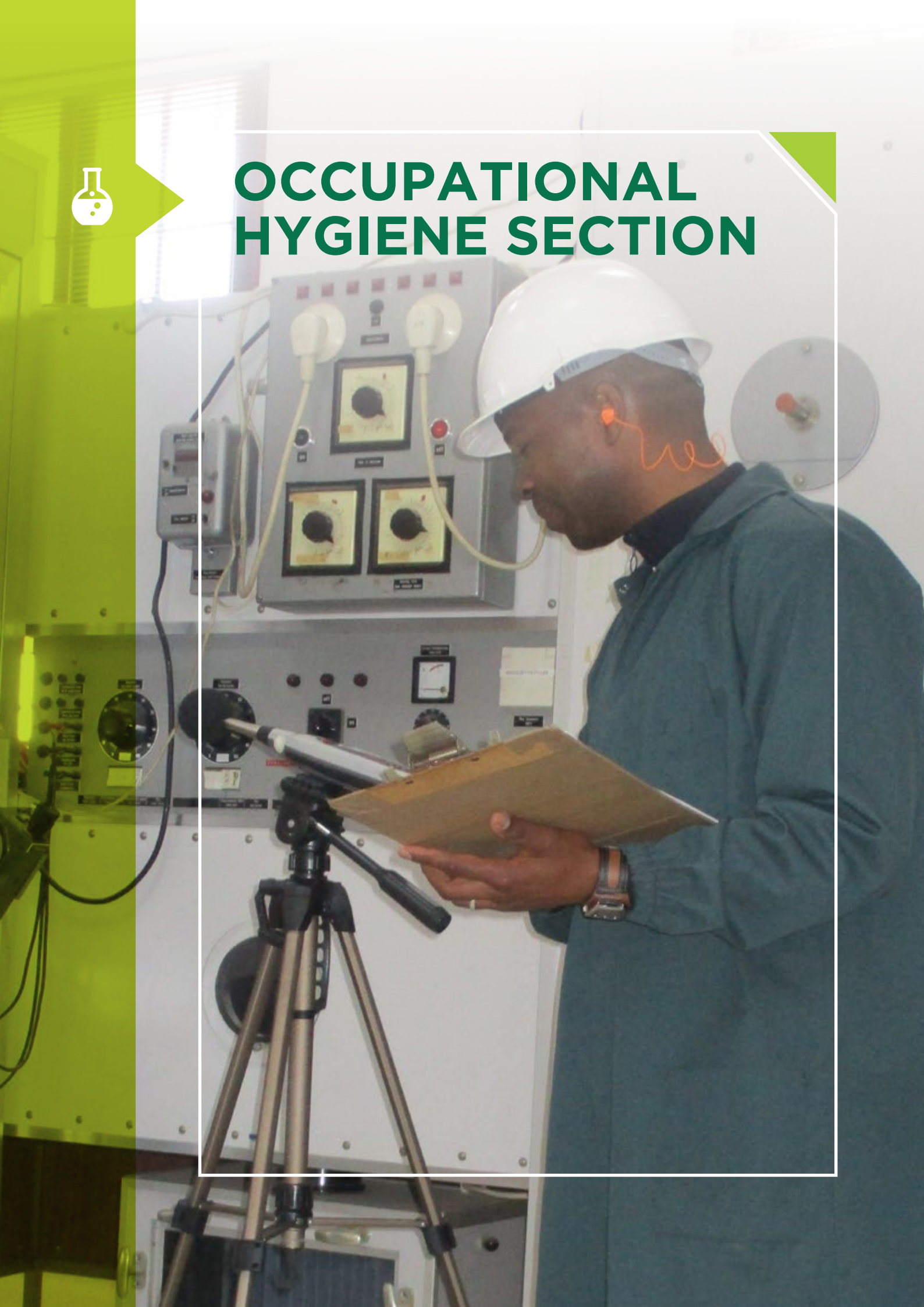
Dr Tahira Kootbodien is in her third year of her PhD on *Genetic Risk Factors and Epidemiology of Suicidal Behaviour in South Africa.*

Mr Felix Made is in his second year of his PhD on *Preventing Coal Mine Dust Lung Disease by Use of Bayesian Hierarchical Framework for Occupational Exposure Assessment in the South African Coal Mining Industry.*

Dr Nonhlanhla Tlotleng and Ms. Samantha Jack are both in their second year of the MSc Programme by the Wits School of Public Health.

Ms Matimba Makhubele, a SAFETP student, is currently completing her Masters in Field Epidemiology based on work conducted in the Epidemiology and Surveillance Section.

OCCUPATIONAL HYGIENE SECTION



OCCUPATIONAL HYGIENE SECTION

Ms Jeanneth Manganyi
Head

The Occupational Hygiene Section of the NIOH strives to promote the health and wellbeing of workers both nationally and globally. The functions of this Section are highly diverse and technically challenging. The Section continues its efforts to source and retain highly experienced professional staff to perform its daily duty of applying complex occupational hygiene science.

The science of occupational hygiene focuses on the prevention of occupational diseases. Specialised services provided by the Occupational Hygiene Section include exposure assessments, sample analyses, research, training and teaching, as well as advisory support.

SERVICES

The Occupational Hygiene Section is at the very heart of the work of the NIOH, and the Section fulfils a unique function within the NHLS nationally. It provides specialised occupational hygiene services and promotes the primary prevention of occupational and environmental health and safety (OEHS) risks to the whole of the NHLS, as well as external clients, including government institutions.

The Occupational Hygiene Section is registered with the DEL, and is accredited by SANAS for ISO 17020. The Asbestos Laboratory participates in the Asbestos Fibre Regular Informal Counting Arrangement (AFRICA) asbestos proficiency testing scheme (PTS), in collaboration with the Institute for Occupational Medicine (IOM) in Edinburgh, UK and has been consistent in maintaining a "1" grading.

The position of the Scientific Analyst in the X-Ray Diffraction (XRD)/ Fourier Transform Infrared (FTIR) Laboratory has been vacant throughout the reporting period; and participation of the laboratory in the quality scheme was therefore placed on hold.

Exposure assessments

A total of 25 exposure assessments (including walkthrough assessments, HRAs and monitoring surveys) were conducted and reported. These assessments were performed for:

- The Department of Correctional Services (DCS) as part of a Service Level Agreement (SLA);
- Support to other NIOH Sections such as the Occupational Medicine Section and HIV and TB in the Workplace Unit;
- The National DoH (Civitas Building), as required by the DEL; and
- The Director: General Health of the National DoH for whom a HRA was conducted at the Mahikeng provincial DoH (Mmabatho Medical Depot) in North West.

Asbestos

The Occupational Hygiene Section executed an asbestos identification audit, which included bulk and air sampling at all Sections within the NIOH building. This was conducted in line with the obligations of the Asbestos Regulations, which require employers to have a documented inventory of all ACMs at their premises.

Respirator fit testing

Respirator fit testing was conducted on 149 respirator users. This service was mainly rendered to support research work and to contribute to the respiratory protective programmes implemented by private companies. Laboratory employees who joined the NIOH were also fit tested prior to using their respirators.

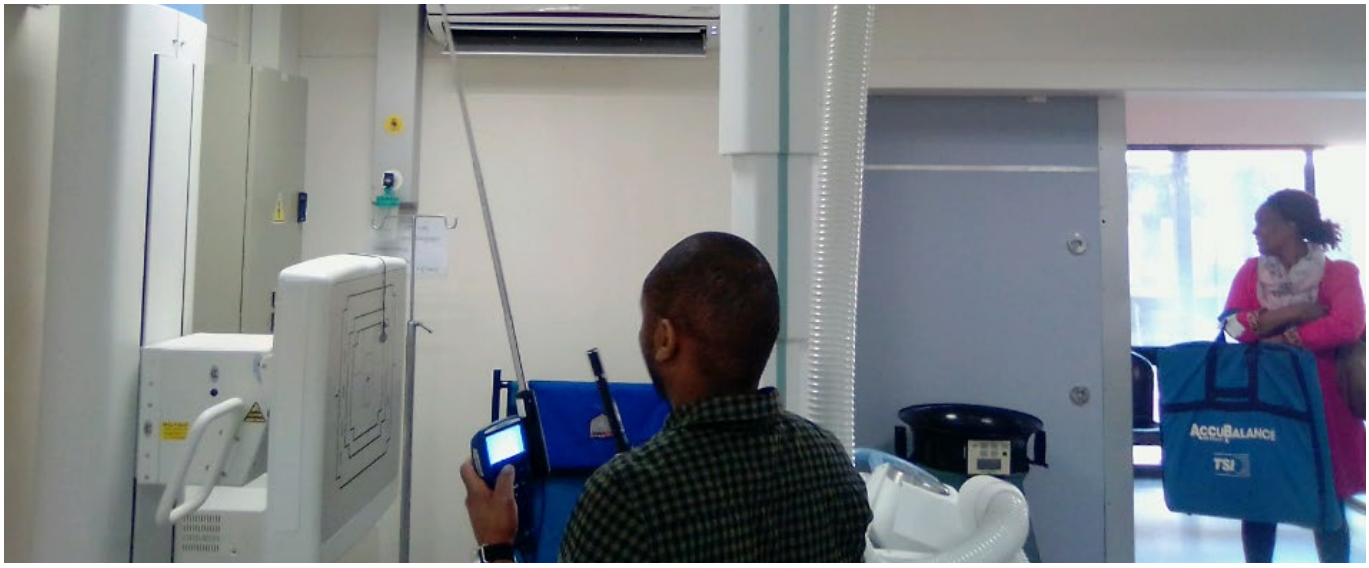


Image 1: Ventilation assessment in a healthcare facility.

Sample analyses

The function of the NIOH Occupational Hygiene Section includes analyses of non-medical samples with the aim to estimate employees' and environmental exposure. The asbestos laboratory, which is managed by Mr Gabriel Mizan, operates within the Occupational Hygiene Section, under direct supervision of the Head of Section. Thirty-one asbestos samples were analysed using phase contrast microscopy (PCM). No samples were analysed in the XRD Laboratory due to the vacant position in this area.

RESEARCH

The Section is involved in a number of research studies relevant to OEHS, with particular reference to South Africa, as part of our staff's academic studies and in collaboration with other NIOH Sections. The aim is to publish research findings in national or international journals and to present at relevant platforms such as workshops and conferences. Details of these research projects are outlined below.

Facial characteristics and determinants of respirator fitness among industrial workers in Gauteng

This is an ongoing PHD study by Mrs Jeanneth Manganyi, which aims to improve the protection of workers who use disposable respirators for inhalation hazards. The study serves to identify factors that affect proper face seal in South African respirator users, and to evaluate the suitability of international respirator fit test panels for designing and testing of respirators for South African respirator users.

Development of a practical tool to assist decision makers in prioritisation of interventions for the control of potential exposure to asbestos in schools

Mr Gabriel Mizan is conducting a PhD research study to assess the health risk from exposure to ACMs in selected schools in Gauteng and evaluate cost effective interventions that could be implemented to mitigate the risk.

The applicability of air quality indicators as a proxy for the presence of airborne tuberculosis in public health facilities in South Africa, 2018

Mr Tebogo Nthoke's study aims to test whether a specific indoor air quality parameter could be a good proxy for airborne TB concentration.

Health and healthcare access of waste pickers in Johannesburg, South Africa

Members of the Occupational Hygiene Section' staff, Mrs Karen du Preez and Mr Moses Mokone, collaborated with the Epidemiology and Surveillance and Occupational Medicine Sections on this study. The study was completed and a report on OHS risk assessment was issued.

Image 2a and 2b: Occupational Hygienists in the field, conducting a risk assessment at a Johannesburg landfill.

Exposure to particulate matter and respirable crystalline silica, radioactivity and heavy metals in two communities located in close proximity to a mine dump in Johannesburg

The Occupational Hygiene Section is collaborating with the Epidemiology and Surveillance Section on this ongoing study which aims to compare the findings to that of a control community that is distant to mine tailing dumps.

TEACHING AND TRAINING

The Section contributed to a number of workshops conducted by the NIOH, including occupational health training to representatives from organised labour such as the National Union of Mineworkers (NUM) and the Congress of South African Trade Unions (COSATU) and delegates from Malawi, as well as the Workplace Biorisk Management Course. We also supported the NIOH Research Day and the Mine Health and Safety Summit through participating and presenting on occupational hygiene-related topics at these events.

The Occupational Hygiene Section also conducted train the trainer respirator fit testing training for selected staff members at Kumba Iron Ore Mine in Sishen. The training focused on the use of the PortaCount respirator fit testing equipment, with the aim to build their capacity and competency.

Other activities include academic teaching and practical support to students who are studying for their diplomas and BTech degrees in Environmental Health at UJ and TUT, as well as those who are studying for their Masters of Public Health degrees and postgraduate diplomas in Occupational Health at Wits.

Image 3a and 3b: Equipment demonstration to Environmental Health students from the University of Johannesburg.

PROFESSIONAL DEVELOPMENT

Occupational Hygiene is a scarce skill profession, which requires continuous development of expertise in an effort to improve and maintain national and global OEHS. The Occupational Hygiene Section hosted Prof Thomas Fuller from Illinois State University and Workplace Health Without Borders (WHWB). Prof Fuller presented a five-day training course on *W505 Control of Hazardous Substances* from 4 - 8 June 2018.

The Section, together with Envirocon, also coordinated a workshop on TSI equipment technology and challenges, which was presented by TSI technical support members from Germany, Hans-Juergen Scholen and Lagrine Belkacem. Both these workshops were conducted as part of staff capacity building.

The Section has seven postgraduates who are enrolled for academic studies: Two for PhDs in Public Health at Wits; three for their MPH in Environmental and Occupational Health at UP; and two for their MPH in Occupational Hygiene at Wits. One student who is studying for her MSc in Community Health submitted her dissertation at UP, and one student successfully graduated from UP with an MSc in Community Health.

Image 4: Participants at the W505 Control of Hazardous Substances Course conducted at the National Institute for Occupational Health.

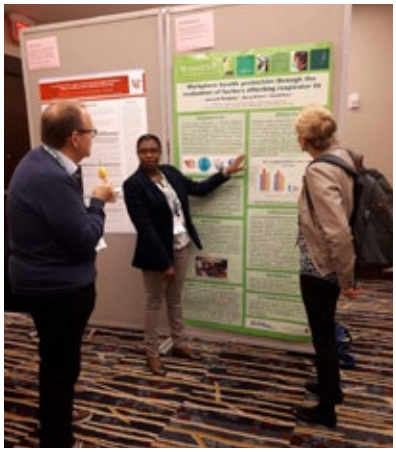


Image 5 and 6: Mrs Jeanneth Manganyi at the IOHA conference presenting a poster and engaging delegates on respirator fit testing.

ADVISORY SUPPORT

The Section provides advisory support to government and the public by responding to queries, participating and serving on technical, professional and advisory committees, in particular for the SANAS, the South African Institute for Occupational Hygiene (SAIOH), the South African Bureau of Standards (SABS) and the DEL.

Thirty-one queries were handled, the majority of which related to concerns regarding the safe handling and disposal of asbestos. The Occupational Hygiene Section served on the TC 7 Technical Committee of the DEL that serves to review the draft Asbestos Abatement Regulations 2016. The Section continues to support the SABS Technical Committee TC0076 on acoustics, electro acoustics and vibration.

HONOURS

At the SAIOH 2018 annual conference, Mr Kevin Renton (a contracted staff member) was presented with an award for “Best Poster” as well as the “Occupational Hygienist of the Year.”

QUALITY ASSURANCE

QUALITY ASSURANCE

Mr Bonginkosi Duma
Manager

The NIOH Quality Assurance (QA) Section continues to maintain accreditation for the three standards acquired through the SANAS, namely: ISO 15189, ISO 17025 and ISO 17020.

SERVICES

The Section also conducts internal audits on an ongoing basis, to ensure that the quality management systems remain intact. To this end, monthly accreditation meetings are held with each NIOH Section. In addition, the Section now offers formal induction to new NIOH staff members, which includes quality related lectures and instructions. The Section is also responsible for coordinating external audits from SANAS and a number of other different external clients for the NIOH. The Section handles customer complaints both internally (within NIOH) and externally. All complaints are investigated, and customers are provided with feedback on the outcomes. NIOH QA ensures that all NIOH laboratories and other non-technical areas receive the necessary priority to make sure that quality management systems are implemented. The Section also provides support to NIOH laboratories to obtain SANAS approval for their quality management systems and technical competence.

The QA Section embarked on a customer survey to obtain feedback from its internal customers and to provide a platform for staff to raise their concerns. Three key complaints were raised as detailed in the table below:

Number of complaints	Description of complaint	Outstanding	Improvement implemented
Three	• Patients requested water dispensers in the clinic • Patients requested visible name tags from the NIOH staff • General Services are still not completing E-apps requisitions within the required turnaround times (TATs)	0	• Dispensers were placed in other departments, except the Immuno/Micro Department. Upon submission of a complaint to the finance unit, an order was placed for another dispenser for the Micro Department • Table nametags are now prominently displayed on the clinic staff members' table • Monthly QA meetings are conducted with General Services to discuss any outstanding E-apps issues

IMPLEMENTATION OF THE INTERNATIONAL ORGANIZATION FOR STANDARDIZATION ISO 9001 STANDARD

In 2018 a decision was taken to implement the ISO 9001:2015 standard in the support departments at the NIOH. Since then there has been significant progress from training to implementation in the following departments:

- The National Biobank;
- The Epidemiology & Surveillance Section;
- Information Services Section; and
- The SHE Department.

SGS, a leading external inspection, verification, testing and certification company, provided training to all representatives within the abovementioned departments who are assisting with the implementation process. Gap analyses are conducted to determine whether the department has an established quality management system (QMS) or not, and if not, recommendations are made on the requirements that must be met to reach the minimum status.

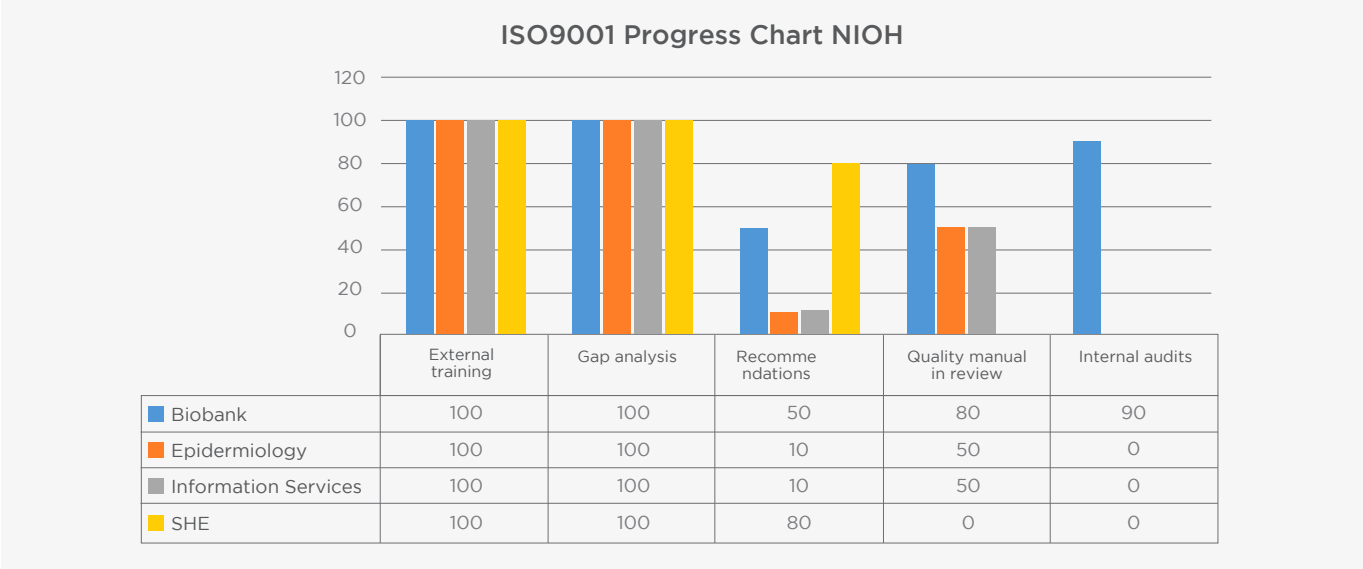


Figure 1: The ISO 9001 implementation progress to date.

The QA Section subsequently drafted three quality manuals for the Information Services and Epidemiology and Surveillance Sections, as well as the National Biobank. The draft manual for the National Biobank is currently uploaded on the Q-Pulse programme. The other two manuals are still under review by the QA Section. The SHE Section already has a safety manual and other policies that cover most of the ISO standard requirements.

To achieve ISO 9001 certification, the NIOH Sections in question must pass two stages of the initial assessment by the external body. The National Biobank passed the stage 1 audit by SGS in December 2018, and the stage 2 audit was scheduled for April 2019.

The following Sections still need to implement the ISO 9001 standard:

- Epidemiology & Surveillance;
- Information Services;
- SHE;
- Information Technology;
- Procurement;
- General Services;
- Logistics;
- Occupational Medicine; and
- The HIV and TB Unit

RISK RELATED TO QUALITY

The table below identifies quality-related risks and the potential consequences of these risks not being monitored.

Risk	Root cause	Consequence	Mitigation	Status
In transit temperature monitoring	Transportation of specimen	Deterioration of specimen	Digital thermometers are used for monitoring specimen	Monitoring continues by using the thermometer
Power failure	Power supply from city power	Damage to the electrical equipment	Use of automated generator	Services continue, using a generator
IT system malfunction	Maintenance of the system	Data loss delay in TAT	Manual capturing of data	Systems are regularly maintained

TEACHING AND TRAINING

The NIOH continued with annual teaching and training on quality-related topics to ensure CPD of internal stakeholders. For the period under review, training was conducted on the following topics:

- Documentation;
- Writing of non-conformances;
- SANAS R80;
- TR28 (SANAS Technical Regulation 28 for Microbiology);
- TR26 (SANAS Technical Regulation 26 for Chemistry); and
- TG25 (SANAS Technical Regulation 25 for Calibrators).

PROFESSIONAL DEVELOPMENT

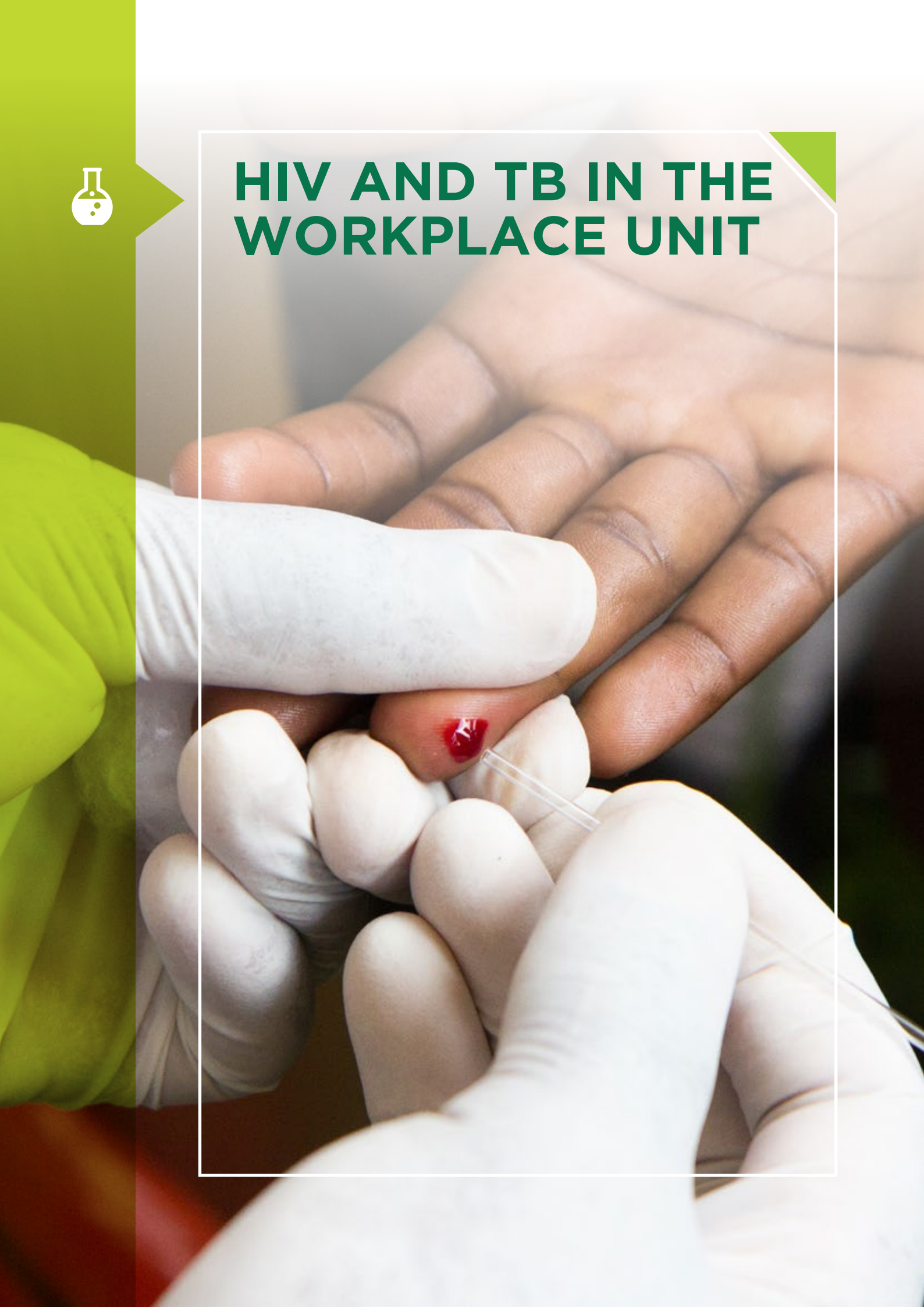
QA staff continued to study to improve their knowledge in quality as part of their CPD. Mr Bonginkosi Duma attended the SANAS training to migrate from ISO 17025:2005 to the new ISO 17025:2017 standard. Importantly, this standard includes a component of risk management that will be implemented across laboratories accredited for ISO 17025:2005 in the next financial year, such as the Analytical Services Section.

HONOURS

The NIOH QA Section provided ongoing support for accreditation purposes to the NHLS Public Health laboratories that test food and water, using the ISO 17025 standard. This support from the Section during 2018, contributed to the ISO 17025-accredication of the KwaZulu-Natal Public Health Laboratory in May 2018. This is the first NHLS public health laboratory that achieved this accreditation and the second ISO 17025 accreditation within the group, after the NIOH.

Image 2: B Duma from the National Institute for Occupational Health and the KwaZulu-Natal Public Health Laboratory team.

HIV AND TB IN THE WORKPLACE UNIT



HIV AND TB IN THE WORKPLACE UNIT

Dr Muzimkhulu Zungu
Head

In 2018, the WHO reported an estimated global TB incidence of 133 per 100 000 population, and 567 per 100 000 population in South Africa. These high TB rates, particularly in South Africa, occur alongside the Human Immunodeficiency Virus (HIV) epidemic, as South Africa is home to 19% of all people living with HIV. In addition, HIV and TB are major contributors to high morbidity and mortality rates in South Africa.

Workers with HIV and TB are less likely to attain and maintain decent work, which in turn increases poverty and creates conditions that make people even more vulnerable to HIV and TB.

2018 proved to be a watershed moment for the elimination of TB, globally and in South Africa, due to the first-ever United Nations (UN) high-level meeting on 26 September 2018 to declare the acceleration of progress to end TB targets, and the subsequent adoption of this declaration by the UN General Assembly (UNGA) on 10 October 2018. The declaration was followed by numerous appeals to end the TB epidemic, including a call by the ICOH, which emphasised and produced position papers on the scourge of TB in worker populations, and particularly in health workers and silica dust-exposed workers.

This latest political declaration by UNGA, combined with the 2016 UNGA Political Declaration on HIV and AIDS: "*On the FastTrack to Accelerating the Fight against HIV and to Ending the AIDS Epidemic by 2030,"* provided renewed hope, especially for affected workers in South Africa. These international instruments will further strengthen the call for provision of HIV and TB services in workplaces. The NIOH welcomes these efforts and will continue to participate in and implement these instruments in the 2019/2020 financial year, as we have done during the preceding financial year.

The Unit played a pivotal role in contributing to workplace HIV and TB interventions to improve the wellbeing of workers, as well as occupational health systems in South Africa, the African region, and the world over.

SERVICES

Occupational tuberculosis assessments

In partnership with the NIOH's Occupational Hygiene Section and Northern Cape Province, the Unit conducted workplace assessments for TB Infection Prevention and Control (IPC) measures in at least four hospitals in the province, namely: Kakamas, Abraham Esau, Dr Harry Surtie- and Springbok hospitals. The assessments were concluded in technical reports with recommendations for managing TB IPC in healthcare settings. Following the technical reports, a monitoring tool was also developed that will be implemented in the 2019/2020 financial year.

Occupational health services in Southern Africa

The Unit forms part of two teams tasked with rolling out the ILO and WHO HealthWISE Tool. Team 1 consists of members from the University of British Columbia (UBC), Canada; International Labour Organisation (ILO); Ministries of Health from Mozambique, South Africa and Zimbabwe. Team 2 comprise members from the ILO, NEPAD and the Lesotho Ministry of Health. HealthWISE is a practical quality improvement tool to help guide the improvement of OHS in healthcare facilities and workplaces.

Rollout has since occurred in the following areas:

- Mozambique: Geral De Mavalane, Geral Da Machava and Ndlavela hospitals;
- South Africa: Kalafong Provincial Tertiary and Dr George Mukhari Academic hospitals; and
- Zimbabwe: Harare Central- and Murhewa hospitals.

Image 1a and 1b: Pictures of risky behaviour (inaccessible sharp container under the desk of health workers) identified using the HealthWISE tool in one of our health facilities.

The tool was also implemented in a total of ten hospitals in a number of districts in Lesotho, namely: Berea, Leribe, Mafeteng, Maseru, Mohale's Hoek and Quthing.

Occupational Medicine Clinic

In collaboration with the Gauteng DoH, the Unit provides OHS services for health workers at the Kalafong Provincial Tertiary- and Dr George Mukhari Academic hospitals. These OHS services include:

- Advisory support in OHS policies and systems;
- Occupational HRAs;
- Risk-based medical surveillance;
- OHS teaching and training; and
- Assistance with waste management.

The services in Kalafong Provincial Tertiary Hospital also includes managing the occupational medicine clinic for health workers through the occupational medical practitioner (OMP) and the clinical associate, under supervision of the OMP. This clinic is therefore now able to provide training for occupational health clinicians, in collaboration with the UP.

Awareness of the human immunodeficiency virus and tuberculosis

The Unit organised and coordinated the commemoration of the World AIDS Day events for the NIOH and the South African National Taxi Council (SANTACO) at Park Station in Johannesburg, in the Gauteng Province.

Advisory support

- The Unit provides ongoing and ad hoc advisory support to health workers on OHS issues, with special emphasis on HIV and TB for the national and provincial DoH, the DEL, and organised labour (trade unions) in the health sector;
- In collaboration with University of Pretoria and the Walter Sisulu University, the Unit provides expert professional services (occupational health systems, occupational medicine and epidemiology) to the Masoyise Health Programme. The Masoyise Health Programme is a wellness approach that incorporates noncommunicable diseases and occupational lung diseases to the previous Masoyise iTB project, which focussed on HIV and TB in the mining industry. The vision of the programme is *"A mining industry that protects and maximises the health and wellness of its employees;"*
- The Unit serves in technical committees of the Mine Health and Safety Council (MHSC) and the DEL, on invitation, and on an ad hoc basis;

- The Unit continues to participate in OHS meetings of construction industry partners such as the Master Builders Association (MBA) North and the South African Forum of Civil Engineering Contractors (SAFCEC) in an advisory capacity; and
- In collaboration with the Occupational Hygiene Section, the Unit conducted a HRA at the Natal Spruit Hawkers Market in Katlehong Ekurhuleni. The results of the HRA were utilised to provide advice for the hawkers and the City of Ekurhuleni Environmental Health Practitioners (inspectors at the market).

TEACHING AND TRAINING

Academic qualifications in Occupational Health

The Unit coordinates the Diploma in Occupational Health and Medicine (DOHM), and teaches Occupational Health to undergraduate and postgraduate students on behalf of the School of Health Systems and Public Health (SHSPH), at the UP. The Unit provides Occupational Health teaching and Training to students who are studying towards their MPH at the Walter Sisulu University in Umthatha. The Unit was a rotation site for practical training of two public health medicine registrars from the UP.

Public Health postgraduate research supervision

The Unit graduated one MMed Public Health Medicine registrar, one MPH, and 12 DOHM students from the SHSPH, UP. The Unit is currently also supervising research projects of three MPH students, one MMed student and one MSc student, as well as two DOHM students.

Training of workers and management in occupational health and safety short courses

Following the fire at the Bank of Lisbon building in Johannesburg, the Unit organised and coordinated a one-week OHS training course, which included OHS induction, emergency preparedness and first aid for the Gauteng DoH. Prior to this, OHS induction training was also provided to all hospital Chief Executive Officers (CEOs). These training sessions were conducted in collaboration with the Gauteng provincial DoH Employee Health and Wellness team and with the support of the CoJ Emergency Services.

The Unit provided five training workshops on HIV and TB for health workers in three provinces: Eastern Cape (90 participants), Gauteng Province (30 participants) and North West (30 participants). The programme included basics on the importance of workplace HIV and TB programmes for health workers, what constitutes an HIV and TB workplace programme, stigma and discrimination and monitoring and evaluation of such programmes.

Training was also provided on HIV and TB, as well as silicosis and asbestos exposure in the workplace, to workers in small, medium- and micro enterprises (SMMEs) in construction and certificates of attendance were issued to the attendees.

In addition, the Unit hosted the 2nd Annual NIOH National Workshop on OHS in the construction industry, which was attended by occupational health professionals, government officials, and business and workers representatives.

The Unit furthermore participated in several other training initiatives organised by the NIOH or other stakeholders such as the following:

- The state of health and threats facing the health of South Africans at the SANDF College; and
- Health worker training for the North West DoH managers.

The Unit hosted three regional workshops together with the ILO on HealthWISE in Mozambique, Zimbabwe and Lesotho.

Finally, the Unit signed a Memorandum of Understanding (MoU) with the Health & Other Services Personnel Trade Union of South Africa (HOSPERSA), with the aim to collaboratively work towards protecting health workers from HIV and TB, and promoting gender equity in the workplace.

RESEARCH

The Unit is involved in ongoing research projects that are currently at various stages. These research projects are in the formal and informal economy within health, mining, construction and other sectors.

On-going research projects

Maki L, Mlangeni N, Zungu. *Occupational health services in the South African construction industry - Prioritising health: the research for done to understand the provision of occupational health services including HIV and TB services for construction workers. (Stage – Writing it up)*

Mlangeni M, Zungu M. *Knowledge attitudes practices and HIV prevalence survey among farm workers: An evaluation study. Limpopo and Mpumalanga Province, 2019. (Stage – Writing it up)*

SAFETY HEALTH AND EVIRONMENT DEPARTMENT

SAFETY HEALTH AND EVIRONMENT DEPARTMENT

Mr David Jones
Manager

STAFFING

The year under review saw the filling of three positions. Two of the positions were for OHN Managers, one of which served as a replacement for a position that became vacant in the previous financial year and one of which was a new position created to primarily provide services to the NICD. The Deputy Manager: SHE also resigned in the year under review and the position was subsequently filled.

CLINICAL

Under the leadership of the NHLS OMP, the department continued to provide guidance and expert medical support for specific cases and incidents, the most notable of which were:

- Possible exposure to Brucella;
- Possible exposure to Congo Fever;
- Employees diagnosed with TB;
- Employees with Hepatitis B;
- Ergonomic incidents and issues; and
- Exposure or possible exposure to other biological agents as well as chemicals and noise.

The OHN Managers continue with monitoring the levels of compliance with regard to Hepatitis B immunisation and surveillance for TB. The information collected is being captured into the OHASIS employee health module.

The level of compliance for Hepatitis B immunisation amongst potentially at risk employees, including those who are currently receiving vaccinations, has now reached 96.23%. Significant progress was also made in ensuring that all employees were subjected to baseline CXRs. To date, 96.09% of employees underwent baseline CXRs.

SPECIAL INVESTIGATIONS AND NIOH SUPPORT

Various departments of the NIOH, including Occupational Hygiene, Occupational Medicine, Immunology and Microbiology, IT and Finance continued to provide expert advice and guidance related to the following:

- Case management for occupational incidents and disease investigations;
- The fit testing of N95 respirators for staff;
- Compliance with legal requirements pertaining to medical surveillance;
- Consulting with employees and their treating healthcare professionals who have specific occupational medical concerns;
- Noise surveillance;
- Chemical exposure monitoring;
- Ergonomic assessments;
- Immunology advice and
- Ongoing development of the OHASIS.

THE OCCUPATIONAL HEALTH AND SAFETY INFORMATION SYSTEM

The Occupational Health and Safety Information System in the National Health Laboratory Service (OHASIS)

Training of identified persons in facilities continue, through online training facilities that can be accessed via the intranet.

To date, 1072 employees (up from 880 last year) have been trained and loaded as live users of the OHASIS. This means that they are able to input data into the Incident Reporting and Investigations and/or Waste Tracking Modules and are also able to access reports.

Three years ago, the facility to self-report an incident was added to OHASIS. This function is aimed at reducing the under reporting of incidents. Each self-report is perused by an OHN manager when it involves a disease, and by a SHE Officer when it involves any other reports. The importance of self-reporting is evident in the graph below.

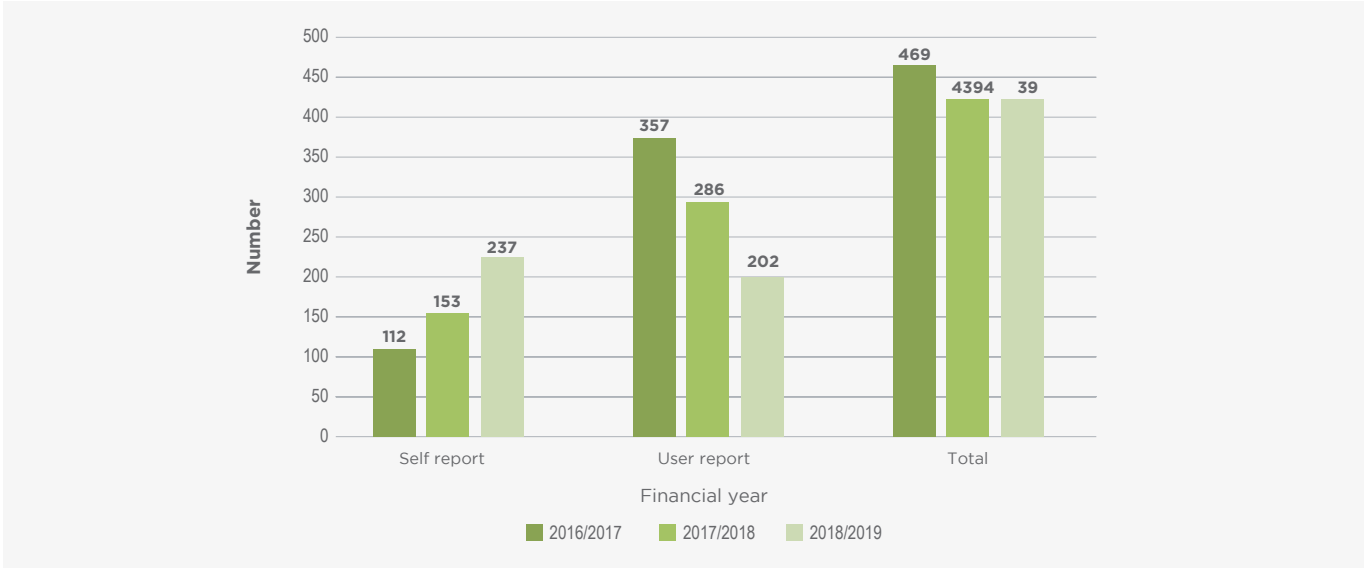


Figure 1: Number of incident self-reports and reports through a user.

In the year under review, the same number of incidents were reported on OHASIS as in the past financial year.

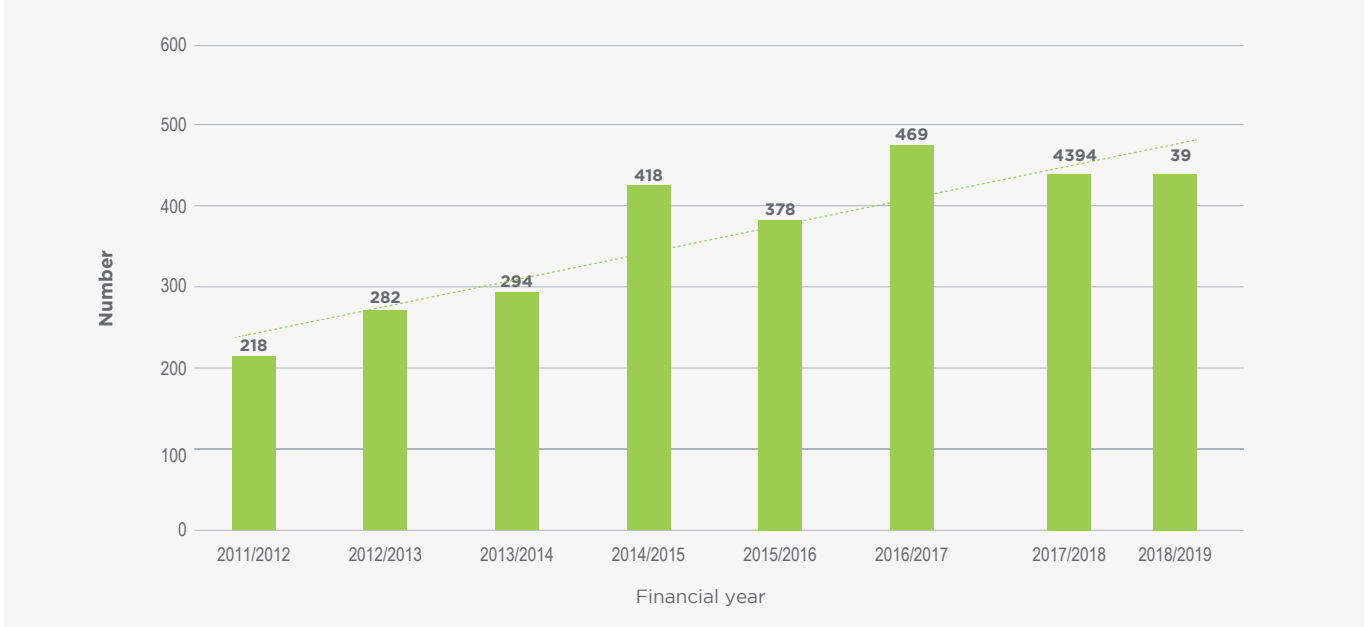
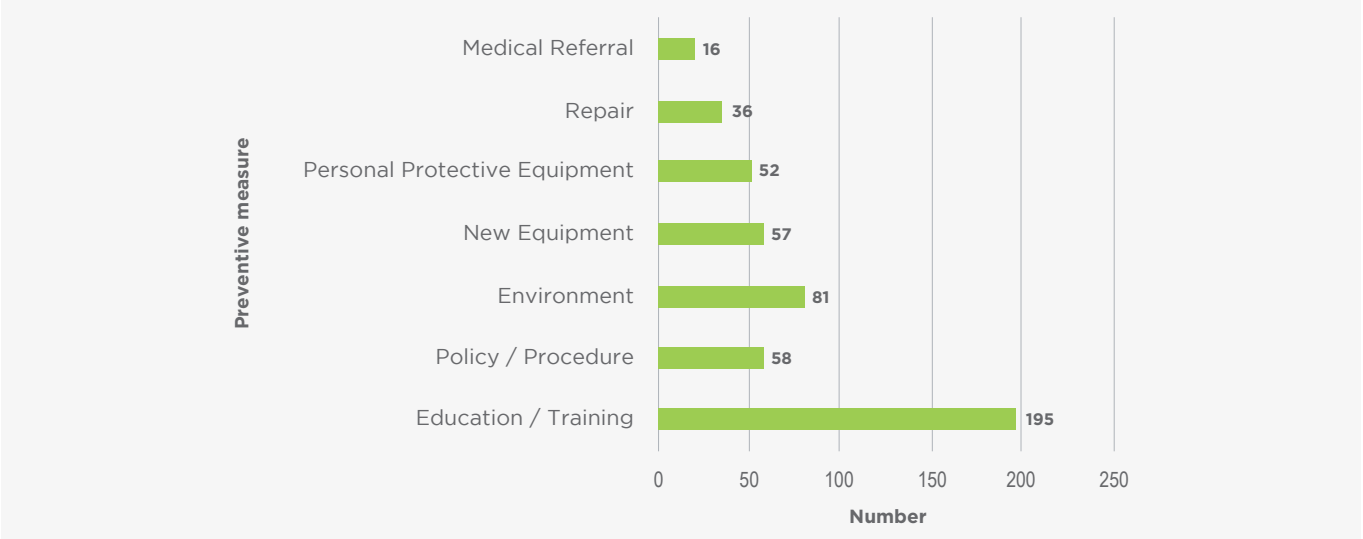


Figure 2: Year-on-year reporting of incidents on OHASIS for the 2011/2012 to 2018/2019 financial years.

Employees are encouraged to report every incident, regardless of how small or insignificant they may perceive it to be. The rationale for this approach is to encourage a culture of reporting and timely correction, as opposed to one of omitting details of issues that could be critical and more difficult to resolve down the line.

A breakdown of the types and number of preventive measures identified over the corresponding time, is indicated below.



The OHASIS used by the NHLS is an online system and negotiations with the UBC are underway to implement this system beyond Africa and government institutions.

The Occupational Health and Safety Information System beyond the National Health Laboratory Service

The year under review saw a continued increase in interest in OHASIS with a request for a quotation to implement the system in the Western Cape DoH, as well as presentations to four African countries namely Zambia, Malawi, Mozambique and Lesotho, in collaboration with NEPAD. We are currently negotiating with Mr Khoza, a Senior Programme Officer and Occupational Hygiene Specialist at NEPAD, to determine the way forward.

AUDITS AND RISK ASSESSMENTS

During the period under review, the SHE Officers continued to audit all facilities which scored less than 95% in the safety audit in the previous financial year, including all the TB culture laboratories and 50% of all the other laboratories. The audits were based on the type of information that is considered by the DEL, as well as the requirements of relevant legislation.

During the year under review, 236 SHE audits were conducted, as opposed to 143 in the previous financial year. The audits comprise a total of 265 questions, of which 27 pertain to TB culture laboratories only, and where relevant, reports of nonconformance are issued. All reports are generated through the OHASIS and are forwarded to both the facility and business managers. The Deputy SHE Manager also forwards monthly updates on the number of outstanding nonconformances to the respective Manager.

In an ongoing effort to remain compliant with legislation and to assess the level of risk that employees are exposed to, the SHE Department evaluated the different risk assessments which were conducted by the various facilities. The department also assisted those facilities without risk assessments and where necessary, recommendations were made for improvements to risk assessments. A total of 248 risk assessments were evaluated for compliance and a number of improvements were facilitated, where necessary.

MEETINGS

The SHE Department monitors and attends Health and Safety Committee meetings to ensure compliance with the relevant legislation. During the period under review, 126 Health and Safety Committee Meetings took place of which 111 were attended by a member of the SHE Department. In addition to these committee meetings, members of the SHE Department attended a variety of other meetings, ranging from Area Manager and Management Committee (MANCO) meetings, to meetings with Human Resources to discuss health and safety incidents that occurred.

HAZARDOUS WASTE

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

Specifications were drafted for use in chemical waste management and healthcare risk waste management tenders to help ensure that suitable service providers are appointed to remove, treat and dispose of hazardous waste. Through the Waste Assurance Section, the SHE Department assists with the evaluation of the tenders submitted, prior to awarding of final tenders.

It is a requirement of the Gauteng and Western Cape Provincial Departments of Environment that major generators of hazardous waste develop and document waste management plans. The objectives are to reduce the amount of waste generated and where possible, enable recycling. The Waste Assurance Section facilitates and assists our laboratories to ensure compliance with the relevant regulations. Currently, 54 of our laboratories have waste management plans.

There was an improvement in the reporting of waste quantities on OHASIS by facilities, which enables the NHLS to:

- Gain an overview of the amount and categories of healthcare risk waste generated;
- Track the waste from cradle-to-grave; and
- Monitor the services provided by the service providers once the waste has been removed from the facilities.

As at the end of the year under review, a total of 169 sites were reporting their waste management on OHASIS.

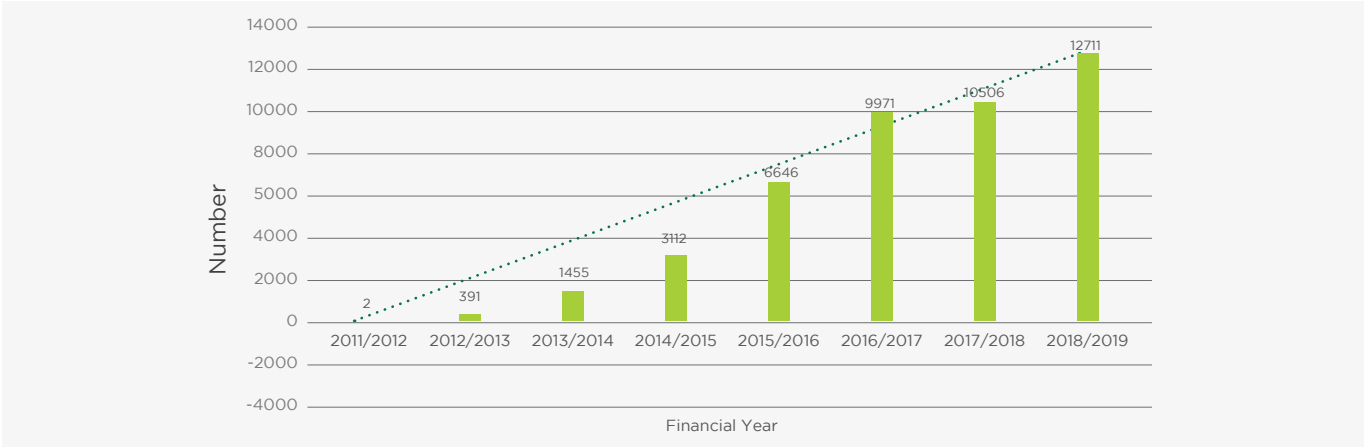
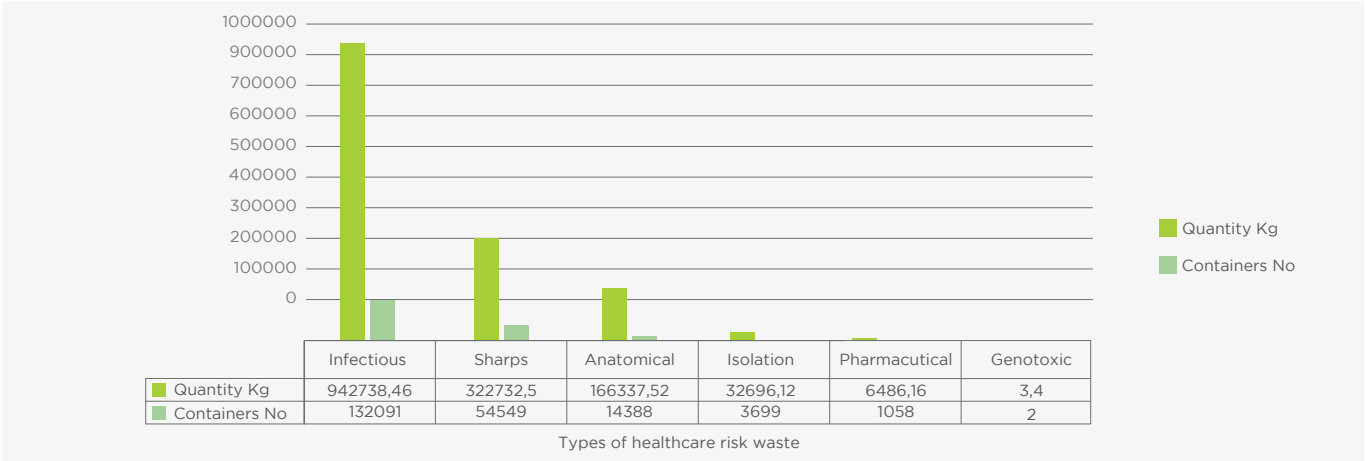


Figure 4: Number of waste manifest documents captured into the Occupational Health and Safety Information System.



	Infectious	Sharps	Anatomical	Isolation	Pharmaceutical	Genotoxic
Quantity Kg	942738,46	322732,5	166337,52	32696,12	6486,16	3,4
Containers No	132091	54549	14388	3699	1058	2

Figure 5: Quantities of medical waste and number of containers removed by category.

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 remain abreast of developments in the waste management sector.

TEACHING AND TRAINING

Training within the National Health Laboratory Service

The SHE Department continued to coordinate the online training of health and safety representatives and managers during the year under review. 104 new employees completed the online training course which the SHE Department developed and continues to assess. This online training is available through the NHLS intranet portal and is accessible to all staff.

The Department also developed and administers online healthcare risk waste training for employees, which has been completed by 97 employees.

The SHE Department trained a total number of 2499 employees in the period under review, either individually, in groups, or online.

Due to a grant from the Biological Threat Reduction Programme of the Defence Threat Reduction Agency (DTRA) in the USA, the Department was able to develop online training material that uses videos. We embarked on a tender process to appoint a service provider for the production of the videos and the completed videos were launched on 11 May 2018. The videos produced are aimed at:

- Health and safety induction for new employees;
- Health and safety induction for new managers;
- Health and safety induction for visitors;
- Health and safety induction for security officers (translated into five different languages);
- How to safely don and doff high-level personal protection equipment (PPE);
- Handwashing sequence;
- How to work safely in a microbiological safety cabinet; and

Image 6: Handing over of the videos at the launch ceremony to the Acting NHLS CEO Dr Karmani Chetty.

- How to do a smoke test on a microbiological safety cabinet.

Complete sets of the abovementioned videos were provided to the laboratories on a memory stick and are available on the intranet under the training Section of the SHE Department. The videos have proven to be invaluable for induction purposes and are frequently utilised by the department, for this purpose.

The Department also identified a requirement for provision of training on the shipping of "Category A" hazardous biological agents. A training programme was arranged for training of laboratory staff to do packing and also for two representatives from the six Areas of the NHLS and the Institutes to be trained as trainers. The shippers course was presented in one day and the train the trainer course over a period of five days. The training, which was prioritised as urgent due to legal requirements, were part-funded by a grant and the rest was funded by the office of the CEO.

All members of the SHE Department underwent refresher training on respirator fit testing, which was conducted by TSI, who are the suppliers of the PortaCount equipment that is used for doing fit tests.

Training and conference opportunities outside the National Health Laboratory Service

Three members of the SHE Department were funded by the DTRA to attend the American Biological Safety Association (ABSA) annual conference in the USA, including attending the three days of preconference training.

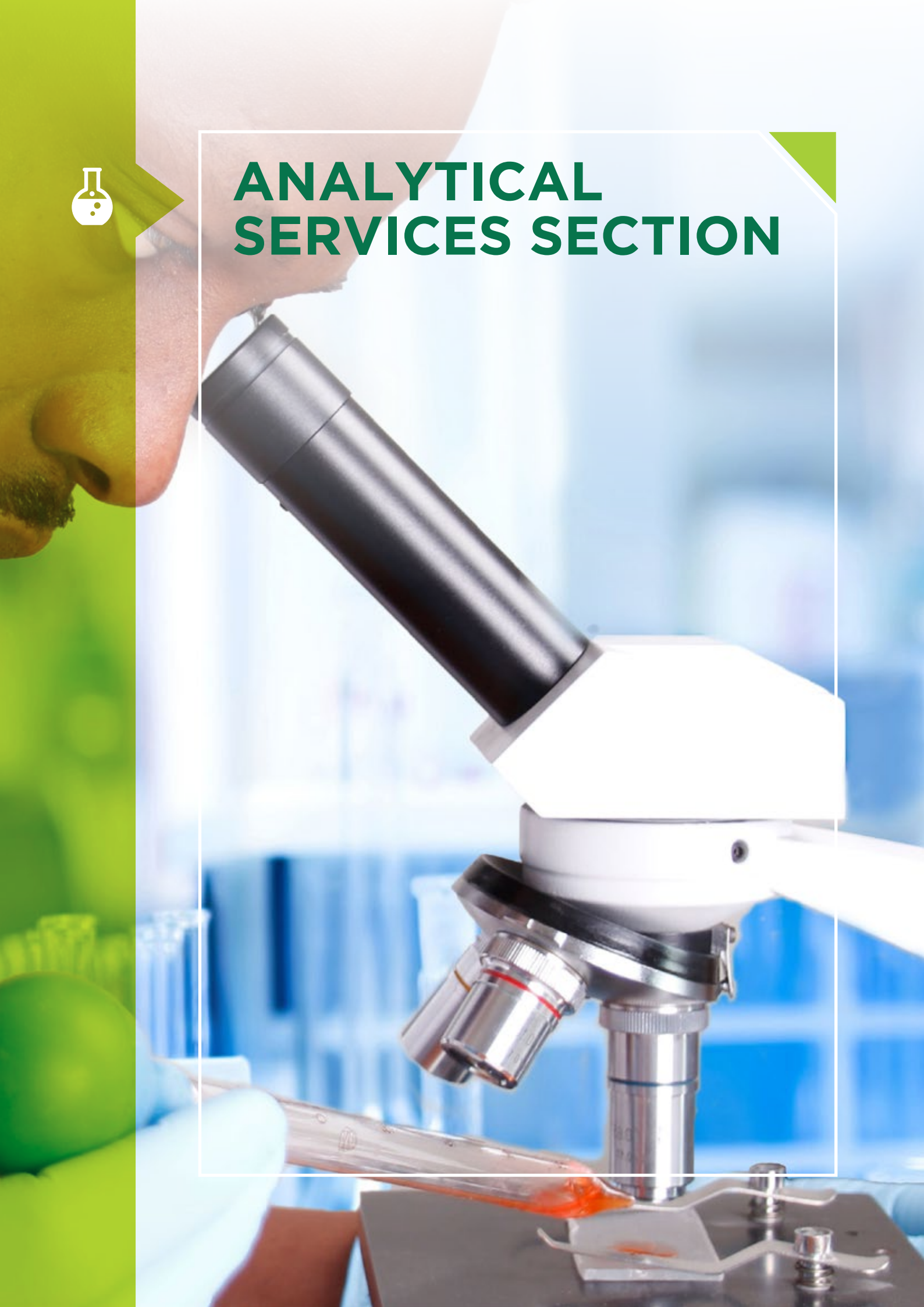
Prior to the ABSA conference, the National SHE Manager was afforded an opportunity to present OHASIS to the CDC in Atlanta, USA. The trip was wholly sponsored, and no costs were incurred by the NHLS.

The Waste Assurance Manager was sponsored to present and participate in the 2018 African Society for Laboratory Medicine Conference Satellite Seminar on Waste Management Strategies for HIV Viral Load and Early Infant Diagnosis, which took place in Abuja, Nigeria. This invitation was extended by the CDC.

As part of its Workplace Skills Plan, the NHLS funded the attendance of two OHN Managers at the annual SASOHN Congress, which was hosted from 31 October – 2 November in Stellenbosch, Cape Town.

Image 7: SHE Department staff.

ANALYTICAL SERVICES SECTION



ANALYTICAL SERVICES SECTION

Dr Boitumelo Kgarebe
Head

The Analytical Services Section continues with its mandate to focus on the analysis of hazardous substances in biological and environmental media as a way of strengthening the assessment of workplace exposure in compliance with the Regulations of Hazardous Chemical Substances.

The Section continued to provide specialised laboratory tests, advisory services and training in support of private industries, government departments, and academic institutions in occupational and environmental health. QA and competence are key in monitoring analytical performance. For this reason, the analytical services laboratories regularly participate in the PTS and EQA.

SERVICES

Diagnostic services

1893 tests (for diagnostic and research purposes) were completed during the reporting period.

Specialised laboratory testing

In line with its mandate to provide laboratory testing services and the organisational objective "to conduct 90% of all occupational and environmental health laboratory tests within specified TATs by 2020," the Analytical Services Section achieved an overall average of 85% for tests conducted within the specified TAT, in the year under review. This was lower than the institutional 90% target for the financial year. This underachievement was mainly due to the closure of laboratories for renovations that took place in the last quarter of the period under review.

Advisory services

In line with the agreed annual performance indicators, the Section continued to render advice to both the private and public sectors. Of note, is the fact that the Section provides technical advice to the national DoH on National Regulations Relating to Lead in Paint, on an ongoing basis.

RESEARCH AND SPECIAL PROJECTS

The Analytical Services Section hosted a specialised scientific meeting on Alcohol Toxicology from 23 - 24 April 2018. This 1st Annual African Meeting of Alcohol Toxicology with the theme *"Notable impressions and investigations,"* focused on various topics concerned with alcohol consumption, pharmacology, detection, analysis and interpretation of alcohol results, as well as the medical, legal and occupational implications of alcohol levels in an individual.

The meeting, a first of its kind in South Africa, was funded by the African Academy of Sciences (AAS) and was a joint initiative of the Analytical Services Section, the Division of Forensic Medicine and Pathology at Wits, and Alcohol Breathalysers (Pty) Ltd.

A method for the analysis of post mortem ethanol in vitreous humour samples was developed and validated as a response to a request from the Division of Forensic Medicine and Pathology of Wits. The method, which can be applied in occupational and other forensic settings, uses vitreous humour as an alternative matrix when the use of blood, the most commonly used matrix, poses limitations.

In August 2018, Dr Boitumelo Kgarebe, Ms Lerato Mochaki and Ms Bianca Southon attended the 56th International Congress of the Federation of South African Societies of Pathology (PathCape 2018), at Spier Wine Farm, in Stellenbosch. At the conference, Ms Mochaki presented an oral presentation entitled: *"Mercury Self-Injection by a White Adult Female: A Case Report;"* and Ms Southon presented a poster entitled: *"The effect of temperature and headspace on the determination of ethanol in post-mortem blood specimens: A South African perspective."*

ACCREDITATION

In October 2018, Ms Lerato Mochaki received her accreditation as an ISO/IEC 17025 technical signatory from the SANAS, for the determination of mercury in drinking water and industrial effluents, as well as for the determination of aluminium in water; which makes her the third technical signatory in the Section.

The Metals and Organic Units maintained their annual ISO 15189 accreditation status. The Organics Unit also extended its scope of tests with an addition of nine analytes. The Section was also audited by the SANAS and maintained their 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 within the laboratory. As part of its participation in the PTS for monitoring laboratory analytical performance and competence in analysing and quantifying biomarkers in specimens, the Section continued with its participation in the following EQA programmes:

- The NY State DoH for arsenic, cadmium, chromium, lead, manganese and mercury in blood and urine and aluminium in serum and water;
- The German EQA programme for mandelic acid, nickel, phenol, o-cresol, hexanedione, 1-hydroxypyrene and methyl hippuric acid in urine;
- The LAMP Program by CDC, USA for cadmium, lead and mercury in blood; and
- The SABS Water Check Scheme.

In January 2019, the Organics Unit of the Analytical Services Section successfully passed Round 1 of the National Metrology Institute of South Africa (NMISA) PTS PT-ORG-31 for the analysis of ethanol (alcohol).

TEACHING AND TRAINING

The Section met its teaching and training targets in the year under review. Our staff trained postgraduate students on good laboratory practice (GLP), analytical techniques and research methodology, as applied in chemical contaminants detection in the workplace and for biological monitoring. The Section continued to host students for exposure to various practical aspects of an accredited laboratory and to assist national institutions to prepare students for laboratory-focused careers.

In May 2018, the Section was part of the multidisciplinary NIOH team that provided OHS training to delegates from the Republic of Malawi under the auspices of a MoU between the NIOH and the NEPAD Planning and Coordinating Agency (NPCA).

The second edition of the course: “Introduction to Applied Chemistry in Occupational and Environmental Health,” was delivered at Wits in November 2019. This training was for second-year undergraduate students in Applied Chemistry from Wits. This course exposes students to a basic understanding of the application of analytical chemistry principles to the practice of Occupational and Environmental Health.

PROFESSIONAL DEVELOPMENT

Ms Bianca Southon finalised corrections to her MSc in Medicine thesis and will graduate in July 2019. Ms Angela Mawela completed her BSc degree in December 2018. One Honours postgraduate student graduated in December 2018, and three commenced studies in January 2019.

HONOURS/RECOGNITION

In January 2019, the Organics Unit of the Analytical Services Section successfully passed the 62nd intercomparison programme 2018 as reference laboratory for toxicological analyses in biological materials. The programme is conducted by the German External Quality Assessment Scheme (G-EQUAS). This is the seventh consecutive year that the Analytical Services Section has maintained its status as a reference laboratory for the determination of exposure to hexane, using the metabolite 2,5-hexanedione in urine.

Image 1: Participants at the 1st Annual African Meeting of Alcohol Toxicology.

In December 2018, at the 11th AAS General Assembly in Pretoria, South Africa, the AAS honoured Dr Boitumelo Kgarebe as an outstanding woman scientist who served the academy and for her achievements and service to the AAS in her capacity as Vice President for Southern Africa in the Governing Council. In addition, Dr Kgarebe was acknowledged for her contribution to science in Africa and for being an example to other women scientists.

TOXICOLOGY AND BIOCHEMISTRY SECTION

TOXICOLOGY AND BIOCHEMISTRY SECTION

Dr Natasha Sanabria
Head

During the period under review, Prof Mary Gulumian transitioned to the Head of Research Projects and Dr Sanabria was appointed as the Head of Toxicology and Biochemistry within the NIOH. The Section continued to focus on research, teaching and training, and consultation to a number of governmental departments and industry stakeholders, as well as specialised service delivery. The Section's work is conducted through the following specialised units:

- The Genotoxicity Unit;
- The HRA Unit;
- The Nano- and Microparticle Toxicity Unit; and
- The Toxicogenomics Unit.

Similarly, established collaborations with local and international institutions were maintained during this transition phase, which allowed for training of staff and postgraduate students in the field of general occupational toxicology and nanotoxicology.

An innovative direction was identified, namely the inclusion of computational toxicology studies, where predictive tools are used to prevent disease. For this reason, staff undertook specialised training for implementation of computational models based on measurements from the various research projects. A computational toxicology workshop was organised for stakeholders.

The Section also hosted a US Science Envoy for environment, science, technology and health representatives from the US Embassy in South Africa.

RESEARCH

The working dynamic and collaborative efforts between Prof Gulumian and Dr Sanabria created a highly productive Section that produced no less than 13 publications, which constitutes approximately 40% of the institute's output during the period under review. Our staff also supported public engagement and authored four non peer reviewed articles for industry related magazines. In addition, our staff served as reviewers for 12 different international journals and presented their research findings at international and local conferences.

INTERNATIONAL COLLABORATIONS

The Brazil, Russia, India, China and South Africa Multilateral Project

The department was awarded an NRF research grant for this new and collaborative nano hybrid project related to nanotechnologies, that speaks to "*New core-shell hybrid nanostructures: Evaluation of surface coating impact to biosafety and potential therapeutic applications*". The Section's first progress report on the project was submitted by Prof Gulumian, Dr Sanabria, Ms Vetten and Ms Andraos.

European Union projects

EUH2020 research grants were awarded for two projects related to the study of the toxicity and the risk assessment of engineered nanoparticles and nanotechnologies. Consequently, Prof Gulumian participated in a number of meetings with EU partners to discuss collaboration on current and new projects.

For example, as part of the "caLIBRAte" project, Prof Gulumian and Mr K Boodhia attended WebEx and teleconferences. In these meetings, it was discussed which measures the NIOH will take to investigate the *in vitro* delivered dose of dispersed nanomaterials, as well as the review of requests for high-throughput screening (HTS) and adverse outcome pathways (AOPs).

Other matters under discussion included:

- Issues with other novel methods;
- Outcomes of exposure and exposure methods;
- Contributions to publications; and
- Deliverables on:
  - The "New Approach Methodologies;"
  - Manufactured nanomaterials (MN);
  - HRA tools; and
  - The Cooper Stage-Gate innovation funnel guidance document.

International Organization for Standardization

A technical report was produced during the reporting period, namely the ISO/TC 229 N 1392 "Nanotechnologies – Label-free electrochemical impedance technology to assess the toxicity of nanomaterials *in vitro*". In addition, new work item proposals (NWIPs) were discussed, and a proposal was submitted by South Africa in collaboration with South Korea. As the head of delegation of the ISO/TC 229 Working Group (WG3) "Health, Safety and Environmental Aspects of Nanotechnologies" Committee, Prof Gulumian, attended numerous WebEx and teleconference meetings throughout the year. Prof Gulumian also represented the SANAS in a recent ISO meeting in Kuala Lumpur (Malaysia). She participated as an expert at these forums.

International Union of Toxicology

Prof Gulumian, Dr Sanabria and Ms Vetten attended the International Union of Toxicology (IUTOX) meeting held in Belgrade (Serbia), to present their research findings and network with toxicologists from other developing countries. In addition, as a member of the Education Committee, as well as the developing countries and Membership Committee, Prof Gulumian attended discussions regarding:

- A workshop and training on global issues in toxicology; and
- Development of case studies to use with programming.

Prof Gulumian attended WebEx and teleconferences to discuss the International Congress of Toxicology (ICTXV) scientific programme and ICTXV Public Relations Committee. Prof Gulumian also attended a meeting at the 58th Annual Meeting and ToxExpo, in Baltimore (USA), to discuss the organisation of a session on "Women in Toxicology" and present on "The status of women in toxicology in Africa", under the African speciality Section.

Organisation for Economic Cooperation and Development

The Toxicology Section participated in the activities of the Organisation for Economic Cooperation and Development (OECD) Working Party on Manufactured Nanomaterials (WPMN), of which Prof Gulumian is a participating member. This required attendance in many meetings throughout the year, which included:

- The WPMN Steering Group 8 (SG8) on Exposure Measurement and Exposure Mitigation that discussed the assessment of bio-durability of nanomaterials and their surface ligands, which was declassified and published;
- Through the NIOH, South Africa will continue to contribute to the collection of data for exposure modelling projects;
- The Steering Group on Test Guidelines (SGTA);
- The group for nano AOP to be implemented in the risk assessment of nanomaterials by identifying key events of relevance for future regulatory decision making;
- The safe innovation approach (SIA) for nanomaterials, and
- The OECD Conference including the workshop on Grouping of Nanomaterials (including the NanoReg2 and Gracious 2020 projects).

These meetings are important for the approval of nanomaterials that are intended for export to the EU, as well as other OECD countries, including South Africa. Through the NIOH, South Africa will continue to contribute also to the collection of data for exposure modelling projects.

Through Prof Gulumian, South Africa provided an update on available information for biopersistent/biodurable MNs, based on comments from the WPMN18. Similarly, South Africa contributed to:

- The standard method for determination of the dissolution rate of nanomaterials in environmental media (dynamic method);
- Advancing nano AOP development for nanomaterial risk assessment and categorisation; and
- Moving towards SIA for sustainable nanomaterials and nano enabled products.

Innovative nano informatics models and tools: Towards a solid, verified and integrated approach to predictive (eco) toxicology (NanoSolveIT)

Dr Sanabria and Prof Gulumian are participating members of the Workplan 2 research group for the international consortium NanoSolveIT (an EU H2020 project). The kick-off meeting was conducted in Athens (Greece), where they presented on behalf of the NIOH/NHLS. Dr Sanabria and Prof Gulumian also attended teleconference meetings with other active members of the consortium. Prof Gulumian was given the task of assessing the quality of data available to be utilised for predictive modelling of the toxicity of nanomaterials.

World Health Organization

The WHO renewed the participation of the NIOH as a WHO Collaborating Centre (CC), in the WHO Chemical Risk Assessment Network for four additional years, until 31 July 2022.

NATIONAL COLLABORATIONS

Department of Science and Technology

The collaborative research efforts of the Section's staff were recognised at the Department of Science and technology (DST) launch of "Beyond Imagination", where Prof Gulumian presented the invited address, *"Nanoscience, nanotechnology, nanomaterials and nanotoxicology in South Africa."*

In collaboration with Mintek, North West University, the CSIR and the UP, the Section also continued to execute work for two DST-funded projects, namely:

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

Prof Gulumian and Dr Sanabria attended the DST seminar on "Nanotechnology Landscape Study" to provide feedback.

The Council for Scientific and Industrial Research

The Section liaised with the CSIR regarding safety data sheets (SDS) for various nanomaterials. In addition, Ms C Andraos and Mr J Sethowa are actively involved in the HSE risk research platform at the CSIR to analyse data for exposure assessment to nanomaterials.

The South African Bureau of Standards

Prof Gulumian continued to serve as Head of the delegation of the TC229-Nanotechnologies on the ISO/TC 229 Working Group 3, Health, safety and Environment, as mandated by the SABS.

The Society of Risk Analysis Africa

As the newly elected president of the Society of Risk Analysis (SRA) Africa, Prof Gulumian participated in meetings, WebEx meetings and teleconferences to discuss the following:

- The SRA World Congress Round Table;
- Draft of a constitution and bylaws;
- The MoU between the Society of Toxicology (SOT) and the SRA Africa;
- The SRA conference in New Orleans; and
- Joint programmes between the SRA and the Society of Environmental Toxicology and Chemistry (SETAC), to train African students during the 5th World Congress on Risk global SRA meeting.

The South African Council for Natural Scientific Professions

The Section contributed to strategic meetings, where Prof Gulumian served as a member of the South African Council for Natural Scientific Professions (SACNASP) and provided expert knowledge on the following:

- New White Paper on Science and Technology National Foresight Initiative 2018;
- Review of the Framework for Voluntary Associations;
- The council's strategic planning session; and
- The registration of those conducting work for the Department of Agriculture, Forestry and Fisheries (DAFF) to be registered with the SACNASP.

SERVICE DELIVERY

Lung Cancer Research Unit (Helen Joseph Hospital)

A new collaboration was initiated between the Pathology and Toxicology Sections at the NIOH, where Dr Sanabria participated in a site visit at a private microbiology laboratory to discuss the approved standard operating procedures (SOPs), as well as the interlaboratory verification procedures. Dr Sanabria also attended meetings with Dr N Vorajee and industry service providers to discuss genetic analyses options, which may form part of the services provided to government hospitals that are serviced by the NHLS, as part of the current work performed within the Pathology Department, which is in collaboration with the Lung Cancer Research Unit.

Mine Health and Safety Council

A site visit was conducted by the CEO and representatives of the MHSC regarding the CytoViva 3-D upgrade. The Section attended numerous meetings and liaised with the MHSC representatives regarding popularising the services that the NIOH will offer to the industry. Dr Sanabria, Ms Vetten, Ms Andraos and Mr Boodhia presented at the MHSC launch of the seed-funded equipment, in an effort to promote the CytoViva applications in the mining industry. This event was aimed at occupational medical practitioners and occupational hygienists. The Section developed a concept note on the CytoViva 3-D system for the MHSC's 4th Occupational Health Dialogue, which was distributed to various stakeholders. The Section also contributed to the NIOH exhibition at the 2018 MHSC Tripartite Summit. Ms Vetten liaised with the MHSC regarding quarterly reporting throughout the year.

Medical Research Council

With the development of the genotoxicity tests, Mr K Boodhia completed specialised testing of urine and blood samples collected from populations residing near and around mine dump tailings in Johannesburg.

National Research Foundation

The NRF invited Prof Gulumian to conduct a technical audit for two "Technology and Human Resources for Industry Programme (THRIP)" projects at the University of Cape Town (UCT) and Groote Schuur Hospital.

TEACHING AND TRAINING

Postgraduate students

The Section provided postgraduate training to students, staff members and the NIOH visitors on the use and operation of the TSI particle sizer instruments, aseptic technique for cell cultures, computational toxicology, CytoViva applications, etc.

Notably, our staff participated in a collaboration with UJ regarding wet-lab experience for cleaning of biosafety cabinets (class II), as well as culturing and maintaining adherent cell lines. Ms Vetten also trained one Wits student on the correct use of the CytoViva Hyperspectral Imaging system. Dr W Utembe organised and hosted the "HeForShe" gender event at the NIOH. Prof Gulumian organised and presented modules at the UP required for the postgraduate course on HRAs, including occupational toxicology and ecotoxicology, as well as an introduction to food toxicology and risk assessment.

Of particular importance, the Section convened a Nanotechnology HSE Risk Research Platform Workshop and also collaborated with UP and UJ to perform site visits related to nanomaterial exposure monitoring and assessments. Ms Andraos also provided hands-on training of interns on the use and applications of the NanoScan Scanning Mobility Particle Sizer (SMPS), Optical Particle Sizer (OPS), Nano-ID Select, and Partector miniature personal sampler.

The Section hosted a square kilometre array (SKA) representative, where Dr Sanabria provided a tour of the specialised facilities and services to demonstrate how to establish a molecular biology and genetic research laboratory. Professor Gulumian was invited to act as moderator for the NWU MSc Nanoscience (Biomed) 2018 Course, where she assessed the content of teaching material provided and made recommendations to improve the programme.

As part of the NIOH delegation for "*Sustaining the health and promoting performance of the Health-workforce in a Laboratory Service,*" Dr Sanabria attended the PathRed Innovation Summit which was hosted at the PRF Auditorium at the NHLS from 1 - 3 August 2018, and contributed to the report. Dr Sanabria also presented a workshop at UJ as part of the biochemistry-related "Industry Engagement" lecture series for the biochemistry Honours students, which included:

- Classical molecular diagnostics (for disease);
- Specific nucleic acid amplification methods (for disease);
- Basics of quantative qPCR and data interpretation (for disease); and
- The role of toxicology and biochemistry at the NIOH.

Looking ahead and as part of the innovative research focus recently identified, the Section hosted a computational toxicology workshop which enabled stakeholders to engage with guest speaker Prof Meek from the University of Ottawa (Canada).

Undergraduate students and visitors

The Section contributed towards hosting the visiting students and guests at the NIOH, which included:

- The NEPAD OEHS training workshop for Malawian delegates,
- Guests from the Sefako Makgatho Health Sciences University,
- A tour for OCSA students and registrars from the School of Public Health (Wits),
- Interpretation of SDS' for the NUM national workshop
- Provision of information related to departmental activities, as well as available services and resources for the Northern Cape Office of the Premier,
- "Career-shadowing" for the University of Limpopo (UL) students from the Department of Physiology and Environmental Health, and
- Several doctors from Cuba that were accompanied by South African Military Health (SAMHS) personnel.

CAPITAL INVESTMENT

The Section initiated replacement of the following old and faulty equipment:

- The laboratory fume extraction system, to allow safe handling of hazardous chemicals and toxins; and
- The Synergy HTX Multi-mode (3-in-1) microplate reader, to allow routine testing of quality control (QC) in human cell cultures.

PROFESSIONAL DEVELOPMENT

The Section hosted five postgraduate students who are enrolled for higher degrees as follows: Four PhDs (three at Wits, one at UJ) and one MTech at TUT.

Ms Andraos and Ms Vetten completed their studies and submitted the respective theses to Wits for review.

The staff attended a MATLAB workshop to improve risk assessment methods for nanomaterials at the NIOH. Some staff attended OECD-based GLP training presented by DNAbiotec.

Dr Sanabria attended the OncoDay-2018 "Precision Genomics with Ion Torrent for tumor profiling" and participated in the South African Genetics Society (SAGS) and the South African Society for Bioinformatics (SASBi) conference to remain current with innovations.

Dr Sanabria and Ms Vetten attended specialised toxicology training at the CTDC10 meeting in Belgrade (Serbia), which formed part of the 12th SCT, under IUTOX. Both also attended the Science Forum South Africa (SFSA 2018) via live streaming of "The Future of the Natural Science Profession", hosted by The SACNASP.

In addition, the collaboration with the Pathology Division required Ms Vetten to receive training regarding the methodology to remove wax from histological slides to mount samples in different media for CytoViva applications

Ms C Andraos and Ms M Magogtya attended training on how to use the new, updated query ticket system of the NIOH as conducted by the Information Services Department.

HONOURS

Prof Gulumian received a Lifetime Achievement award at the First Conference of Biomedical and Natural Sciences and Therapeutics (CoBNeST) meeting. Her research was awarded the "Silver Poster Award" for a blood biochemical and hematological study after subacute intravenous injection of gold and silver nanoparticles and coadministered gold and silver nanoparticles of similar sizes.

In addition, Prof Gulumian was appointed as the Director of the newly established African Continent Nano Surfaces, Coatings and Nanostructured Materials (NANOSMAT-Africa). Prof Gulumian was appointed on the Editorial Board of the journal *Nanomedicine and Nanotechnology.* The Editor-in-Chief invited Prof Gulumian to be the Associate Editor of *Inhalation Toxicology,* a Taylor and Francis journal.

Prof Gulumian obtained NRF funding to train postgraduate students for MSc and PhD studies in nano-related toxicology and biochemistry research projects. In addition, she was the recipient of the 2019 SOT Endowment/ IUTOX Global Scholars Award.

Image 1: Computational Toxicology Workshop participants (from left to right) Lucky Sikhwivhilu (MINTEK), Simphiwe Simelane (UJ), Natasha Sanabria (NIOH), Bette Meek (UOTTAWA), Mary Gulumian (NIOH), Charlene Andraos (NIOH), Langelihle Dlamini (UJ), Gebhu Ndlovu (MINTEK) Note: Edward Nxumalo and Richard Harris participated, but are not shown.

Image 2: Prof Gulumian at the 19th OECD WPMN meeting in Paris, France on 20 -22 February 2019.

Image 3a: Dr Sanabria and Prof Gulumian at the registration for the NanoSolveIT EU H2020 Project meeting in Athens.

Image 3b: Prof Gulumian during the presentation at the NanoSolveIT EU H2020 Project meeting in Athens.

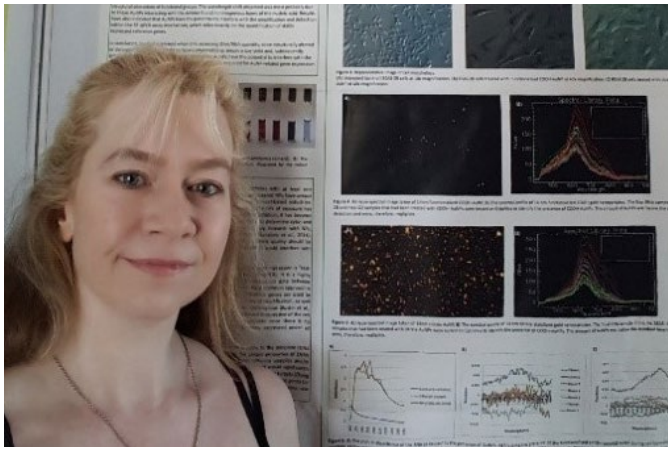


Image 4: Dr Sanabria presenting her research at the 10th Congress of Toxicology in Developing Countries (CTDC10), which formed part of the 12th Congress of the Serbian Society of Toxicology (12thSCT), under the International Union of Toxicology (IUTOX).

INFORMATION SERVICES SECTION

INFORMATION SERVICES SECTION

Ms Angel Mzoneli
Head

The Information Services Section serves as an enabling partner that renders support to 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 following are encompassed in Information Services:

- South Africa's national reference library for occupational health, namely the AJ Orenstein Memorial Library, which is the only specialist reference library in Southern Africa. This library deals exclusively with occupational health topics and houses an extensive collection of information resources in occupational health, both in print and electronic formats;
- The query handling service, which is aimed at responding and facilitating access to technical and scientific occupational health information, guidance and expert advisory services offered within the institute;
- An archive, which is aimed at the comprehensive collection, documentation and preservation of the character and identity of the organisation and providing evidence of the historical development and changes of the organisation over time; and
- The institutional repository, which is a digital collection of the organisation's intellectual output.

Additionally, 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. This is achieved through the Section's expansion of its offering to include access to the library collections of the NHLS (formally known as the South African Institute for Medical Research (SAIMR) Library), located in Braamfontein.

The Section serves the requirements of all the NHLS staff, including those located in laboratories, at the eight medical schools throughout South Africa, as well as the NICD. The NICD collections are currently housed at the NIOH resource centre and staff within the Section continue to provide a considerable remote information service to the NICD community.

SERVICES

Information Services offers its knowledge and information to all stakeholders, both internal and external, to support the promotion of good occupational health practice. The Section ensures provision of comprehensive resources and services in support of the research, teaching and training activities of the organisation, and serves as 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, the Section provides a wide variety of information resources, which include electronic databases and 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 required to source information in occupational health was shared with occupational health professionals, university students, workers, management, health and safety representatives and labour union officials.

Through its query handling service, the Information Services Section repeatedly received and responded to requests for technical and scientific information on occupational health issues. These queries were channelled via the interactive web-based tool that serves to capture all occupational health information queries and requests from government departments, employers, employees, occupational health practitioners, labour unions and the general public. A query ticket system is used for response to these queries, ensuring a 24-hour turnaround time. The queries received includes, but are not limited to:

- Requests for occupational hygiene surveys;
- Requests for training on handling of asbestos;
- Requests for advice on how best to handle ACMs in homes;
- Queries on risks related to ACMs in homes and workplaces;
- Requests for advice from both employers and employees on occupational health-related issues in the workplace;
- Requests for data on cancer statistics in South Africa;
- Requests for the Occupational Hygiene Section to conduct risks assessments in workplaces;
- Requests for information, training and guidance on occupational health topics, such as asbestos (e.g. regulations governing the removal of asbestos and how to register as an asbestos contractor, etc.);
- Requests for assistance with research guidelines from university students;
- Requests for information on training interventions offered by the institute;
- Requests for information on autopsy services offered by the NIOH to ex-miners;
- Requests for information held by the MBOD and outcomes on applications for compensation of second degree benefits;
- Requests for information about the DOH and Masters in Public Health degree; and
- Requests for referrals to the NIOH clinic.

Queries received and captured on the system on the whole originated from provinces throughout the country (university students, government departments, private industry, construction and mining companies, occupational health practitioners, doctors, and academic institutions); from our neighbouring countries, a few from other American, European and Asian countries and many more that were not indicated by the requestors. This confirms the importance of the role of the Information Services Section, nationally and internationally. During the reporting period, the Section revamped the query handling system to make it more interactive and to enable a reporting function that demonstrates trends of queries over time. The system is currently available and fully functional.

The NIOH Library and the Query Handling Service combined, received a total of 661 queries and successfully responded to 641 of them.

In support of research activities, the Section maintained its library collections and enabled ease of access to full text scientific journal articles through its subscription to the EBSCO Medline Complete database and a clinical e-book collection. This EBSCO database provides full text access to over 2 400 medical journal titles and medical and clinical electronic books. Open access electronic resources and databases were also added to the library collection, which researchers can access through the library page on the intranet.

Information Services continued to provide researchers with the necessary literature to execute their research projects. From projects conducted, the predicted annual target for publications for the reporting period was 27. This target was exceeded by 26%, as a total of 34 publications were produced by the NIOH researchers in the reporting year. All 34 publications were uploaded onto the website for ease of access and a research newsletter was disseminated to external stakeholders from various government departments, researchers from various South African universities and other organisations dealing with OHS.

The Section also successfully developed an Institutional Repository, which is an electronic collection of the institute's research output which can be accessed through the institution's website. In addition, the Section expanded the repository to include the intellectual output of the NICD, with assistance from the NICD IT and Communications Department. The Institutional Repository will be launched in the new financial year.

Displays and exhibitions of various library resources available in the library were set up in commemorating national and world events, e.g. World TB Month, World Aids Day, Library Week, International Women's Day, etc.

TEACHING AND TRAINING

The Section continues to host groups of students as part of their experiential learning programme. During the reporting year, the IS Section hosted a total of ten university students as Library Studies interns, of whom six were from the Durban University of Technology (DUT) and four from the University of Limpopo (UL). The programme offers practical training to final year information science students in a quest to balance theoretical knowledge with hands-on experience in the field of information science.

The libraries further trained new employees and interns on information search tools, such as the EBSCO Medline Complete database. Staff from various Sections were trained on the newly revamped query ticket system. The training covered topics relating to capturing and responding to queries.

The Information Services furthermore conducted library orientation sessions for OHNs, registrars, and officials from provincial government departments, health practitioners, university students and international visitors.

The Section also coordinated two OHS training workshops for NUM and COSATU leadership, shop stewards and health and safety representatives. At these workshops, as well as the NEPAD training workshop, our staff conducted presentations on sources of occupational health and safety information.

PROFESSIONAL DEVELOPMENT

Staff in the Section attended various training interventions and workshops to enhance their skills in sourcing information and executing their work, e.g. Inmagic Genie Cataloguing module; and Sabinet workshops. Our staff also attended a number of in-house skills development courses that were organised by the NHLS learning academy.

NATIONAL BIOBANK

NATIONAL BIOBANK

Mr Bonginkosi Duma
Manager

SERVICES

The National Biobank stores different types of specimen at different ultra temperatures. Due to significant expansion that was undertaken during the financial year under review, the storage capacity of the facility has since increased to accommodate four million specimens. This expansion was necessitated by an increase in storage demands from our clients.

Currently, the National Biobank stores 1.2 million samples. The type of sample stored also expanded to include tissue blocks and slides from other provinces, and samples that include serum, plasma, TB microbanks, urine and buffy coats.

In the year under review, Biobank embarked on a public relations campaign to promote the services of the National Biobank in two provinces, namely: Limpopo and Mpumalanga.

The Biobank also acquired new equipment in the form of liquid nitrogen tanks that has the capacity to keep live cells at temperatures of -156 degree Celsius.

Image 1: The new facility has the capacity to store approximately four million samples.

Image 2: Biobank Liquid Nitrogen tanks store specimen at -156 degree Celsius.

Biobank quality management system

In an effort to ensure good QA, the National Biobank applied for ISO QMS accreditation. The Biobank passed passed stage one of the ISO 9001:2015 external audit and the stage two audits are scheduled for April 2019. Should we successfully pass stage two, the ISO 9001: 2015 certification will be awarded.

TEACHING AND TRAINING

In the third quarter of the period under review, Ms M Maseme attended the European, Middle Eastern and African Society for Biopreservation and Biobanking (ESBB) conference, which took place from 4 - 7 September in Antwerp, Belgium. At the conference, she presented a poster on Biobank Ethics, which was well received. She also conducted an oral presentation titled: *"Biobanking: A game changer for scientific research"* at the NIOH Research Day, which took place in Johannesburg on 30 October 2018.

The bioinformatics position is still vacant, as the candidate who was earmarked for appointment, could not produce the relevant documents required. The position remains vacant and a new potential candidate is currently being pursued.

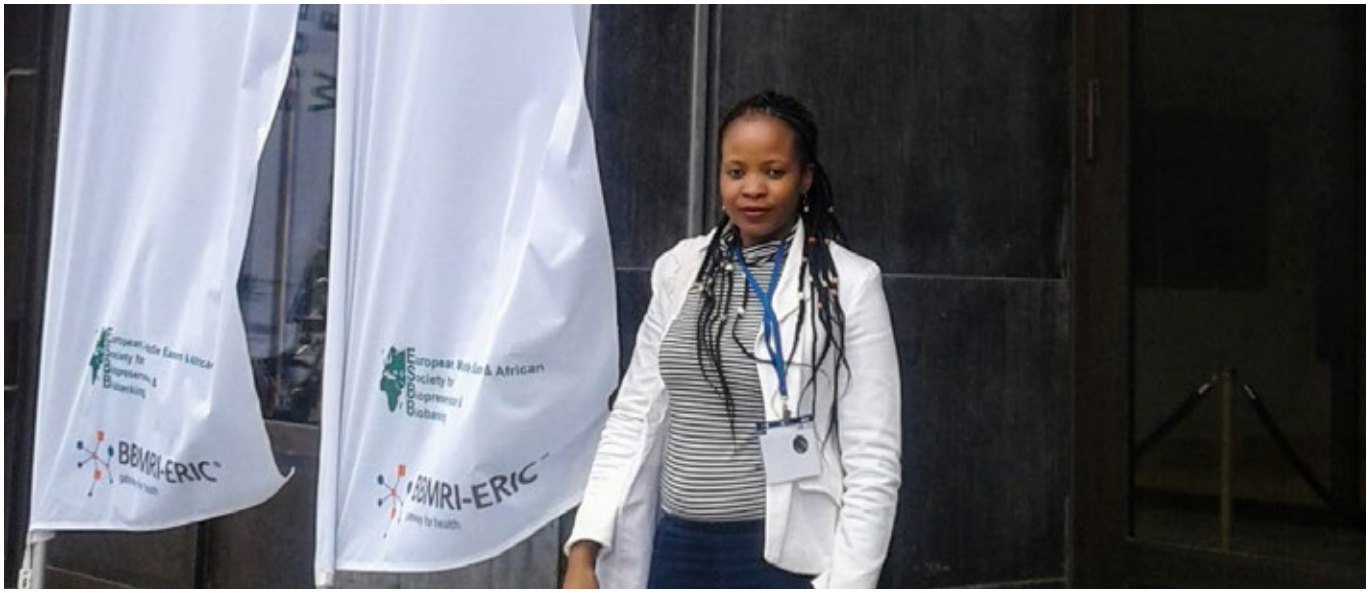


Image 3: Ms M Maseme attending the European Biobank Week 2018 organized by the European Middle Eastern & African Society for Biobanking and Biopreservation (ESBB). She was nominated to lead the Biobank Quality Management System within the Africa Working Group at this meeting.

Each year, the National Biobank attracts visitors from across South Africa and the entire globe. During the period under review, we were visited by doctors from Cuba, the national DoH and SANDF. The aim of the visits is usually to learn more about biobanking and its merits.

Image 4: Doctors from Cuba, NDoH and SANDF visited the Biobank to learn about Biobanking on 2 October 2018.

PROFESSIONAL DEVELOPMENT

Ms Maseme is currently finalising her MSc in Ethics at Wits.

As part of our continued support of this event, the National Biobank staff attended the Annual Research and Academic Conference of the SANDF, which was held in Pretoria, from 4 - 7 September 2018. The conference is organised by the South African Military Health Services (SAMHS), a branch of the SANDF. We conducted an exhibition at the conference to create awareness of the services rendered by the National Biobank and to showcase our work.

The Biobank staff also conducted presentations on the following topics at the PathRed Innovation Summit, which took place at the PRF Auditorium at the NHLS from 3 - 7 August 2018:

- The importance of Biobanking in South Africa;
- Encouraging and ensuring efficient storage;
- Sharing of biomaterials and the associated data continues; and
- Sample collections can be either small scale for study specific projects or large scale at national level for futuristic and multidisciplinary research.

BIOBANK MEMBERSHIP

The NHLS Biobank continues to maintain its ISBER and ESBB memberships to ensure that our operations remain in line with international standards. ISBER is developing a new biobanking standard, namely ISOTC276, that is earmarked for completion by the end of this year. This standard will assist international biobanks to be audited and obtain accreditation. Mr Duma is part of the ISBER Standards Committee and delivered input on the development of the standards.

Access to the NHLS Biobank can be found via the following link: www.nationalbiobank.nhls.ac.za

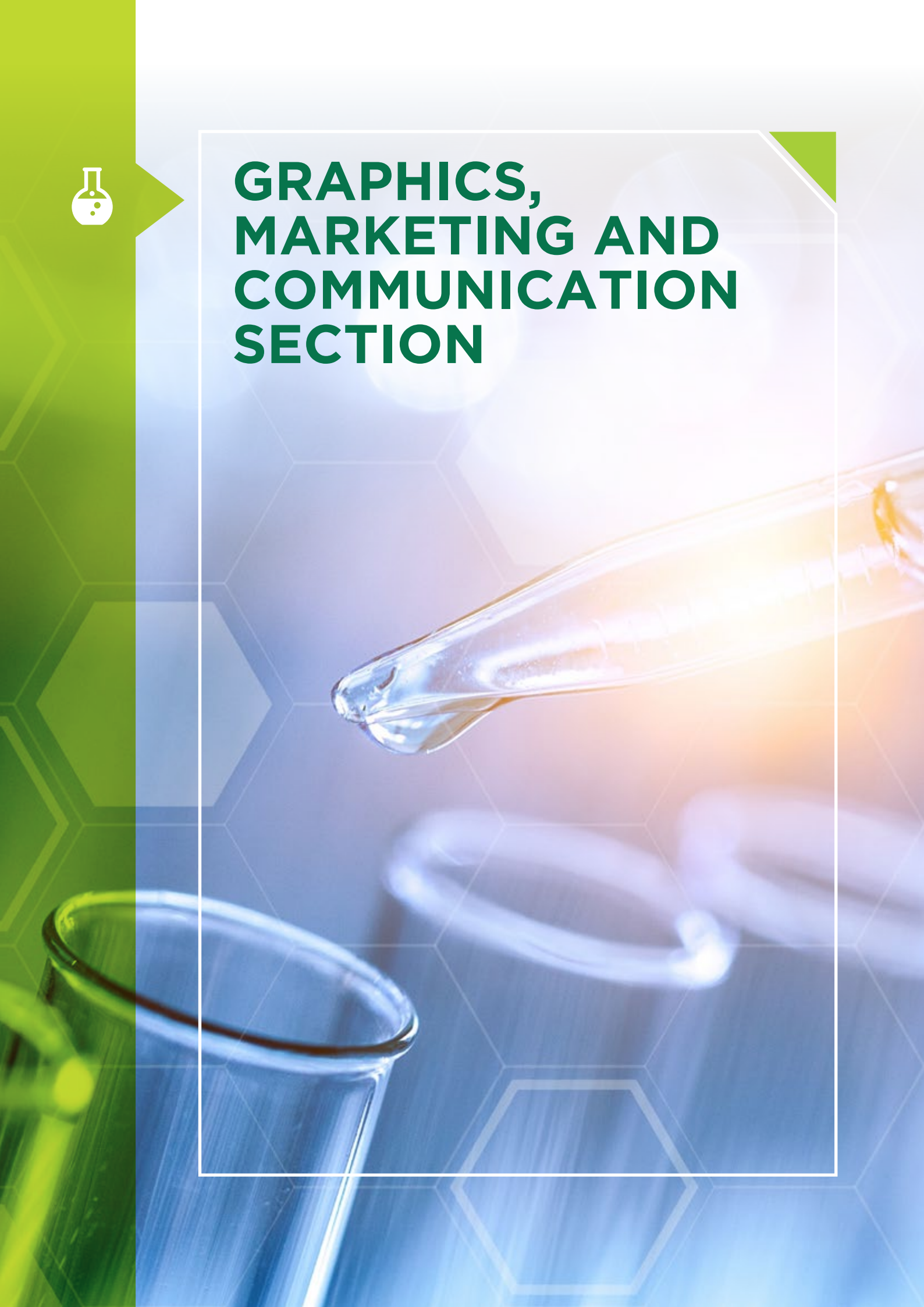
Image 5: Dr Koh Furuta and Mr B Duma at the International Society for Biological and Environmental Repositories Standards Committee Meeting, creating international standards for biobanking.

Image 6: Mr Bonginkosi Duma receiving his award at the 12th International Conference and Exhibition on Tissue Preservation, Life Care and Biobanking, in Atlanta, USA.

HONOURS

Mr B Duma received a certificate of achievement for his outstanding presentation on "*Quality indicators as a measure of good practice at the national biobank in South Africa*" at the 12th International Conference and Exhibition on Tissue Preservation, Life Care and Biobanking, which was held from 9 - 10 November, in Atlanta, USA.

GRAPHICS, MARKETING AND COMMUNICATION SECTION



GRAPHICS, MARKETING AND COMMUNICATION SECTION

Mrs Shanaz Hampson
Manager

As the custodian of the NIOH brand and public image, the Section aspires to build the NIOH's reputation and brand awareness through proactive marketing, communication and information dissemination to internal and external stakeholders, to support the organisation's strategic objectives. The Section also manages and coordinates the NIOH programme for CPD through the HPCSA, and provides support to the various capacity building initiatives undertaken by the various departments within the NIOH.

The central function of the Section is to convey the organisation's messages to internal and external stakeholders through various communication channels available, which include the intranet, newsletters, e-mail, internet and social media platforms. The Section also plays a crucial role in media relations.

During the period under review, the Section experienced decreased service capacity, due to the resignation of a staff member in 2017. Plans are underway to employ an editorial specialist in the new financial year and later a graphic designer, who will serve as transversal support for both the NIOH and its sister institute, the NICD.

SERVICES

Good communication is an essential tool within any workplace to achieve productivity, improve morale and commitment and maintain strong working relationships at all levels. The Graphics, Marketing and Communication Section provides a support function to the NIOH and the NHLS. Its primary objectives are the promotion of good OHS practices through a preventative approach and through national and international training, outreach programmes and information dissemination.

The Section continues to coordinate training programmes for the NIOH, organise programmes for visitors, and provide an event management, marketing, communications, public relations and graphic design service internally and externally, locally and internationally.

During the period under review, the Section contributed to the management and provision of content for the NIOH website, as well as the NHLS intranet. The newly revamped website platform, which launched in September 2018, serves as a robust OHS information dissemination portal. The Section ensured consistency of content, layout and design, both in alignment with the corporate identity of the NHLS, as well as through the activation of topical content for all stakeholders. This redesign and relaunch of the website positioned the institute's website portal as a seamless 'touchpoint' for quality OHS information dissemination.

In terms of effective channel management, the Section is preparing a social media and marketing tactical plan, which will outline aims, objectives and key metrics required for measurement of our digital reach. This is in line with the digital strategy of the NIOH, which is currently in its draft stage. Seamless management of these platforms is vital for ensuring consistency of brand messaging and awareness among various stakeholder segmentation groups that were identified, and is also necessary to expand the NIOH digital footprint. A Twitter account was created with the handle: *@nioh_sa* and a YouTube channel was designed and developed for the institute and launched in the third quarter of the period under review. The launch of these two new communication channels will provide the opportunity for networking on a global scale, assist with targeting specific stakeholders through tailored communication, and provide a diverse PR platform to share information such as:

- The institute's strategic direction;
- Research projects that are currently underway; and
- Our stance on current affairs and topical issues relating to OHS.

MARKETING AND STAKEHOLDER RELATIONS

The Section continues to engage with and build on existing relationships with the media including: TV, radio and various publishing houses, by communicating key organisational events and activities, topic-specific editorials, and responding to the media as and when the need arises. The Section facilitated a number of media interactions, which included television, radio and print interviews by the NIOH Executive Director and NIOH subject matter experts. The newly launched social media platforms enhanced interactions with stakeholders substantially, and these channels will be leveraged to assist in PR, communication and marketing efforts.

In an attempt to position the institute strategically and to broaden our stakeholder reach, the Section frequently negotiated for additional exposure in the form of editorials or thought leadership pieces, whenever advertisements were placed in any of the non peer reviewed publications. The impact of such features and opinion pieces in the OHS arena is significant, as it provides opportunities to increase awareness and drive stakeholder engagement.

Throughout the reporting period, the Section dealt with a number of queries from the media and occupational health professionals from various industries, in both public and private sectors, for printed and audio visual marketing material and technical and scientific information on a variety of occupational health-related issues. These queries originated from the website or were sent directly to the Section. Our staff cultivated relationships with the web platforms of many occupational health-related organisations and societies, allowing the NHLS and the NIOH to act as a single entry point for these information resources.

In line with the NIOH strategic plan and the draft NIOH digital strategy, the Section is always exploring or being approached by publications that are well suited and positioned to promote the concept of decent work and OHS within workplaces. Direct marketing and information dissemination were therefore undertaken through advertising, and editorial and thought leader placements in the following publications:

- ***Earthworks: For a sustainable environment***
  Ms A Fourie. Notable mention: *Risky Contact (in the construction sector)*. Issue 43.
  July-September 2018.
  www.earthworksmagazine.co.za

- ***The JSE Quarterly***
  NIOH Profile. Prof JI Phillips, Dr S Kisting and Ms S Hampson. *Complete Well-Being.*
  The NIOH is looking beyond the immediate workplace to ensure optimal health and safety of all workers.
  113 - 114. July-September 2018.
  www.jse.co.za

  Cover feature. Profile and interview with Dr S Kisting by journalist Kerry Dimmer.
  Healthy Results. Pg. 57 - 59. 2018 edition.

- ***Mining Prospectus;***
  Dr S Iyaloo, Ms C Andraos, Ms S Hampson and Dr N Sanabria.
  Environmental Effects of Mining Activities. Pg. 22 - 23. Issue 41 (Nov/Dec 2018).
  www.miningprospectus.co.za

- ***The Sunday Times - Healthy Times***
  Advertorial placement. Ms S Hampson. *Vulnerable Workers – The Informal Economy.*
  Winter 2018 edition. Pg. 17.

- ***SA Building Review***
  Ms D Singo, Mr G Mizan and Dr M Magombo. Cover story: *Asbestos: The Wonder Fibre and Serial Killer.*
  Pg. 70 - 73. Vol 7. 2019.
  www.sabuildingreview.co.za

- ***SA Profile (two features)***
  Dr N Sanabria. *Translating Digital Data into Biological Applications*. Pg. 52 - 54. Vol. 2 2019.
  Dr S Kisting. *Profile of NIOH. Leading by example – a preventive approach to OEHS.*
  Pg. 56 - 57 Vol 2 2019.
  www.saprofile.co.za

- ***South African Business Integrator***
  Dr N Naicker, and D K Wilson. Cover Feature: *Informal Economy: Promoting Health and Safety.*
  Pg. 52 - 55. Vol 4 Issue 2. (Sept 2018 – Feb 2019)

  Dr W Utembe, Ms S Hampson and Dr N Sanabria. *Protecting the next generation by eliminating lead based paint in SA*. Pg. 66 - 69. Vol 5. Issue 1. (March 2019 – August 2019).
  www.sabusinessintegrator.co.za

- ***SA Harvest***
  Ms M Muvhali, Ms E Ratshikhopha, Ms A Fourie and Dr T Singh. *Occupational Hazards: are occupational allergies an overlooked health problem among SA crop farm workers.*
  Pg. 28 - 29. Issue 39. (March-April 2019.
  www.harvestsa.co.za

- ***Business Day Earth:*** Full page advertisement placed
- ***Mining Decisions:*** Full page advertisement placed
- ***African Mining News:*** Half page advertisement placed

Given the specialised scope and reach of these publications, the NIOH will perform well in marketing to and educating its readership to gain exposure and create awareness on the world of work and concepts of good OEHS practice.

INFORMATION DISSEMINATION

The Section is responsible for coordinating and arranging visits by key stakeholders, to re-establish relationships and initiate new collaborative endeavours. During the reporting year, meetings were conducted with representatives from the DEL, the Compensation Commissioner; the MBOD; SASOHN, SASOM, SAIOH; the National Institute for Occupational Safety and Health (NIOSH-CDC, [US]); the International Atomic Energy Agency (IAEA); the WHO; the ILO; WHWB, Occupational Knowledge International (OKI); the AAS; Women in Informal Employment - Globalizing and Organizing (WIEGO); provincial occupational health coordinators; the Minerals Council South Africa; the MHSC; The UL Department of Physiology and Environmental Health; the Office of the Premier: Northern Cape; CoJ Municipality; Pikitup Johannesburg; the Railway Safety Regulator (RSR); the Asbestos Relief Trust (ART) and the Kgalagadi Relief Trust (KRT), as well as the Q(h)ubeka trust.

The primary purpose of these visits is to provide insights into the occupational health and other specialised, relevant services provided by the NIOH.

With the intention of building more OHS capacity within the country, the Section also coordinated visitor programmes for both undergraduate and postgraduate occupational health nursing students from Wits and from industry; postgraduate OHS nursing students from OCSA; DOH students from UP, the SHSPH and Wits; occupational medicine registrars from Wits and UP; third-year environmental health students from TUT; visiting academics from OKI, California and Illinois State University in the USA.; and NUM Free State Regional Office leadership.

Visiting academics conducted special presentations to the NIOH staff on a variety of topics, including:

- *'Mining Experiences in the Informal Economy',* by Perry Gottesfeld, OKI California, USA; and
- *'The Importance of Health Promotion in Occupational and Environmental Health and Safety (OEHS)',* by Dr Susan Goldstein, Soul City Institute.

The Section also welcomed and participated in awareness raising campaigns and exhibitions at the following events throughout the reporting period:

- The SASOM Annual Congress, which took place from 22 - 23 June 2018 at the Protea Hotel by Marriott, at OR Tambo International Airport;
- The MHSC Summit, which took place from 18 - 19 October at Great Lakes Hotel and Conference Centre, in Benoni;
- The SAIOH branch meeting, which was conducted at the NIOH and;
- The MHSC OHS Dialogue, which took place from 7 - 8 March 2019 at the Birchwood Hotel and Conference facility.

As one of the MHSC partners, and a centre of excellence, the NIOH was invited to exhibit some of the outcomes of the research it undertook with the MHSC, including seed-funded projects such as the CytoViva project by the Toxicology and Biochemistry Section. Six staff members attended the exhibition over two days to profile the institute and showcase instruments that may be of benefit to stakeholders in attendance. Great mutual benefit was derived from this networking opportunity.

The Section also contributed information and content towards the UCT School of Public Health and Family Medicine's Tribute exhibition to Jock McCulloch[1], titled: *"Asbestos Blues and the Politics of Silicosis in South African Gold Mines*". The event took place on 17 May and Dr Kisting provided the keynote address at the event.

The Section also formed part of a multidisciplinary team from the NIOH that participated at the NHLS PathRed Innovation Summit, which took place from 1 - 3 August 2018, at the PRF Auditorium, at the NHLS.

Dr Kisting convened and chaired the session titled: "*Sustaining the Health and Promoting Performance of the Health Workforce in a Laboratory Service".* The objectives of the session were to:

- Introduce basic concepts of occupational health in a laboratory setting, to highlight the critical role that it plays in the performance of the workforce in the workplace; and
- The significant potential that exists in using innovation to improve working conditions.

The panel consisted of senior representatives from the NIOH, Mr D Jones, Mrs S Hampson, Dr B Kgarebe, Dr N Sanabria and Dr M Zungu, who all provided presentations on the following topics relating to OHS and innovation:

- OHS Information Services;
- Innovative Methods to Communicate Research Studies; and
- Towards a Green and Healthy Workplace; and
- Safety Innovation Through Technology.

The session was well-attended and received positive feedback. Key considerations and outcomes of the presentations that were delivered, indicated that a nurturing work environment is necessary, in fact, imperative, to ensure collaborative relationships to thrive and allow staff to proactively engage and create or innovate.

[1] "Professor Jock McCulloch, who died from asbestos cancer (mesothelioma) on 18 January this year, not only distinguished himself with his research on the impact and machinations of the asbestos industry, but was also "a great friend of the people and especially the workers of South Africa". McCulloch was an Emeritus Professor of History in the School of Global, Urban and Social Studies at the Royal Melbourne Institute of Technology (RMIT) University, Melbourne, Australia. He authored and co-authored four books on the human cost of the global asbestos trade. It is believed that the asbestos-related disease from which he died was the result of his exposure to blue asbestos in South Africa during the mid-1990s. He was in the country at the time to research his book, South Africa's Gold Mines and the Politics of Silicosis. McCulloch also wrote Asbestos: Its Human Cost; Asbestos Blues: Labour, Capital, Physicians and the State in South Africa; and, with co-author Geoffrey Tweedale, Defending the Indefensible." Extracted from the UCT News archive - *Remembering a warrior for social justice.*

Image 1: Asbestos Blues and the Politics of Silicosis in South African Gold Mines – A tribute to Jock McCulloch. From left to right: Mary Miller, Saloshni Naidoo, Haidee Williams, Shahieda Adams, Sophia Kisting-Cairncross, Mohamed Jeebhay, Spo Kgalomono and Charles Abrahams – Image source: UCT Occupational Medicine Archives.

Image 2: National Institute of Health staff engaging tripartite stakeholders at the Mine Health and Safety Council Bi Annual Occupational Health and Safety Summit from 18 - 19 October 2018.

LOCAL AND INTERNATIONAL COLLABORATION IN OCCUPATIONAL HEALTH

Together with other Sections at the NIOH, international relationships were fostered through dedicated collaboration and networking efforts with key international organisations such as the WHO; the ILO; the ICOH; the NIOSH-CDC, USA; the Finnish Institute for Occupational Health (FIOH); the HSL of the UK, WHWB, DTRA and Sandia Laboratories, USA.

Relationships were also maintained with local societies and stakeholders, namely the national and provincial departments of health; the departments of labour and mineral resources; the SASOM; the African Regional Association for Occupational Health (ARAOH); the SASOHN; the SAIOH; the Mine Medical Professionals Association (MMPA), the NEPAD Agency, academia, union representatives, employers, employees, and public and private sector groups.

Capacity building knowledge exchange - New Partnership for Africa's Development

The NIOH remained committed to the concept of decent work and the protection and promotion of workers' health. In line with this approach, the NIOH aims to build and strengthen capacity in OHS in the African region, and particularly in the Sub Saharan region. To this end, a MoU was signed between the NIOH and NEPAD on 12 August, during the second quarter of the period under review.

The Section, with assistance from the Occupational Medicine Section, coordinated and hosted a five-day OEHS training workshop for 21 Malawian OHS practitioners in partnership with NEPAD. A number of the NIOH Sections formed part of the multidisciplinary team that provided OHS training for nationals of the Republic of Malawi under the auspices of a MoU between the NIOH and the NPCA.

The training programme was intensive with a practical approach to OEHS. Feedback from participants indicated that there was, in general, a better understanding on basic concepts of occupational health, approaches to some occupational health issues, and the equipment, systems, human resources and skills required to address certain occupational health requirements.

The National Institute for Occupational Health Remembrance Day

As a national institute, the NIOH strives to enhance occupational and workplace environmental health and safety for all workers through the cultivation of healthy, happy, safe and sustainable workplaces. Very importantly, the institute strives to be a consistent catalyst for a mindset change towards greater prevention in OEHS.

On 24 July 2018, the NIOH hosted a Remembrance Day with the primary objective to find new ways to prevent workplace injuries, diseases and fatalities. The event also served to pay commemorate all those comrades in OEHS, those warriors for social justice, who lost their lives during the course of their duty. The NIOH paid heartfelt tributes to:

- Prof Jock McCulloch (activist and advocate for global ban on asbestos);
- Mr David Goldblatt (photographer whose work chronicled half a century of social and political change in South Africa);
- Mr Stephen Kotoloane (former head of the Asbestos Interest Group [AIG] and community leader and activist);
- Mrs Faieza Desai (struggle stalwart and community activist);
- Prof Leslie Nickels (public health educator and activist);
- Dr Danuta Kielkowski (leading researcher in improving vital registration and reporting of mortality in relation to occupational and industrial groups); and
- Mr Phiroshaw Camay (former General Secretary of the Council of Unions of South Africa and the National Council of Trade Unions and director for Cooperative for Research and Education).

We also acknowledged several NIOH workers who passed on during the course of their duties, and particularly those who made significant contributions to OHS and strived for decent work. They are: Mr Derrick Rendall; Mr Richard Khakhu; Mr Adriaan Greyling; Mr Jerry Moseboa and Mr Enoch Mogomotsi.

Mr. Mzwakhe Nhlapo, the National Head of Health and Safety from NUM also attended the event to honour fallen comrades from the union's side and to deliver a passionate message on the importance of health and safety in the workplace.

The tribute was supported by an exhibition of images and documents related to these fallen colleagues' lives and work. Professor Mohamed Jeebhay, Head of the Occupational Medicine Division at UCT delivered the keynote address on "Mortality at Work and the Need for Prevention." Dr Sophia Kisting, Executive Director of the NIOH took the opportunity to express her gratitude to these good men and women, these heroes who have shared their research and knowledge to help create a "gentler, more just and equal world of work and society. It's crucial," she said, "that their colleagues and future generations continue the work in a transparent, inclusive manner with the shared purpose of protecting the human rights of every man and woman at work and at home".



Image 3, 4 and 5: The National Institute of Health Remembrance Day: Commemorating and honouring fallen heroes.

Image 6: Tribute exhibition for those that have passed on during the course of their work.

Workplace Biorisk Management Training Course

In line with a preventive approach to OHS, the NIOH hosted its annual five-day Workplace Biorisk Management Training Course, during the third quarter of the period under review. The course served to address the risk to HBAs in the workplace as a critical element to the burden of disease and to identify areas where the prevention of transmission and protecting worker exposure is urgently required.

The training took place from 1 - 5 October at the Emoyeni Hotel and Conference Centre, Johannesburg and was well attended by 75 delegates and 30 speakers, facilitators and demonstrators. Delegates included technical professionals, as well as management from a wide variety of professions such as scientists, doctors, nurses, environmental health practitioners, occupational hygienists, engineers and architects, which added to the robust discussions and debates that ensued.

Sectors that were represented include: Health, labour, business, industry and mining. The course aimed to close the existing knowledge gaps and empower attendees with the required skills through lectures, demonstrations, satellite sessions, discussions on case studies, problem solving exercises, and highlighting current best practices to prevent and control biological exposure in various work settings.

Image 7: Practical sessions during the Workplace Biorisk Management Training Course – walkthrough assessment at Charlotte Maxeke Johannesburg Academic Hospital.

United Nations General Assembly on tuberculosis

The NHLS and the NIOH were part of a group of South African organisations that joined the global community and participated in the high-level UNGA meeting on TB on 26 September 2018 in New York City. The theme of this historic meeting was: "United to end TB: An Urgent Global Response to a Global Epidemic." The meeting was attended and addressed by significant numbers of Heads of State, as well as Ministers of Health and TB survivors. The aim of this meeting was to accelerate efforts in ending TB and reaching all affected people globally with prevention and care.

This high-level meeting on TB was a notable and unprecedented step forward by governments and all partners engaged in the fight against TB. The UNGA adopted the ambitious Political Declaration on TB, to be endorsed by Heads of State, that will strengthen action and investments for the elimination of TB, saving millions of lives. The declaration can be accessed here: http://www.stoptb.org/webadmin/cms/docs/Political-Declaraion-on-the-Fight-against-Tuberculosis.pdf.

The ICOH confirmed that "thanks to an intense year of efforts by ICOH, the International Occupational Hygiene Association (IOHA) and other partners, their suggested language related to workers' health was successfully included in this endorsed declaration. This is evident in Paragraph 17 of the declaration, which identifies "healthcare workers, miners and others exposed to silica," as high risk vulnerable groups. Then there is paragraph 31 which states: "Commit to… implementing primary prevention in high risk occupations by reducing silica dust exposures in mining, construction and other dusty workplaces, and worker TB surveillance and infection prevention and control in healthcare settings." The rationale and some of the many efforts leading to this success are summarised in an article that can be found at: http://www.icohweb.org/site/news-detail.asp?id=152.

Image 8: The International Commission on Occupational Health, represented at the tuberculosis meeting by Gwen Brachman, Perry Gottesfeld, Marilyn Fingerhut, and Sophia Kisting. Andrea Hiddinga, immediate past president, represented the International Occupational Hygiene Association.

The NIOH is extremely proud to share that Dr Sophia Kisting was a lead developer of the ICOH position paper on *"Preventing TB among Health Workers."* Dr Muzimkhulu Zungu, Dr Shahieda Adams, Prof David Rees and the NIOH team also made substantial contributions to the position paper on *"Preventing Tuberculosis among Silica Dust Exposed Workers."*

In addition, Dr Kisting was a key presenter at the Africa side event that was hosted on 25 September, prior to the UN TB meeting. This event was organised by the African Union and NEPAD. Based on feedback from the ICOH colleagues, her outstanding presentation on "*Prevention of TB through inclusive workplace action"* was well received.

According to the ICOH, next steps for example include the development of workplans to facilitate assistance to countries and organisations to implement workplace practices to reduce silica in workplaces and to protect health workers.

Climate Reality Project

During the third quarter of the period under review, Dr S Kisting was invited to participate in the "24 Hours of Reality: Protect Our Planet, Protect Ourselves", live broadcast global event. This event was produced by the Climate Reality Project and was headed by Mr Al Gore, former Deputy President of the USA. Her contribution focused on health and the possible avenues to prevent adverse health outcomes as a result of climate change. In the South African context, the focus was specifically on coal emissions and those from other extractive industries, and on highlighting the effects on workplaces and the surrounding communities at large, as a result of these pollutants.

Image 9: Dr Kisting and Ms Shanaz Hampson outside the Globecast Africa Broadcasting Studios in Auckland Park.

The Section played a key role in this campaign and facilitated the logistics for this live broadcast as well as the pre-interview teleconference with producers in Los Angeles California. Participating in this event elevated the NIOH profile significantly on social media channels. The broadcast interview can be accessed via: https://www.youtube.com/watch?v=unJHUDgyKFI

University of Cape Town Honours Dr Kisting - President of Convocation Medal

On 5 April 2018, Dr Kisting was awarded the President of Convocation Medal at the UCT. This medal is awarded annually by the President of Convocation to a UCT alumnus who has made a significant contribution to the common good. In her citation, the President of Convocation, Lorna Houston, lauded Dr Kisting for her distinguished leadership, which demonstrates a deep and abiding passion for collective and inclusive efforts to protect the health, social and economic rights of the most vulnerable workers. The NIOH is very proud of this award that our Executive Director received during the period under review.

Image 10: Dr Kisting with Dr Max Price, Vice Chancellor of the University of Cape Town.
Source: UCT Occupational Medicine Archives

STRATEGIC INITIATIVES IN OCCUPATIONAL HEALTH AND SAFETY TRAINING

1st Annual African Meeting of Alcohol Toxicology

The 1st Annual African Meeting of Alcohol Toxicology with the theme "*Notable impressions and investigations*," focused on various topics concerned with alcohol consumption, pharmacology, detection, analysis and interpretation of alcohol results, as well as the medical, legal and occupational implications of alcohol levels in a person. The meeting, a first of its kind in South Africa, was a joint initiative of the Analytical Services Section at the NIOH, the Division of Forensic Medicine and Pathology at Wits, Alcohol Breathalysers (Pty) Ltd, and the African Academy of Sciences.

The main sponsor of the event was the Pan-African AAS that aims to drive sustainable development in Africa through science, technology and innovation (STI). It has a tripartite mandate of pursuing excellence by:

- Recognising leading scholars and achievers;
- Providing advisory and think tank functions for shaping the continent's strategies and policies; and
- Implementing key STI programmes that influence developmental challenges through its agenda setting and funding platform, the Alliance for Accelerating Excellence in Science in Africa (AESA).

In his opening statement, The Executive Director of the AAS, Professor Nelson Torto, thanked the organisers, in particular Dr Boitumelo Kgarebe, Head of Analytical Services at the NIOH, who is also the AAS Vice President representing Southern Africa, for approaching the academy for funding of the event. He underscored the importance of meetings such as this that leverage science-based evidence to address local issues, and invited wider institutional collaboration with the academy, especially under its flagship AESA programme. He informed the audience that AESA was established by the AAS and the NEPAD, and that it was endorsed by the African Union (AU) in 2015 as a strategic partner to specifically respond to the critical requirements of the continent to address its research and development (R&D) challenges.

The keynote speaker, Mr James Wigmore, an internationally recognised expert on alcohol toxicology from Canada, shared his experiences to improve the understanding of the complexities, shortcomings and expertise involved in the analysis and interpretation of alcohol (ethanol) in biological systems. 70 Practitioners from enforcement, testing, medical, legal, OHS, and other allied fields shared their experiences at this forum, identified gaps in the determination of alcohol in biological systems, and provided evidence-based information on alcohol consumption, pharmacology, detection and interpretation of alcohol results. The NIOH plans to continue hosting events like these through the auspices of the NEPAD and the AAS in future.

The National Institute for Occupational Health Biennial Research Day 2018

The NIOH hosted a Research Day on 30 October 2018. This provided an opportunity for the NIOH staff and students to showcase their work, encourage discussion around, and rally for support of preventive interventions in the workplace. The creation and optimal utilisation of new knowledge through research, can support and provide opportunities to make a positive impact on OHS, both in South Africa and internationally.

Three distinguished keynote speakers led the talks of the day:

- Prof Nelson Torto, Executive Director of the AAS who spoke on *"Transforming lives through Research and Innovation; an AAS perspective"*;
- Prof Koleka Mlisana, Executive Manager of Academic Affairs, Research and Quality Assurance (AARQA) at the NHLS who spoke on *"Support for Research and Capacity Building through AARQA"*; and
- Dr Muzimkhulu Zungu from the NIOH HIV TB in the Workplace Unit who spoke about *"UBUNTU, the African Spirituality in Occupational and Environmental Health and Safety."*

Eleven oral presentations delivered by NIOH staff and students; and 15 posters were presented. 160 Delegates attended this event and overall, positive feedback was received. The Graphics, Marketing and Communication Section played YouTube videos of the NIOH researchers discussing their work on the day, and encouraged

active engagement and participation on social media platforms. Prizes were given for the best oral- and poster presentations. Mr Felix Made was awarded a prize for his oral presentation on: "*Coal Dust Exposure Assessment in the South African Coal Mining Industry.*" Ms Tebogo Maeteletja was awarded Best Poster prize for her poster entitled: *"Respirable Dust Exposure Amongst Waste Reclaimers at a Landfill Site in Pretoria, South Africa."*

Image 11: The purpose of research is to inform action. A Research Day provides opportunities for sharing ideas. Dr Kgokong, Prof Torto, Dr Kgarebe and Prof Mlisana.

The Occupational Hygiene Training Association (OHTA) - Training module

In line with capacity building initiatives in OHS, the Occupational Hygiene Section hosted a five-day training course from 4 - 8 June 2018. The course is a core module of the International Occupational Hygiene Certificate and is called *W505 Control of Hazardous Substances*. The course was presented in collaboration with the WHWB, who was represented by one of its members, Prof Thomas Fuller from Illinois State University. A presentation on PPE was also provided by Prof Derk Brouwer from the Wits School of Public Health (SPH) on day 3 of the course.

The training benefited 13 candidates, five of whom were external participants. This module covered theoretical and practical components. A written examination and certification of successful completion was facilitated by the British Occupational Hygiene Society (BOHS). The training aimed to cover how exposure to hazardous substances arises in the workplace and practical ways to build on knowledge of the methodologies and technologies available to control exposures and reduce risks to health.

The course outline covered:

- Hazardous substance uses and processes;
- Workplace control principles;
- Process design and principles;
- Ventilation systems and performance assessment;
- PPE; and
- Administrative Elements.

INTERNATIONAL LIAISON

INTERNATIONAL LIAISON

Dr Tanusha Singh
Manager

The NIOH worked closely with the WHO as both a coordinating- and collaborating centre (CC). The WHO renewed the participation of the NIOH in the WHO Chemical Risk Assessment Network for an additional four years until 31 July 2022.

The NIOH attended the 11th Global Meeting of the WHO Collaborating Centres for Occupational Health. Dr S Kisting conducted a presentation on the progress made on the "Workers in Vulnerable Situations" project that the NIOH is leading on behalf of the WHO. The requirements and contributions of the WHO CCs were highlighted during the presentation.

Technical experts from the NIOH also contributed to two systematic review protocols entitled:

- *"Systematic Reviews of Occupational Exposure to Dust and/or Fibres and of the Effect of Occupational Exposure to Dust and/or Fibres on Pneumoconiosis;" and*
- *"Systematic Review and Meta-analysis of Health Services Use and Health Outcomes Among Workers in the Informal Economy."*

The NIOH attended the PHASA Annual Conference 2018, which was hosted in Parys in the Free State from 10 – 12 September 2018 and commemorated the 71st anniversary of the WHO.

Good progress was made on the following three projects that the NIOH led as part of its mandate as a WHO CC:

- *WHO Guideline Development for the Safety of Nanomaterials in the Workplace;*
- *WHO Chemical Risk Assessment Network Participation, Provision of HIV and TB Workplace Services for Health Workers in South Africa; and*
- *The Systematic Review and Meta-analysis of One Priority Occupational Risk Factors.*

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