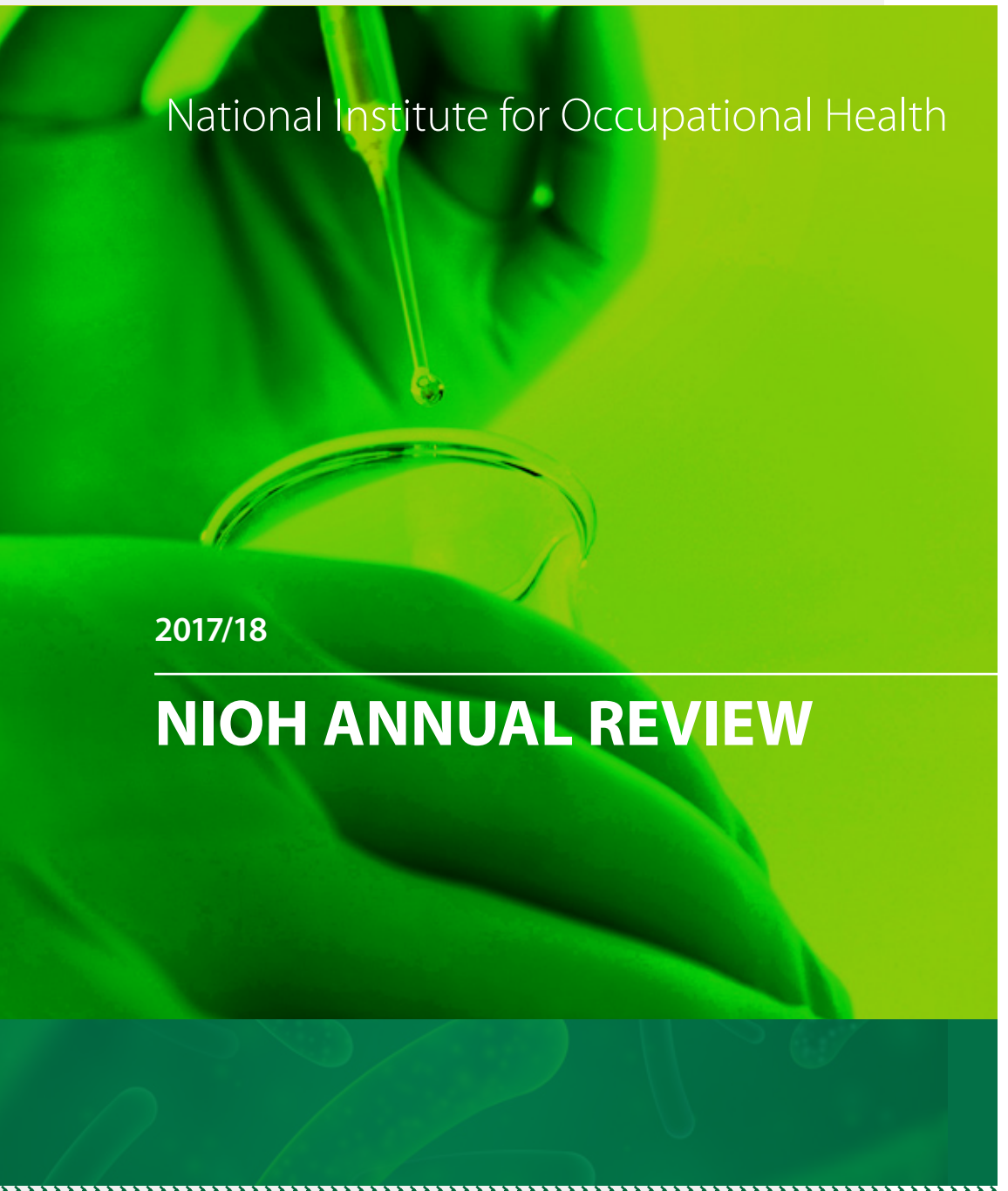
NATIONAL INSTITUTE FOR OCCUPATIONAL HEALTH

Division of the National Health Laboratory Service



National Institute for Occupational Health

2017/18

NIOH ANNUAL REVIEW

NATIONAL INSTITUTE FOR OCCUPATIONAL HEALTH

Division of the National Health Laboratory Service

National Institute for Occupational Health

Annual Review 2017/18

CONTENTS

LIST OF ABBREVIATIONS

16S rRNA	16S Ribosomal Ribonucleic Acid
ABSA	American Biological Safety Association
ACM	Asbestos containing material
AOP	Adverse Outcomes Pathway
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
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 Engineer
BRICS	Brazil, Russia, India, China and South Africa
CC	Collaborating Centre
CDC	Centers for Disease Control and Prevention, US
CDW	Claims Data Warehouse
CEI	Cumulative Exposure Index
CKDu	Chronic Kidney Disease of Unknown Origin
CLTD	Centre for Learning and Teaching Development
CoJ	City of Johannesburg
COPD	Chronic Obstructive Pulmonary Disease
COPSOQ	Copenhagen Psychosocial Questionnaire
CPD	Continuing Professional Development
CSIR	Council for Scientific and Industrial Research
DCS	Department of Correctional Services
DIY	Do-it-yourself
DMR	Department of Mineral Resources
DNA	Deoxyribonucleic Acid
DoH	Department of Health
DOH	Diploma in Occupational Health
DOHM	Diploma in Occupational Health and Medicine
DOMH	Postgraduate Diploma in Occupational Medicine and Health
dsDNA	Double-stranded Deoxyribonucleic Acid
DST	Department of Science and Technology
DTRA	Defense Threat Reduction Agency
DUT	Durban University of Technology
EFSA	European Food Safety Authority
EGFR	Epidermal Growth Factor Receptors
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
HCT	HIV Counselling and Testing
HCW	Healthcare Worker
HPCSA	Health Professionals Council of South Africa
HRA	Health Risk Assessment
HSL	Health and Safety Laboratory, UK
IAEA	International Atomic Energy Agency
IARC	International Agency for Research on Cancer
ICOH	International Commission on Occupational Health
ICPMS	Inductively-coupled Plasma Mass Spectrometry
IDA	International Development Association
IgG	Immunoglobulin
ILO	International Labour Organization
IOM	Institute for Occupational Medicine, UK
ISBER	International Society of Biobanking and Biorepositories
ISO	International Organization for Standardization
IT	Information Technology
IUTOX	International Union of Toxicology
KRT	Kgalagadi Relief Trust
LAMP	Lead and Multi-element Proficiency program, US
LIMS	Laboratory Information Management System
MBA North	Master Builders Association North
MBOD	Medical Bureau for Occupational Diseases
MDL	Method Detection Limit
MGMH	Movement for Global Mental Health
MHSC	Mine Health and Safety Council
MMed	Master of Medicine Degree
MMPA	Mine Medical Professionals Association
MN	Manufactured Nanomaterials
MoU	Memorandum of Understanding
MPH	Master of Public Health Degree
MSc	Master of Science Degree
MTech	Master of Technology
NAPHISA	National Public Health Institute of South Africa
NBAC	The National Laboratory Service (NHLS) Biobanking Advisory Committee
NCR	National Cancer Registry
NEPAD	New Partnership for Africa's Development
NGO	Non-governmental organisation
NHI	National Health Insurance
NHL	Non-Hodgkin's Lymphoma
NHLS	National Health Laboratory Service
NICD	National Institute for Communicable Diseases
NIOH	National Institute for Occupational Health
NIOSH-CDC	National Institute for Occupational Safety and Health (US)
NMMU	Nelson Mandela Metropolitan University

NSCOB	National Steering Committee on Biobanking
NUM	National Union of Mineworkers
OECD	Organisation for Economic Co-operation and Development
OEHS	Occupational and Environmental Health and Safety
OHASIS	Occupational Health and Safety Information System
OHS	Occupational Health and Safety
OHSS	Occupational Health and Safety Systems
OHASIS	Occupational Health and Safety Information System
OHN	Occupational Health Nurse
OHS	Occupational Health and Safety
OMP	Occupational Medicine Practitioner
PT	Patch Testing
PATHAUT	Pathology Disease Surveillance Database
PCM	Phase Contrast Microscopy
PCR	Polymerase Chain Reaction
PPE	Personal Protective Equipment
PDC	Professional Development Course
QA	Quality Assurance
QMS	Quality Management System
qPCR	Quantitative PCR
RSR	Railway Safety Regulator
SABS	South African Bureau of Standards
SACNASP	SA Council for Natural Scientific Professions
SADC	Southern African Development Community
SAFCEC	South African Forum of Civil Engineering Contractor
SAIMR	South African Institute for Medical Research
SAIOH	Southern African Institute for Occupational Hygiene
SANRC	South African Medical Research Council
SAMHS	South African Military Health Services
SANAS	South African National Accreditation System
SANDF	South African National Defence Force
SASOHN	South African Society of Occupational Health Nursing Practitioners
SASOM	South African Society of Occupational Medicine
SATIBA	South African Tissue Bank
SDGs	Sustainable Development Goals
SEWA	Self-employed Women's Association
SHE	Safety, Health and Environment
SHSPH	School of Health Systems and Public Health
SMME	Small, Medium and Micro-sized Enterprise
SOT	Society for Occupational Toxicology
SPT	Skin Prick Testing
SRA	Society of Risk Analysis
STI	Sexually Transmitted Infection
TB	Tuberculosis
TUT	Tshwane University of Technology
TNO	Organisation for Applied Scientific Research, the Netherlands
UBC	University of British Columbia
UCT	University of Cape Town

UJ	University of Johannesburg
UK	United Kingdom
UL	University of Limpopo
UN	United Nations
UP	University of Pretoria
UVC	Ultraviolet C
UVGI	Ultraviolet Germicidal Irradiation
Wits	University of the Witwatersrand
WHO	World Health Organization
WIEGO	Women in Informal Employment: Globalizing and Organizing
WPMN	Working Party on Manufactured Nanomaterials
XRF	X-ray Fluorescence
XRD	X-ray Diffraction

EXECUTIVE DIRECTOR'S OVERVIEW

Executive Director's Overview

Dr Sophia Kisting

Under the leadership of the NHLS the NIOH continues to work with great commitment and dedication to have greater impact on occupational and environmental health and safety. We have made significant strides with regards to a greater focus on workplace ethics and trust we can look confidently ahead to a future of decent work, reduced absenteeism and more sustainable, more equal and more productive workplaces. As a WHO Collaborating Centre the NIOH is the lead for the global project on the informal economy and vulnerable workers. In this context we collaborate with many of the 44 WHO collaborating centres globally including the BRICS countries. The changing world of work with more technological innovations provide golden opportunities for sustainable preventive practices in occupational and environmental health and safety (OEHS) as well as the greater preservation of workers' health. The Institute has profiled ways in which the heavy burden of OEHS diseases presenting to health services, including those of our national and provincial Departments of Health, can be reduced effectively through better compliance of workplaces with occupational health and safety legislation but above all by working for a mind-set change towards greater **prevention.**

As a follow-up to the inclusive occupational health and safety (OHS) concept paper of 2015, the NIOH and the broader OEHS community contributed to the all-important business case discussions for the establishment of the National Public Health Institute of South Africa (NAPHISA). The concept paper reviewed international best practice about the nature of occupational health and safety systems (OHSS). Due consideration was given to the role of the NIOH, since, in the poorly resourced area of OEHS, the multi-disciplinary Institute constitutes a core component. An important role is the support for government departments for the development of effective OEHS systems.

The NIOH continued to facilitate contributions from the broader OEHS fraternity for the inclusion of OEHS in the ongoing National Health Insurance (NHI) consultative process, which is expected to last for several financial years to come. In our review of OEHS systems, we 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 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, we celebrated the second 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 National Health Laboratory Services (NHLS) and the broader world of work and we are deeply appreciative of their support and encouragement. The progress observed on gender concerns and the collaborative interventions undertaken auger well for greater unity of purpose to help overcome gender inequalities at work.

Components of OEHS services to **prevent** occupational diseases and injuries are often underdeveloped or at times totally lacking in South African workplaces. Consequently, the need for OEHS services, especially the specialised services of the NIOH, is considerable in most industrial sectors, as well as in the informal economy. The NIOH and its partners in government and in the private sector undertook a very wide range of activities to address OEHS needs in different sectors of our economy. These activities covered OEHS policy advice, teaching and training, technical support to at least 16 government departments, trade unions and employers; research and different aspects of OEHS surveillance; teaching and training; information services as well as the provision of specialised laboratory services. The NIOH further strengthened the understanding of workplace ethics for OEHS professionals and is in the process of implementing an application that will facilitate access to information on ethics and work.

We have significantly increased our engagement with informal economy workers and as a World Health Organization (WHO) Collaborating Centre (CC), the NIOH currently leads the WHO initiative on better OHS for vulnerable workers. The engagement with governments, trade unions, employer organisations and the informal economy was strengthened mainly through collective teaching and training programmes and targeted service delivery. A significant development in the reporting period was the initiative by the Department of Health in collaboration with the WHO to develop an HIV and TB policy for health workers. This is a most significant undertaking by the NDoH and we will continue to support this process to finalisation and implementation.

The NIOH supports the Sustainable Development Goals (SDGs) adopted by the United Nations in September 2015. The SDGs include decent work, health, gender equity, youth employment, sustainable economies and sustainable environments. All of these are of great importance for healthier, productive, sustainable workplaces and the protection of the health of workers. The SDGs are intended to promote human rights, engender greater equity and peaceful and inclusive societies, create decent and sustainable jobs, and address the enormous environmental challenges of our time, including climate change. According to the WHO, environmental pollution (secondary to industrial and other workplace activities) contributes enormously to the burden of non-communicable diseases in many countries, including our own. This should further encourage all workplace stakeholders to greater compliance with OEHS legislation through effective and efficient preventive interventions at workplaces.

RESEARCH

The NIOH aims to continue to generate new knowledge through the rigour of good scientific research on key OEHS issues, especially those facing South Africa and the rest of the African continent. Collectively, the research projects of each division described in this Annual Report are testimony to the many OEHS issues requiring new knowledge, but also to the growing scope of the institute's research efforts and the strategic and greater engagement of younger researchers. It is notable that the research focus of the NIOH has broadened to increasingly include aspects of environmental health, gender concerns and reproductive health, problems related to climate change, as well as important policy concerns. The scientific publications listed in the NIOH Annual Report demonstrate a focus on many of the priority OEHS issues facing our country. Among the topics covered were asbestos in schools and in homes; preventing tuberculosis in individuals with silicosis; tuberculosis 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.

SPECIALISED AND OTHER SERVICES

The NIOH continues to provide discipline-specific information services 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 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, 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, due partly to scarcity of sources of information elsewhere, as is the case in South Africa. The extent and diversity of information services offered by the NIOH, many of them with limited availability elsewhere in the country, are obvious from this report. 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 has grown significantly in the year under review, and is successfully housing thousands of specimens from different government departments. The HIV and TB Programme of the NIOH 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). The support for health workers has been most welcome as is the roll-out of training in different countries in Southern Africa on the WHO/ILO HealthWISE Programme. The Marketing and Communications Section has done particularly well in profiling the history of the Institute and in strengthening engagement with OEHS programmes nationally and internationally. The Finance and General Services Section has made us all proud by maintaining the historical nature of the old building and making it a special home to the NIOH. The strategic and careful upgrading of the building has continued, and it has become a pleasure to work in this nearly hundred year old building.

The Safety Health and Environment (SHE) and Information Technology (IT) Programmes made significant strides in pioneering 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. 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. We are inspired by the roll-out in Namibia, the Gauteng Department of Health and the current initiatives in Mpumalanga, Western Cape and Lesotho Departments of Health.

A special commendation must go to Mr Daniel Afrika in the Pathology Department who has, in addition to all his tasks, worked ceaselessly to improve health and safety training within the institute.

Looking to 2018 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 our heavy burden of disease, it is incumbent upon the Institute to help nurture a culture of greater prevention of OEHS diseases and injuries. 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, OEHS for migrant workers, subcontracted workers, young workers and workers with disabilities. We have constituted a Green Committee and look to greater emphasis on greener workplaces and green jobs. 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 in skills ranging from fire-fighting and first aid competency, to basic computer training. However, more strategic efforts are needed to reach more workers in precarious work.

The greatly talented NIOH Choir has gone from strength to strength over the last year and has provided the most beautiful renditions of national, regional and international songs at our major public events. We are proud of the contribution of each and every member of the choir and trust that they will continue to grow and include more and more OEHS songs from across the globe in their repertoire.

ACKNOWLEDGEMENTS AND APPRECIATION

We wish to acknowledge the significant contribution of so many to the ongoing success of the OEHS interventions of the NIOH. We wish to acknowledge the significant and strategic support from the NHLS and from our government departments, in particular the departments of Health, Labour, Mineral Resources, Science and Technology, Environmental Affairs, Defence, Agriculture and Correctional Services. We wish to acknowledge all the employer organisations and the growing number of trade unions, which continue to challenge us for an on-going positive impact on workplaces and better worker health. The NIOH is the richer for these interventions.

Our appreciation goes to the many professional OEHS organisations including the South African Society of Occupational Medicine (SASOM), South African Society of Occupational Health Nursing Practitioners (SASOHN) and Southern African Institute for Occupational Hygiene (SAIOH), as well as international organisations, including the WHO, ILO, UN Women, FIOH, NIOSH, ICOH and OECD, for their collegial support and great collaboration. We are particularly appreciative of the collaborative support from our sister OEHS institutes in Africa and across the globe.

We owe a particular gratitude to current and former staff of the NIOH, both academic and non-academic, for making and maintaining the Institute as an internationally recognised, accessible centre of excellence in OEHS research, teaching and training, and service delivery.

CONCLUSION

We invite the actors of the world of work and the broader South African public to join us on our journey of building 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

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 has 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 2017, the Pathology Division was appointed 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 and in addition to these pathology services, the division offers analytical electron microscopy services.

The service work of the division includes the provision of data and material for teaching, research and surveillance purposes. The quality of the work in the laboratories of the division is maintained through participation in external quality assurance (EQA) schemes, as well as accreditation with SANAS, in accordance with the recognised International Standard ISO 15189:2007.

DIAGNOSTIC SERVICES

Autopsies

In terms of the Occupational Diseases in Mines and Works Act: Act 78 of 1973, the Pathology Division continues to carry out the statutory requirement of examining the cardio-respiratory organs of deceased miners. A pathology report of this examination is sent to the Medical Bureau for Occupational Diseases to assist with the compensation process for families of deceased mine workers.

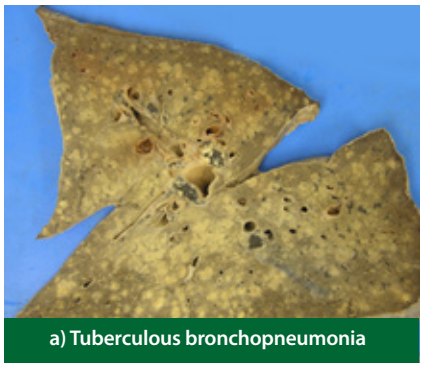
To promote the use of the autopsy service, presentations and workshops were conducted with stakeholders, to raise awareness and educate our clients about the services provided by the NIOH. Despite these efforts the numbers of autopsies continue to decline. In the 2016 calendar year, only 850 autopsies were performed, which is a notable decrease from the 909 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 a great deal of information about the lungs that are examined. Approximately two hundred items of information are carefully recorded by the examining pathologists. This information is entered into the Pathology Division database (PATHAUT). The PATHAUT database is a national resource and contains unique information about disease 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 have been produced, using the 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. Detailed disease surveillance reports compiled from the PATHAUT database giving demographic data and disease rates are produced annually. These are made available in the public domain through the NIOH web site. The URL for the reports is: http://www.nioh.ac.za/?page=pathology_disease_surveillance_reports&id=162.

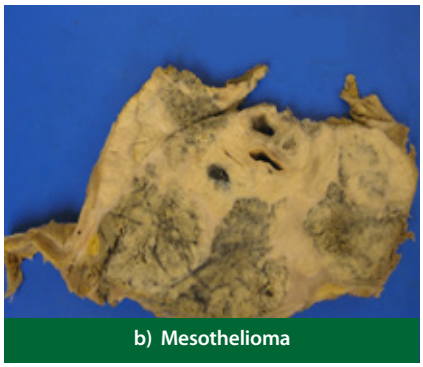
Surgical pathology

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 Department provide pathology expertise and services for the newly created centre, which officially opens in April 2018.

Due to a lack of capacity at the NHLS laboratories, the NIOH Pathology Division accepted the request in October 2017 to be the service provider for general surgical pathology to Limpopo. This resulted in an improved pathology service to the province. The general surgical pathology specimens received from Limpopo affords an opportunity for the pathologists at the NIOH to examine a broad range of general pathology.



a) Tuberculous bronchopneumonia



b) Mesothelioma

c) Silicosis

Figure 1: Cross sections of lungs with a) Tuberculous bronchopneumonia; b) Mesothelioma; c) Silicosis

Electron microscopy

The electron microscopy section functions within the division and is headed by Prof J I Phillips, a National Research Foundation (NRF) rated scientist. The section supplements the service work of the Pathology Division by determining the asbestos fibre concentrations in lung tissue to assist with diagnoses of asbestos related disease.

The section executes qualitative and quantitative analyses for the presence of asbestos fibres. Analyses are conducted on bulk materials and air samples, which are obtained on filters. These analyses are performed for other divisions of the NIOH and external clients, including national, provincial and local government, non-governmental organisations, universities and private businesses. The section participates in an external QA scheme and maintained its satisfactory rating in the Asbestos in Materials international QA scheme that is coordinated by the Health and Safety Laboratory, UK.

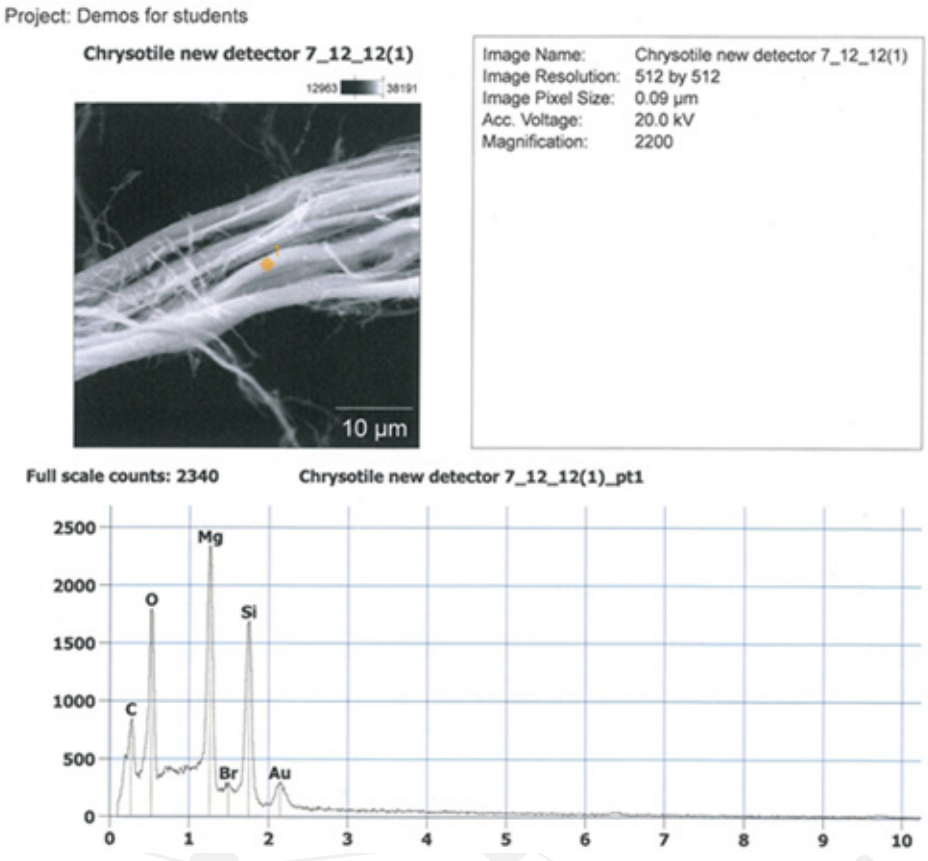


Figure 2: Scanning electron micrograph of chrysotile asbestos found in a floor tile from a school that is being renovated.

The service to analyse samples for asbestos was first offered in 2003. Since then, data generated from the samples that has been submitted for analysis, has been stored and entered into a database. This database is unique in South Africa and its interrogation provides information about the legacy of asbestos in the country. To date, the database contains over 3000 entries with information regarding the type of sample and where it originates from, as well as the type of industrial sector along with the activity being performed – such as the renovation of an asbestos containing structure. This information was used to produce an annual surveillance report which is available in the public domain through the NIOH website at: http://www.nioh.ac.za/?page=asbestos_surveillance_reports&id=191.

RESEARCH

Research relevant to the health of South African workers is conducted by members of the Pathology Division staff. Material and data from the service work of the division provide a significant quota of information for research projects. Current areas of interest are centred on diseases of the lung in mine workers, caused by exposure to silica dust or asbestos fibres. We have been collecting data on women employed in mining since 2005, and this data is currently being analysed.

During the course of the year, editors of scientific journals requested Prof Phillips to peer review five research articles. Staff in the division co-authored seven articles in scientific journals. The division also produced the PATHAUT annual report on autopsy examinations which were performed in 2016. This report is of great value for researchers in the mining industry.

Prof Phillips chairs the NIOH Research Committee and chairs the NIOH monthly Research Forum. He is the Vice Chair of the NHLS Research Development Committee and represents the NIOH on the NHLS Research and Innovation Committee.

The division collaborates with other divisions within the NIOH and assists with projects that involve the enumeration and identification of asbestos. Links are fostered with local and international institutions which includes:

- The Centre for Scientific and Industrial Research (CSIR);
- The University of the Witwatersrand (Wits): Schools of Pathology, Public Health, Clinical Medicine and Archaeology;
- The University of Johannesburg (UJ): Faculty of Health Sciences;
- The Health and Safety Laboratory, UK;
- The Occupational and Environmental Lung Injury Centre, Sheffield University, UK;
- The University of Wales, UK;
- Harlan Laboratories, Switzerland;
- Dokkyo University School of Medicine, Japan;
- London School of Hygiene and Tropical Medicine,
- University College, London, UK;
- Brooklyn College, City University of New York, USA;
- Sciences Po University, Paris, France;
- Environmental and Occupational Health Sciences; and
- The School of Public Health, Chicago, Illinois.

The division also receives visitors from these local and international institutions.

TEACHING AND TRAINING

The division plays a role in teaching and training through workshops, presentations and formal lecturing to professional bodies, universities and teaching hospitals. Prof J Murray is an Associate Professor in the School of Public Health and Prof J I Phillips is a visiting Professor at UJ, where he chairs the Academic Advisory Committee and is a moderator for honours examinations. He was an invited speaker at the 2nd PathReD 2017 Congress which was held at Emperors Palace in Johannesburg in June 2017.

Dr N Vorajee was an invited speaker at the SASOHN conference and workshop. 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 and medical technicians and -technologists to prepare for their National Board Examinations by offering tuition once a week.

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

Dr N Vorajee and Dr D Lakhoo are senior lecturers at Wits University and deliver lectures to medical and allied medical undergraduate and postgraduate students.

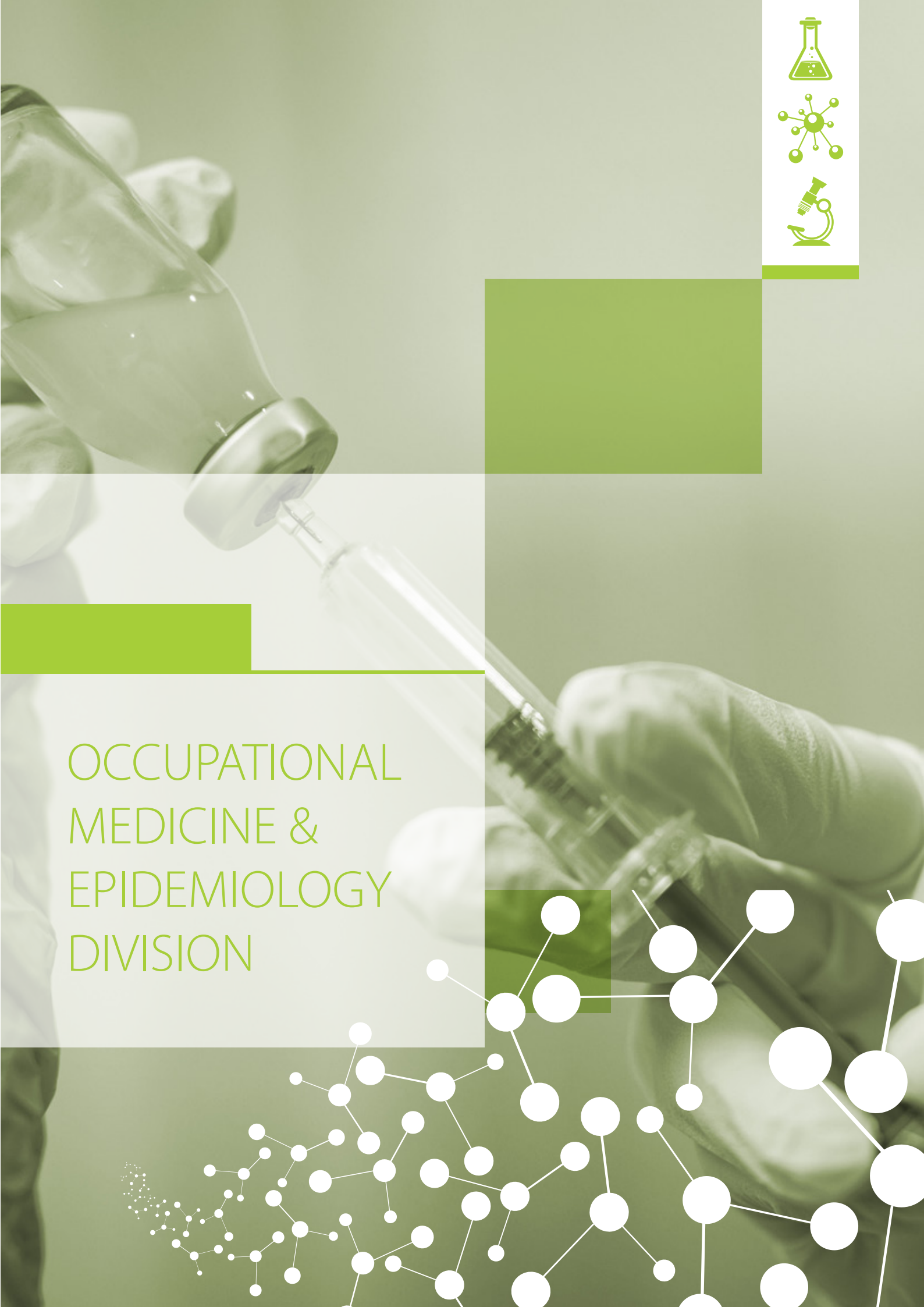
Dr Vorajee actively participates in and presents cases at regular clinical pathology meetings with doctors from the Johannesburg teaching hospitals. Specialised training is given to small groups of healthcare professionals, mine workers, organised labour, and mortuary and funeral parlour staff. In collaboration with the trade unions, members of the Pathology Division conducted workshops, focusing on lung disease.

HONOURS

Dr Naseema Vorajee was awarded her Master of Medicine (MMed) (Anatomical Pathology) by Wits, for her thesis titled: Epidermal growth factor receptor and anaplastic lymphoma kinase mutations detected by immunohistochemistry in lung adenocarcinoma in patients from Johannesburg.

PROFESSIONAL DEVELOPMENT

Two postgraduates are enrolled at Wits; one for a Master of Technology (MTech) and the other for a Master of Science (MSc) Degree. One undergraduate completed a Diploma in Medical Technology and one postgraduate completed a MMed in Anatomical Pathology at Wits.



OCCUPATIONAL MEDICINE & EPIDEMIOLOGY DIVISION

Occupational Medicine & Epidemiology Division

Prof. David Rees

The division comprises three sections: Occupational Medicine; Immunology and Microbiology; and Epidemiology and Surveillance. The sections' reports follow this brief introduction which focuses on a notable aspect of the sections' work in the reporting year.

Workplace psychosocial factors have been prominent concerns in occupational health for decades and continue to be a major focus of research and of workplace interventions to reduce their negative effects. Although recognised as substantial determinants of wellness and productivity in South Africa, to date, the NIOH has made a limited contribution to this aspect of working life in the country, with competition for limited resources to deal with more traditional hazards being one explanation. It is therefore pleasing to note that the Occupational Medicine section, headed by Dr Spo Kgalamono, has decided to build capacity in this area. Important tasks that are earmarked, are to identify tools to measure stressors suitable for South Africa, and to become knowledgeable about interventions that have proven to be helpful in reducing the impact of negative psychosocial factors.

The new Aspire laboratory that opened in 2017, is a notable achievement for the Immunology and Microbiology section, which is headed by Dr Tanusha Singh. While significant strides have been made through improved treatment and technological advances to detect TB cases, TB was still the top infectious killer in 2016 and is the main cause of deaths related to antibiotic resistance. Infection control is a key tool to reduce the impact of TB, especially in health facilities, and huge investments were made in infection control devices and products. The suppliers of these devices claim that they reduce or eliminate airborne infectious agents, but are not able to provide supporting data on efficacy testing to back these claims.

Ineffective products (e.g. some UVGI devices) create a false sense of security for workers, placing them at high risk of infection. The Immunology and Microbiology Section opened a world class, state-of-the-art, high containment biosafety level 3 laboratory which assesses the effectiveness of airborne infectious control products and devices. This laboratory will contribute to strategies to prevent exposure to TB and other airborne infectious agents in high-risk occupations such as in the health sector in South Africa, the SADC region, and globally.

The WHO identified vulnerable workers as an occupational health priority. The informal economy constitutes a substantial proportion of the world's vulnerable workers and is thus an important aspect of the WHO's effort. It is therefore only appropriate that the Epidemiology and Surveillance Section, headed by Dr Nisha Naicker, has become increasingly active in OHS in informal work. An example of their work is a large project with informal waste recyclers (also known by the less acceptable term; waste pickers) to identify risks to health and ways to ameliorate them. Data collection began in the reporting period. The project will be one of the largest rolled out ever in the sector globally, and it has the potential to identify methods to improve the working conditions in this neglected area.

OCCUPATIONAL MEDICINE SECTION

Occupational Medicine Section

Dr Spo Kgalamono

The Occupational Medicine Section runs a referral clinic, which is the largest of the three referral clinics in the country, providing specialised occupational health services. The section also houses an ergonomics unit that has been instrumental in contributing to the new ergonomics regulations.

Occupational health professionals from both private and public sectors refer suspect occupational disease cases to the NIOH referral clinic for various reasons including: diagnosis and management of occupational diseases, ergonomic risk assessments and assessment for qualification for workers' compensation. Referrals are sent to the section from all over South Africa and its neighbouring countries. Recommendations for current workers include: advice on return to work, control of workplace exposure and suitability for compensation.

The referral clinic also serves as a training centre for registrars in occupational medicine and public health medicine. The registrars gain experiential learning by evaluating patients and conducting research specific to occupational health.

DIAGNOSTIC SERVICES

The referral clinic contributes to the prevention of occupational diseases through comprehensive patient management and advice on workplace hazard control measures. Due to lack of occupational health capacity at provincial level, the clinic provides a much-needed clinical service to South Africa and the SADC region. The service includes response to complaints by employees on control of unsafe working conditions, clinical assessment of cases and assistance with compensation submission. For this purpose, the referral clinic works very closely with the Departments of Health and Labour.

The profile of diseases assessed at the clinic predominantly remains of respiratory nature, with occupational asthma and chronic obstructive airways diseases forming the bulk of referrals. Fewer cases of pneumoconiosis, in particular asbestosis, are assessed at the clinic. This may be an indication of the successful ban of asbestos in the country, which prohibits the manufacturing of asbestos products.

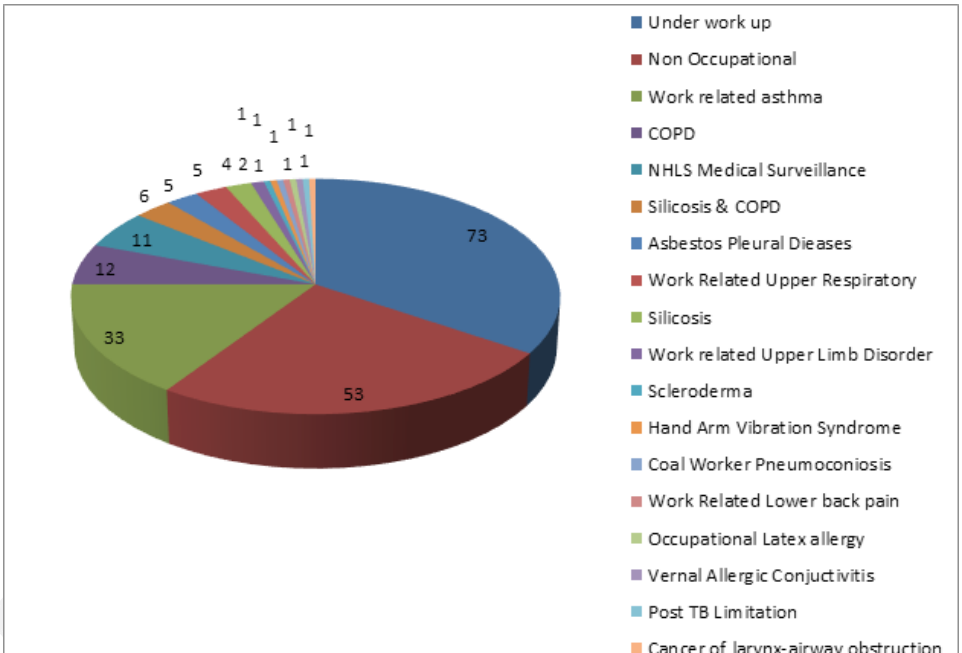


Figure 1: Number of cases by disease categories

The section continues to offer additional support to the Medical Bureau for Occupational Diseases (MBOD) through participation in the Medical Review Authority and the Joint Committee for the certification of cases of occupational diseases for the mining sector.

TEACHING

Capacity building in occupational health continues to be a strong focus of the section. There are now four specialists in the section that contribute to the development of the speciality in the country, through the training of registrars and assisting the Colleges of Medicine of South Africa in the final examination process. Besides the four resident NIOH occupational medicine registrars, public health medicine and occupational medicine registrars from the universities of Pretoria, Limpopo and Witwatersrand rotate annually through the section, for experiential learning. In addition, staff members substantially contribute to the Postgraduate Diploma in Occupational Health (DOH) for doctors and nurses and masters courses in various universities across the country. In particular, some members of staff contributed to revision the curriculum for the Wits Diploma in Occupational Health for doctors, developed content and set exams. Staff members also continue to contribute to diplomas and masters courses at various universities around the country.

The section conducted informal training to empower employees through organised labour, employers and other occupational health professionals. The training covered topics of national interest or other topics requested by stakeholders. Several staff members presented specific topics at workshops organised by the NIOH, SASOM, SASOHN, the Department of Mineral Resources (DMR) and the Department of Labour (DoL), to mention but a few.

RESEARCH

The focus of the research, during the period under review, was to increase collaboration with other sections within the NIOH on numerous projects, while supervising postgraduate students completing their Masters and PhDs at various universities. Below is a summary of key collaborative projects that are currently underway:

Informal workers

Study team: NIOH and the South African Medical Research Council (MRC). This is a collaborative project with the Epidemiology, Analytical Services and Occupational Hygiene Sections. The project is part of the NIOH's agenda to address the plight of vulnerable workers.

The study focuses on hazardous exposures facing waste reclaimers at landfill sites when collecting recyclable waste, their health status, and access and utilisation of healthcare services. A team of NIOH researchers conducted interviews and data was collected. The scenario around access to health is currently being analysed by the Occupational Medicine Section.

Environmental silica dust exposure from mine dumps as a risk factor for chronic respiratory disease in a Gauteng township

Study team: S Iyaloo[1,2], T Kootbodien1, N Naicker[1,2,3], S Kgalamono[1,2], K Wilson[1], A Mathee[2,3,4], K Mashao[5] and D Rees[1,2]
NIOH[1], School of Public Health, University of Witwatersrand[2], Environmental Health Department, Faculty of Health Sciences, University of Johannesburg[3], Environment and Health Research Unit, South African Medical Research Council[4], Medical Bureau for Occupational Diseases, National Department of Health[5]

There are approximately 270 silica-rich, gold mine dumps in Johannesburg. To date, there has been no research on health effects using objective measures such as X-rays and lung function tests in communities living in close proximity to these mine dumps. A study was thus undertaken by the team to assess the respiratory health effects, using a weighted cumulative exposure index (CEI), based on duration of exposure and distance from the mine dump in an exposed (Riverlea) and minimally exposed (Ennerdale) community. Subjective measures of respiratory disease such as a history of symptoms, and objective measures of respiratory disease such as chest X-rays and lung function tests were used to diagnose respiratory chronic obstructive pulmonary disease (COPD). This was done by using the percentage of predicted in forced expiratory volume in one second (FEV1), pulmonary TB and silicosis. A total of 281 and 100 houses were approached with enrolment rates of 80.4% and 84.0% in Riverlea and Ennerdale respectively. Data analysis is underway.

Glyphosate and other pesticide exposure as risk factors for Non-Hodgkin's Lymphoma

Study team: Ndaba M, Iyaloo S, Rees D, Kgalamono S.

This study plans to establish whether pesticide exposure (specifically glyphosate exposure) is a risk factor for Non-Hodgkin's Lymphoma (NHL) in South Africa. This was in response to the reclassification of the pesticide glyphosate, a commonly used herbicide, as a category II carcinogen by the International Agency for Research on Cancer (IARC). One of the key findings of the IARC was the association between glyphosate exposure and NHL. Review of data from the Claims Data Warehouse (CDW) will help to identify the major NHL subtypes in South Africa, and provide information on determinants and distribution within the country. This data includes diagnostic patterns, province, age at diagnosis and sex of the cases diagnosed from different institutions. More information on manufacturing, transport and distribution of glyphosate will be sought from different role players.

Kidney function changes in sugarcane workers in South Africa

Study Team: Magombo M[1,2], Assounga A[1], Barregard L[2], Dorkin E[3], George J[4] , Jina R[1,2], Kgalamono S[1,2], Naicker S[4], Naidoo R[1], Rees D[1,2], Snyman T[4], Wesseling C[2]

NIOH[1], School of Public Health, Wits[2], CSIR[3], UP[4]

Chronic kidney disease of unknown origin (CKDu) has been discovered in some parts of the world amongst agricultural workers, and in particular among sugar cane cutters. Studies done in different parts of the world suggest that the cause of this kidney disease is repetitive dehydration, as a result of strenuous work in a hot environment. The current study was designed to evaluate changes in biomarkers of kidney injury during the sugarcane harvest season, over nine weeks

The South African study commenced on one of the sugar cane farms. Data was collected during the first part of the harvest season in March, April and June 2017. Environmental temperatures during the study ranged from 22 to 32 degrees Celsius. The study population comprised 74 male sugarcane workers above the age of 18 years. Of these, 38 were cutters and 36 were controllers who do not fulfil strenuous tasks in hot environments at the beginning of the harvest season.

Biological samples are currently being analysed

Sources of asbestos exposure in patients with malignant mesothelioma in South Africa

Study team: Ruxana Jina[1,3], David Rees[1,3], Gabriel Mizan[1,3], Kerry Wilson[1,3], Trudie Vorster[1], Vusi Ntlebi[1], Naseema Vorajee[1,3], Spo Kgalamono[1,3], Tebogo Nthoke[1], Alison Reid[2], Lin Fritschi[2], Sophia Kisting[1], James Ian Phillips[1,4]

NIOH[1], School of Public Health, Curtin University, Western Australia[2]; School of Public Health, Wits[3]; The Department of Biomedical Technology, Faculty of Health Sciences, UJ[4]

Although asbestos was banned in South Africa in 2008, the country has a long history of asbestos mining, manufacturing and use. As a result, the risk of exposure still exists today, through asbestos-containing materials, environmental contamination and domestic exposure. One disease caused by asbestos exposure is malignant mesothelioma, an aggressive, fatal tumour.

In the 26 years since the sources of asbestos exposure in mesothelioma patients was last reviewed in South Africa, industry has changed, and construction materials have aged and weathered. It is thus important to produce a new review on the sources of asbestos exposure in patients with mesothelioma. This study will provide guidance to government and the population as a whole on the approach to be taken in dealing with present exposures. It will also provide useful information on the number of mesothelioma cases per year that result from environmental and occupational exposures and the geographical location of these exposures. So far, seven cases have been interviewed and more data is being collected around the country.

PROFESSIONAL DEVELOPMENT

Of the four occupational medicine registrars, one has completed the four-year training and is scheduled for exams in July 2018. One staff member is enrolled for a BTech in Occupational Health Nursing, at the Tshwane University of Technology (TUT).

ERGONOMICS UNIT

The Ergonomics Unit provides ergonomic services to South African workplaces including government departments, private companies and academic institutions. These services cover ergonomic risk assessments, research and teaching and training. Partly through the support of the unit, the DoL produced Draft Ergonomics Regulations for South Africa, which were recently accepted by the Advisory Council on Occupational Health and Safety. These regulations will guide workplaces in fulfilling their responsibility of protecting workers from exposure to ergonomic risks. The unit is also involved in various research activities. In recognition of the fact that ergonomics is a scarce skill in South Africa, capacity building activities on ergonomics were targeted at occupational health professionals, with the view that they will disseminate the acquired knowledge to the broader communities at workplaces.

SPECIALISED SERVICES

Ergonomic risk assessments are conducted in workplaces through the identification of ergonomic hazards, assessment and evaluation of the risk it poses to the workers. Recommendations are then formulated to prevent and control the risk if it cannot be eliminated.
In the year under review, most assessments were conducted at the NHLS followed by state-owned enterprises and private companies. Considering the spread of the NHLS branches in South Africa and their access to ergonomic services, the unit developed ergonomic screening tools to make it easier for branches outside the Gauteng region to identify ergonomic issues and intervene in simple cases, while referring difficult cases. These tools are currently being piloted and will be reviewed for their effectiveness.

RESEARCH

In the 2017/2018 reporting cycle, the unit concentrated on information dissemination of previously completed research. This took the form of presentations at different research platforms and the completion of a PhD thesis. Other research activities concentrated on supervision and examination of postgraduate students' research projects.

Oral and poster presentations were done at two local conferences. Supervision of upcoming researchers is important in building research capacity in this new field. Two Masters of Public Health (Industrial Hygiene) research projects from Wits School of Public Health were supervised and one Master of Medical Science of Nursing and Public Health, University of KwaZulu-Natal was examined.

TEACHING AND TRAINING

Capacity building activities on ergonomics were offered to occupational health professionals comprising occupational health nurses, occupational medicine doctors and occupational hygienists. These activities were delivered through formal postgraduate courses, continuing education and workshops.

The capacity building activities offered to the South African Society of Occupational Health Nurses (SASOHN), were for the purposes of continuing education. For doctors and hygienists, ergonomics were incorporated in the Diploma in Occupational Health and the Master of Public Health (MPH) in Industrial Hygiene, respectively.

Different occupational health professionals from Lesotho received training on OEHS through a workshop organised by the NIOH under the auspices of the New Partnership for Africa's Development (NEPAD). The NIOH and NHLS also conducted workshops for informal sector workers, as well as a workshop for workers from different sectors, that was organised by the DoL.

PERFORMANCE TARGETS

The performance of the unit is depicted in Figure 1 below. Eight ergonomic risk assessments were completed, one article was published, and twelve teaching and training activities were performed.

PROFESSIONAL DEVELOPMENT

One postgraduate is enrolled for a Certificate in Ergonomics at Rhodes University.

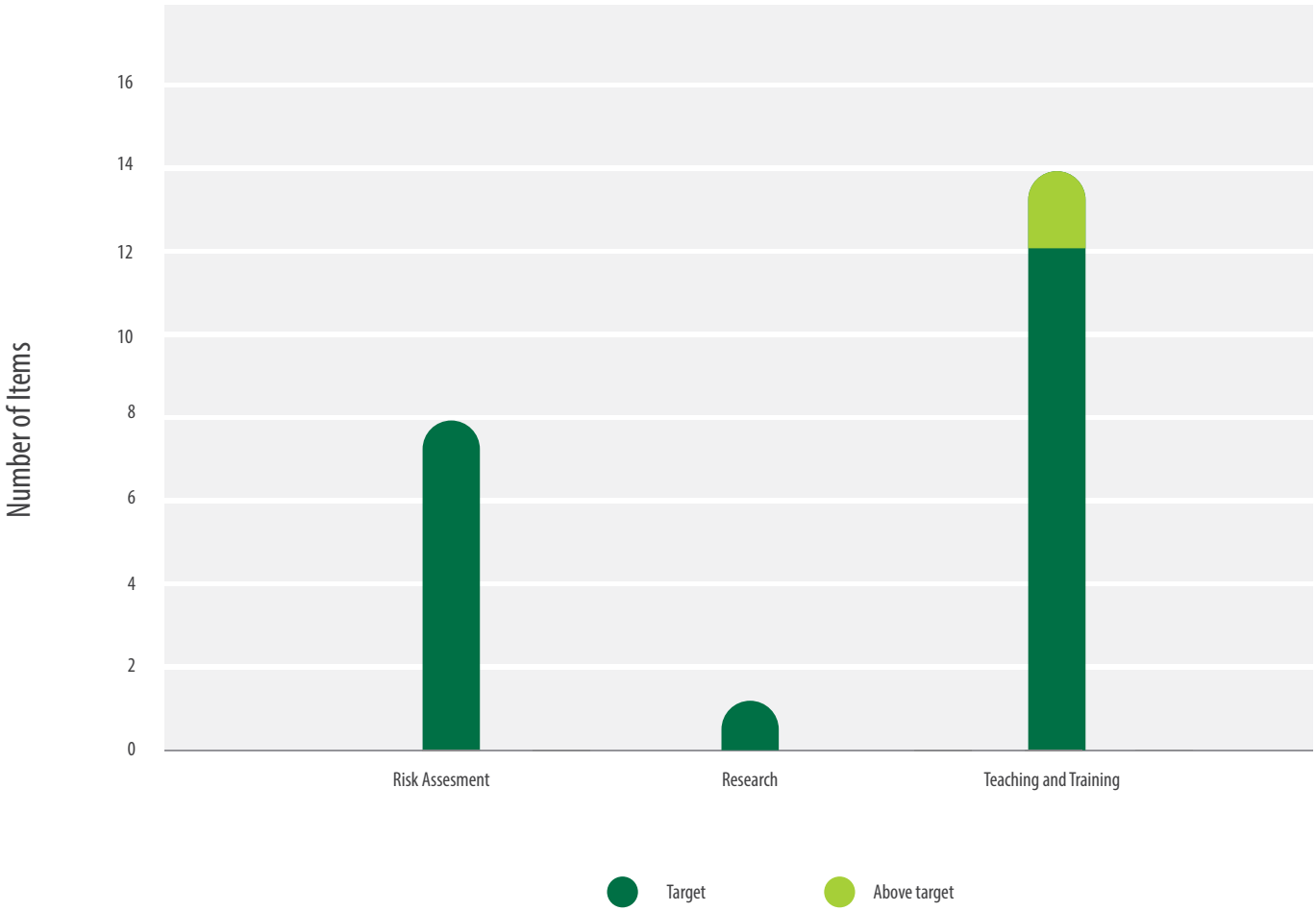


Figure 1: Performance of the Ergonomics Unit in the 2017/2018 period

IMMUNOLOGY & MICROBIOLOGY SECTION

Immunology & Microbiology Section

Dr Tanusha Singh

The section's primary focus in the reporting year was airborne infection prevention and control which is a challenge in many workplaces, and particularly in healthcare facilities. The implementation and sustainability of mitigation strategies remain key determinants in the transmission of airborne diseases. The section also focused on occupational allergies by providing tailored diagnostics to clinically manage workers' allergies.

One of the main thrusts for the year was the promotion and awareness of occupational allergies and infectious diseases through teaching and awareness campaigns. Several forums with multiple stakeholders such as the DoL, DoH, Council for Scientific and Industrial Research (CSIR) and academia, culminated into programmatic approaches to address various occupational health matters.

The Section's major highlight was the launch of the Aspire Laboratory (Aerogen Science – Promoting Innovative Research) on 24 November 2017. The NIOH holds the blueprint for this state-of-the-art facility, which is the only of its kind in the world. The facility will serve as a local and global resource to services and research into preventive interventions aimed at reducing transmission of airborne infectious pathogens (e.g. TB). The laboratory will contribute to efficacy assessments of infection control devices.

Image 1– Aspire Laboratory launch
Left: Dr Tanusha Singh and Prof David Rees cutting the ribbon

Image 2 – Aspire Laboratory launch, Right: Laboratory project team (from left) Mr Awie van Rensburg (AFMS), Mr Almero Oosthuizen (NAKO), Mr Gregers Chalker (AFMS), Dr Tanusha Singh (NIOH), Mr Paul Barnard (AFMS), Mr Tobias van Reenen (CSIR), Prof David Rees (NIOH) and Mr Zibusiso Masuku (NICD)

Image 3: From left: Aerogen test room, building management system (BMS) control room, clean room.

Image 4: Street waste pickers participating in a health & safety questions and answer session.

DIAGNOSTIC SERVICES

The section provided specialised testing for occupational related respiratory and skin disease and continued to maintain the occupational allergen bank, which is probably the most comprehensive bank of workplace allergens locally. Through this service, the section contributes to a source of valuable information on occupational allergies across industrial sectors.

Two surveillance reports on occupational respiratory allergies and occupational skin diseases were produced for the first time. The laboratory continued to provide sterility testing of nanoparticle samples and conducted hazardous biological agent (HBA) risk assessments after worker complaints were reported in different settings, including mining.

The section continued to provide an identification service of medically important airborne fungi in response to the increasing number of queries related to mould or fungal exposure in indoor environments. The laboratory was audited by the South African National Accreditation System (SANAS), and was recommended for accreditation. This marked the 11th consecutive year of accreditation, which reinforces the quality of our testing service to clients. A number of queries were handled by various staff.

RESEARCH

Research was a priority in the year under review and the research agenda focused on prevention of workplace exposure, with specific reference to HBAs that cause infections and allergies. The research 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 reviewed the ICOH position paper titled "Draft ICOH Position Paper on TB amongst Health Workers". This is in line with efforts to introduce OSH preventive measures as part of the global End TB Strategy. Ongoing projects 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]
NIOH[1], Wits[2], CSIR[3], UP[4]

Background: Mycobacterium TB remains a threat to healthcare workers (HCWs) with 8.8 million new active TB cases worldwide every year and nearly 2 million TB deaths. Health workers face an increased risk of contracting TB due to occupational exposure in their work environment. Huge investments were 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 infection 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: The cross sectional study involved mapping of the public health facilities in various provinces that are 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 conducted walkthrough inspections in four hospitals in Gauteng province, three in the Western Cape and two in KwaZulu-Natal. The total number of environmental samples collected in the three provinces is n=309, 163 and 126, respectively, with an overall total of 598 samples. The samples are analysed for airborne TB, using molecular biology techniques at the NIOH laboratory. Infection control.

Effect of hand washing and scrubbing on bacterial flora and skin irritation in HCWs

Study team: A Fourie[1,2], O Matuka[1,2], B Binta[1], Z Kirsten[1], H Carman[3], B Girdler-Brown[4], T Singh[1,2]

NIOH[1], Wits[2], Private Dermatology consultant[3], University of Pretoria (UP)[4]

Background: Hand hygiene is a fundamental component of infection control in reducing microbial levels on the hands of HCWs. Excessive hand washing damages the skin barrier resulting in changes to the composition of microflora on the hands. Hand contamination with *Staphylococcus aureus (S.aureus)* and *Escherichia coli (E.coli)* may contribute to infections. The study aimed to assess the effectiveness of different hand washing methods in reducing levels of bacterial flora, especially *S. aureus* and *E.coli* on the hands of theatre workers. It also sought to determine the relation between skin irritation and higher bacterial loads.

Method: A cross sectional study was conducted among 70 theatre staff members in surgical theatres of three Johannesburg hospitals that were randomly selected. Samples were taken before and after hand washing, using the modified glove juice method and the finger nail press technique. Standard microbiological techniques were applied to identify bacteria.

Results: Of 75 workers, 11 were sampled on two occasions and the rest only once. *S.aureus* was isolated in the prewash samples of 33 (45%) workers and in the post wash samples of 25 (33%) workers. Of the 33 with positive cultures of *S.aureus* at prewash, 22 (67%) showed a decrease in the post wash count, while 11 (33%) showed an increase or no change in the post wash count. There were no statistical differences found in terms of the method of handwashing used or the cleansing formula (soap) used. It thus seems as if *S.aureus* is commonly found on the hands of theatre workers, that hand washing is effective in a proportion of these workers only and that consideration should be given to closer monitoring of the hand washing protocols used. There was no clinically significant association between the type of handwashing technique and skin irritation.

TEACHING AND TRAINING

Capacity development remained a key focus of the section through targeting various occupational health professionals such as occupational and public health registrars, occupational health practitioners, occupational health nurses, occupational hygienists and scientists. The HPCSA medical intern scientist microbiology training was supported throughout the reporting year and one intern medical scientist, Ms L Muleba, successfully passed her two-year internship programme.

Contributions were made to Medical Scientist Committee of the HPCSA. Apart from contributions made to occupational health curriculae for various universities and stakeholders, such as the Diploma in Occupational Health for the Universities of Pretoria and Witwatersrand and the MPH for Wits and the DOH, a number of successful initiatives were held during the year. A list of the presentations and activities that took place are highlighted below.

- Ms A Fourie presented on the topic "Occupational Contact Dermatitis –a practical approach" to students enrolled for the Diploma in Occupational Health at University of Pretoria;
- Ms O Matuka presented on airborne infection control at the Gauteng province occupational health task team meeting which was held at Randgate Clinic, Wes Rand District in Randfontein on 17 August 2017;
- Ms A Fourie presented occupational skin disease data from the clinic at the dermatology Independent Practitioners Association (IPA) meeting;
- Ms O Matuka gave a lecture on ultraviolet germicidal irradiation to the MPH students at Wits on 18 August 2017;
- Ms A Fourie presented on the topic "Revisiting Occupational Diseases – Dermatological Concerns' at a SASOHN meeting in the West Rand;
- Dr T Singh presented on the topic "Risk Assessments for hazardous biological agents (HBAs) and its challenges" at the HBA workshop organised by the DoL on 29 June 2017. The main objective of the workshop was to get inputs from different professional bodies in preparation of the review of the HBA regulations. Stakeholders who participated in the workshop included both public and private sectors, as well as academic institutions; and
- A training session on occupational allergies and infectious disease was presented to occupational medicine and public health registrars.

OHS awareness among street waste pickers

In celebration of World Day of Health and Safety at Work (28 April), the Immunology and Microbiology sections hosted a "Health, Safety & Wellness Workshop" for street waste pickers at the NIOH on 25 April 2017. The objective was to raise awareness about OHS and wellness among the group of waste pickers.

The workshop, which was well attended by 72 attendees, comprised an overview of OHS and specific hazards relevant to the industry, with a video demonstrating the plight of waste pickers in the CoJ. The video included testimonies of the lives of two pickers, one of whom described the disparity of females in the sector and the risk they face of being raped daily. The Social Health and Displaced Persons Unit also conducted a presentation on social determinants among waste pickers.

Another activity that was well received by the attendees, was a quiz. In addition, the females were able to join the MINA presentation regarding female hygiene, which was conducted parallel to the event. Each female trainee received a free MINA menstrual cup. The males were able to attend another session on male reproductive issues, which was presented by the Wits Health Research Institute.
The group also visited the mobile clinic during the course of the event

Fungal disease week

The section celebrated Fungal Disease Awareness Week (14-18 August) by producing a summary of the importance of the week in relation to occupational health. This was published on the NIOH website to raise awareness of fungal exposure in the workplace. This initiative highlighted the importance of diseases caused by exposure to fungi/moulds in the workplace. It also emphasised the importance of preventing exposure and of recognising symptoms or diseases so that workers' health is protected and improved. Workers spend a substantial fraction of their time (~90%) within buildings such as offices. Indoor air quality therefore becomes an important risk factor for human health.

Biorisk management in the workplace course

The section hosted a 5-day biorisk management course at the Sunnyside Park Hotel from 20-24 November 2017. The course served to close the existing knowledge gaps and empower attendees with the required skills through a series of lectures, demonstrations, case studies, problem solving exercises, and discussions on current best practices, to prevent and control biological exposure in various work settings.

This advanced course specifically focused on employees and communities' health and safety and introduced the concept of biorisk management, which combines risk assessment, risk mitigation, and performance of systems – through an assessment, mitigation and performance (AMP) model, that is based on an approach of the WHO. The course was an intense learning experience, filled with a multitude of activities that were well received by an enthusiastic group of approximately 84 delegates; including speakers from private and the public sector and comprised hygienists, engineers, infection control and occupational health practitioners, health and safety representatives, managers and labour inspectors. The course was overall very successful, and several requests were received for it to be regularly hosted in the future, which the section will pursue.

World hand hygiene day and hand wash awareness

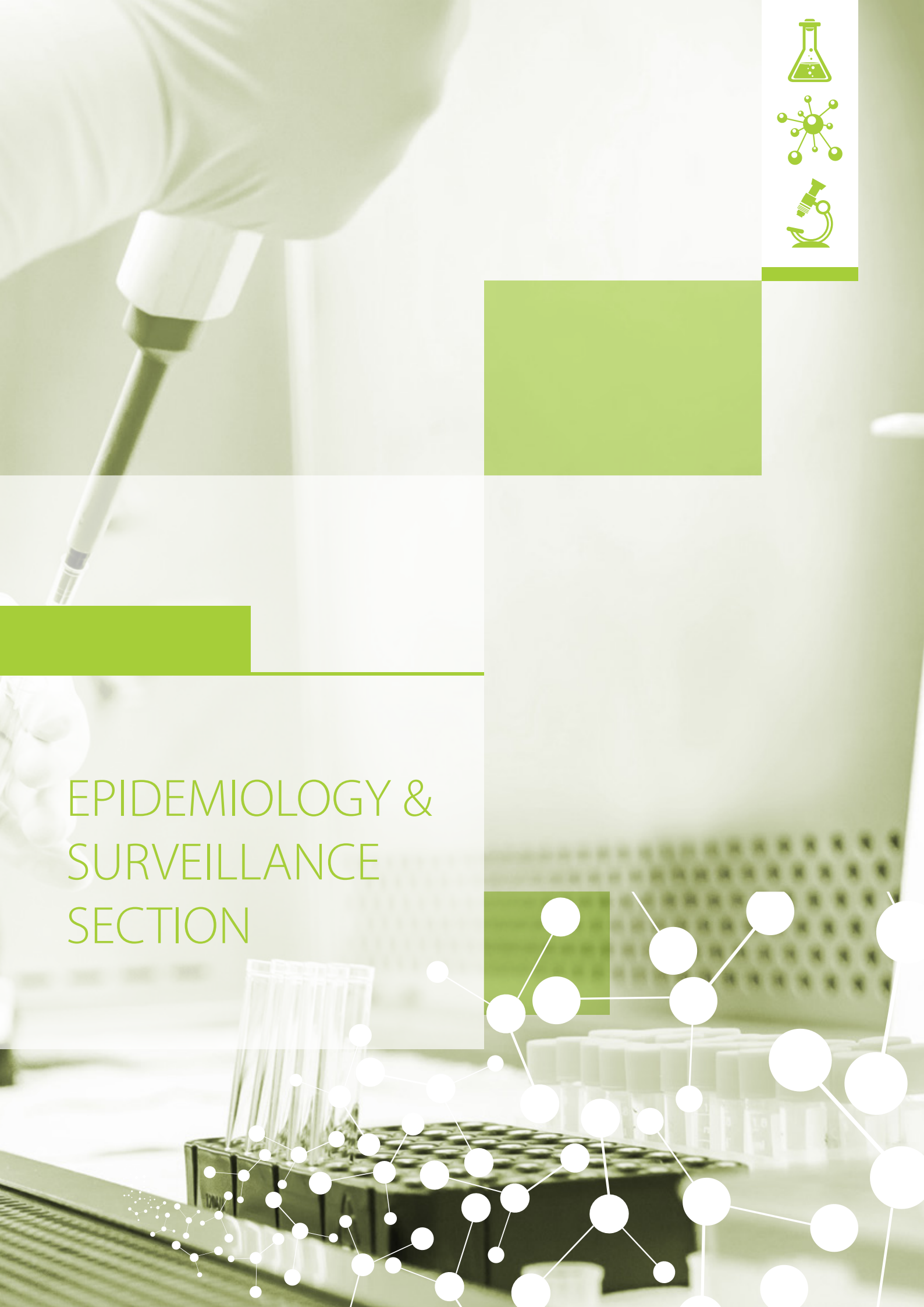
In celebration of World Hand Hygiene Day, the section hosted a Hand Hygiene Day at Hillbrow Hospital on 11 May 2017. The event was attended by health workers who received a presentation on contact dermatitis and the importance of hand hygiene and hand care. This was followed by a practical exercise on hand washing, as well as a quiz. WHO posters that demonstrate hand washing steps, were also distributed to participants.

The allergy team (Ms A Fourie, Ms E Ratshikhopha and Ms Z Kirsten) hosted a hand wash awareness campaign in collaboration with the Charlotte Maxeke Academic Hospital, which took place on the same date as the hospital's infection control day, on 19 October 2017. Ms A Fourie conducted a presentation on the topic: "The importance of hand hygiene". The day was very successful with over 60 participants who took part in the quiz and hand wash competitions. Even though it covers basic fundamentals, this initiative contributes to the overall strengthening of infection control among health workers.

PROFESSIONAL DEVELOPMENT

Three postgraduates were enrolled for studies, one for a MSc at the UP and two for Masters of Public Health at Wits.

Image 5: Delegates who attended the biorisk management course.



EPIDEMIOLOGY & SURVEILLANCE SECTION

Epidemiology & Surveillance Section

Dr Nisha Naicker

The section studies and analyses the patterns, causes, and effects of health and disease conditions in occupational settings and communities at risk for environmental exposures due to industry.

SERVICES

The Epidemiology and Surveillance Section provides epidemiological and biostatistical support to sections within the NIOH, various government entities and parastatals.

Research Support

Technical research support is provided to all NIOH sections and external clients / stakeholders in the public sector (national, provincial departments, parastatal departments, science councils) and private sector. Assistance is provided for study design, sample size determination, project management, data collection, data entry, data analyses and scientific writing.

The section is currently assisting the GDoH in developing the Mental Health and Happiness Index project that will involve all employees in the department. 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. The OHS sub-directorate within the Employee Health and Wellness Programme (EHWP) directorate at the GDoH has a mandate to support efficient and compliant occupational health programmes in all GDoH facilities. The OHS directorate conducted its survey of OHS management in Gauteng facilities for the third time, with support from the NIOH Epidemiology Unit in 2017. The data was analysed by Dr Kerry Wilson. The questionnaire included aspects of management, training, risk assessment, medical surveillance and emergency preparedness.

A total of 50 institutions were interviewed, which included 31 hospitals, two district offices, ten forensic pathology services, one dental hospital, two laundries and four nursing colleges. The results indicated a substantial improvement in all OHS areas surveyed in Gauteng healthcare facilities. This is very likely because of increased awareness of requirements following surveys conducted by the OHS sub-directorate and support provided in the form of policies and regular workshops.

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

Surveillance Programme

South Africa does not have an optimally functioning national occupational health surveillance programme. As such, the section consulted with several stakeholders to incorporate occupational health histories in current longitudinal surveillance programmes or in new surveillance programmes that are being established. The South African Population Research Infrastructure Network (SAPRIN) is a population based longitudinal project that is rolled out in KwaZulu- Natal, Limpopo and Mpumalanga Provinces. Occupational health questions will be incorporated in their standardised questionnaires in the future, following approval by their steering committee.

The National Cancer Registry (NCR), will collaborate with the Epidemiology and Surveillance sections to investigate possible occupational risk factors in patients diagnosed with cancer. A pilot study is planned to assess a brief occupational history tool, in addition to the NCR notification form, to determine occupational exposures.

A similar tool will be used in a surveillance programme initiated by the Lung Institute at Helen Joseph Hospital to determine occupational and environmental risk factors for lung cancer and other chronic lung diseases. This project has ethics approval and will commence in the next financial year. The section studies and analyses the patterns, causes, and effects of health and disease conditions in occupational settings and communities at risk for environmental exposures due to industry.

A meeting was conducted with the Compensation Commissioner and several key stakeholders to develop a reporting format for compensation data. The Commissioner is in the process of collating the information and will provide the data sets for the section to analyse.

The Occupational Health Information Systems (OHASIS) is an online reporting tool for all NHLS injuries and diseases related to the work environment. As part of the surveillance programme, there will be ongoing analyses of this data set from 2012.

RESEARCH

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

Primary research

Health and health care access of landfill waste pickers in Johannesburg, South Africa study Collaborative

Study team: V Ntlebi [1], N Naicker[1,2,3], T Kootbodien[1], K Wilson[1,2], F Made[1], S Kgalamono[1,2], P Poongavanum[1], A Mathee[2,3,4], TG Barnard[3], D Rees[1,2].
NIOH [1], University of the Witwatersrand [2], University of Johannesburg [3], South African Medical Research Council Council [4].

Background: Workers in the informal economy have little control over their work environment and virtually no training in OHS, which results in a higher health risk profile. The working environment is usually unregulated and often not safe 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 focusing on the informal economy workers. The aim of this study is to generate knowledge on the working conditions (exposures) and health outcomes, as well as healthcare access associated with waste recycling at two landfill sites in Johannesburg.

Method: The fieldwork for the study commenced in March 2018. A total of 370 workers will be interviewed, biological samples (blood and urine) will be collected for metal concentration analyses and a basic health screening assessment (heights, weight, blood pressure, heart rate, temperature, cholesterol and glucose levels) will be conducted.

Progress: Fieldwork is in progress at site 1. The results will provide essential evidence based information to assist policy makers and organisations working to improve the quality of life for these workers.

Image 1: Waste pickers at landfill in Johannesburg, South Africa.

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

Study team: N Tlotleng[1], N Naicker[1,2,3], D Rees[1,2], S Kgalamono[1,2], T Voster[1], N Vorajee[1,2], J Phillips[1].
NIOH[1], Wits[2], UJ[3].

Background: This is a two-year national study involving tertiary and academic hospitals in South Africa. The study will describe occupational and non- occupational asbestos exposure in patients diagnosed with malignant mesothelioma.
Method: Sources of non-occupational exposure due to living in houses with asbestos cement roofs, exposure due to do-it-yourself (DIY) activities/hobbies that may have resulted in the handling of asbestos containing materials will be described. Cases of mesothelioma are obtained from the NHLS CDW. The attending physician will obtain consent from patients to participate in the study. The NIOH team will then contact the patients to obtain further information on their exposure to asbestos.

Progress: The study commenced in October 2017 and will continue until October 2019.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 asbestos containing materials. The study will also provide evidence that could inform policy decisions regarding the control of asbestos exposure in the country.

Tuberculosis prevalence and silica exposure in communities living near mine dumps.

Study team: T Kootbodien[1], S Iyaloo[1], N Naicker[1,2,3], A Mathee[2,3,4], S Kgalamono[1,2], D Rees[1,2]
NIOH[1], Wits[2], UJ[3], South African Medical Council[4].

Background: Little is known about environmental dust exposure and the risk of pulmonary tuberculosis (PTB) in communities living near gold mine dumps in South Africa. The aim of this study was to determine the effect of dust exposure (containing silica) on the prevalence of PTB in Riverlea, compared to Ennerdale, which is 60 km away (control).

Method: The study was part of the larger Health, Environmental and Development panel study, that is conducted annually by the South African Medical Research Council (MRC). Progress: The data is currently being analysed and will be presented at the Public Health Association Conference in September 2018.

Secondary data analyses of OHASIS

Ongoing analyses of the OHASIS data. Dr Kerry Wilson produced the four-year (2012-2015) report on the comparative analyses of incidents. The ethics application to use the OHASIS data to answer key questions in several publications was submitted. This will be addressed in 2018/2019.

Statistics South Africa (Stats SA) data set

Under the leadership of Mr Felix Made , staff in the section analysed mortality data from Stats SA and produced the following publication: Distribution of cancer mortality rates by province in South Africa which was published in the Cancer Epidemiology Journal in October 2017. The study showed that approximately 38 000 (8%) of the total deaths in South Africa in 2014 were attributed to cancer. Lung cancer was a major driver of cancer death in men and cervical cancer was the leading cause of cancer death in women. The second paper which is in the draft stage, will assess occupation in relation to mortality in South Africa.

Data from the South African phase of the musculoskeletal study

In collaboration with the Occupational Medicine Section, data from the musculoskeletal study by the Ergonomics Unit was analysed, to assess factors related to multi-site musculoskeletal pain in nurses and bank workers in South Africa. This type of pain potentially reduces productivity at work and may result in increased sick leave taken by affected employees.

Other projects and related work

A literature review was conducted on the health outcomes of informal workers in various sectors of the informal economy. This formed part of the WHO CC for Occupational Health Report on *Priority 7: Knowledge networks on occupational health and safety for vulnerable*

groups and high risk sectors. Dr Tahira Kootbodien is currently analysing data from fine needle aspiration biopsies (FNAB) of thyroid nodules that were diagnosed at Tygerberg Hospital NHLS from January 2006 to January 2016. Thyroid nodular disease is common, found in up to 60% of the general population. FNAB is the diagnostic tool of choice. It determines the likelihood of malignancy and thus the need for surgery. This study aimed to reclassify thyroid disease diagnoses (using the Bethesda for Reporting Thyroid Cytology) to reduce reporting borderline findings and ultimately decrease unnecessary thyroid surgery at Tygerberg Hospital.

Dr Nisha Naicker is working on the Lead exposure and cognitive impairment in older people living in communities located near mine tailing dumps in Johannesburg project. Collaborators on this project include MRC, Environmental and Health Research Unit and Mount Sinai University, New York, USA. Interviews will be conducted, and blood tests and bone X-rays will be performed on participants.

Ms Samantha Jack attended the 5th Global Mental Health Summit held in Johannesburg from 8 – 9 February 2018. The Movement for Global Mental Health (MGMH) is a network of individuals and organisations that aim to improve services for people living with mental health problems and psychosocial disabilities worldwide, especially in low- and middle income countries where effective services are often scarce. Presentations covered aspects of mental health in the workplace. The summary of the summit will be published in the May 2018 issue of the South African Psychiatry Journal.

Mr Vusi Ntlebi and Ms Kerry Wilson presented at the Waste Pickers Workshop hosted by the Department of Environmental Affairs (DEA), which took place in Pretoria, from 1 - 2 February 2018. The objective of the workshop was to present relevant research on waste pickers to assist in the development of the DEA's National Guidelines on Waste Picker Integration. We trust that this research will serve as a positive contribution towards developing these guidelines and that it will pave the way for us to continue collaborating with the DEA.

TEACHING AND TRAINING

The section continues its teaching and training on undergraduate and postgraduate academic programmes within the NIOH and at Wits and UJ. Dr Nisha Naicker and Dr Kerry Wilson assist the School of Public Health Medicine (Wits) in facilitating lectures in the Graduate Entry Medical Programme (GEMP), as well as participate in the post graduate assessor's committees. Our staff also support academic institutions as examiners for Masters and PhD theses.

Dr Kerry Wilson is currently supervising a PhD student from Wits and Dr Nisha Naicker supervises seven Masters students and four PhD students, from Wits, UJ and the Nelson Mandela Metropolitan University (NMMU). In addition, our staff support students from the NIOH with their project development and analyses of their data. The section is hosting a Masters student from the South African Field Epidemiologist Training Programme from March 2018 to December 2019. The student will be mentored by several staff members.

PERFORMANCE TARGETS

The section commenced with the development of an occupational surveillance programme that will expand in 2018/2019. We furthermore contributed to the publications output of the NIOH and increased the number of students who are supervised by our staff. Existing collaborations were maintained and new partnerships were established with academic institutions, research councils, government departments and non-governmental organisations (NGOs).

HONOURS

Ms Nonhlanhla Tlotleng received her PhD titled, *An in vitro study investigating the effects of functional groups on the toxicity of gold nanoparticles*, at Wits in December 2017. Her PhD was supervised by Prof Lisa du Toit in the School of Therapeutic Sciences, Department of Pharmacy and Pharmacology and Dr Robert Tshkikhudo from the CSIR. Her thesis provided a comprehensive investigation on the interaction and toxicity effects of newly synthesized gold nanoparticles in human embryonic kidney (HEK 293) and human hepatocellular carcinoma (HepG2) cell lines.

PROFESSIONAL DEVELOPMENT

Dr Tahira Kootbodien is continuing with the second year of her PhD on Genetic risk factors and epidemiology of suicidal behaviour in South Africa. The first paper of the PhD is being reviewed by co-authors and will be submitted for publication in the first quarter of the new financial year. The paper assessed household and garden pesticide use, and its possible role as a risk factor for suicide in South Africa.

During the period under review, Mr Felix Made commenced with his PhD titled: Preventing Coal Mine Dust Lung Disease by Use of Bayesian Hierarchical Framework for Occupational Exposure Assessment in the South African Coal Mining Industry. The protocol is completed and was presented to the Postgraduate Committee for approval. Following the recent increase in lung diseases among coal miners in the Mpumalanga Province, there is clear indication that exposure to dust is not adequately assessed which leads to obscured clinical decision making via the current method. The findings of this PhD could provide evidence for the use of advanced statistical approaches in the assessment of risk from dust exposure.

We have four postgraduates enrolled: two of whom are PhD students at the University of Cape Town (UCT) and Wits, and two are MSc students at Wits.

OCCUPATIONAL HYGIENE SECTION

Occupational Hygiene Section

Ms Jeanneth Manganyi

The Occupational Hygiene Section provides professional occupational hygiene services to help reduce and control workplace exposure risks and promote a safe and healthy working environment. The services include teaching and training, risk assessments, exposure monitoring, research and advice. The section made a considerable investment in the recruitment of experienced personnel, improved facilities, equipment and skills over the last year. As a result, we are now in a more advantageous position to provide valuable input in promoting the occupational hygiene profession and responding to urgent needs of South Africa and its neighbouring countries.

SPECIALISED SERVICES

The services offered by the Occupational Hygiene Section are cost-effective and are provided to both the private sector and national and provincial government departments, including the Departments of Health, Labour, Defence, Correctional Services and Environmental Affairs. We also offer support for OHS initiatives within the NIOH and the NHLS. The section maintained its accreditation with SANAS as an Inspection Body (full scope), as well as our registration with the DoL as an Approved Inspection Authority (AIA). We also provide analytical services for both internal and external clients. These services include:

- Asbestos fibre counting, using phase contrast microscopy (PCM);
- Respirable crystalline silica analysis, using Fourier Transmission Infrared Spectroscopy (FTIR);
- X-Ray diffraction (XRD); and
- Elemental analysis using X-Ray fluorescence (XRF) methods.

The XRD laboratory (headed by Ms Madzivhandila) and the asbestos laboratory (headed by Mr Mizan), function within the Occupational Hygiene Section and under direct supervision of the Head of Section. The section produced 13 technical reports on exposure assessments that were conducted at various workplaces during the period under review. The majority of the reports were produced for the Department of Correctional Services (DCS) and form part of the ongoing service level agreement. The assessment processes for the DCS aimed to identify and assess potential health hazards and to determine the risks to which officials and offenders are exposed to while performing work activities. The objective was to identify additional measures that could be implemented to control workplace health and safety risks. A wide variety of production processes were assessed at countrywide management areas, which included dairies, abattoirs, crop production, steel, carpentry and upholstery workshops; as well as garment and shoemaking factories. Routine functional and maintenance activities were evaluated, including food preparation, operation of boiler houses and office tasks at facilities such as clinics and hospitals, laundries and dog units.

In addition, the section continued to render support with health risk and exposure assessments, which contributed to the investigations of other NIOH sections, such as Epidemiology and Surveillance, Immunology and Microbiology, Occupational Medicine and Pathology and the HIV/ TB Unit.

Figure 1: Assessing heat stress exposure

Figure 2: Evaluation of personal noise exposure

ANALYSES SERVICES

The Asbestos Laboratory, through the leadership of Mr Gabriel Mizan, analysed 12 samples for asbestos fibres throughout the reporting period. The laboratory also counted 10 asbestos slides as part of the AFRICA international proficiency counting scheme of the Institute for Occupational Medicine (IOM), UK.

A total of 120 samples that were collected at abandoned mine dumps around Johannesburg and that originate from a collaborative research project with the MRC, were analysed at the XRD laboratory to determine particulate exposure. In addition, five samples were analysed as part of the proficiency scheme run by the Health and Safety Laboratory, UK.

RESEARCH

The section is involved in several research projects:

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

Principal Investigator: Jeanneth Manganyi

This is an ongoing PhD study which aims to improve the protection of workers who use disposable respirators against inhalation hazards. This is done through the identification of factors that affect proper face seal in South Africans and the evaluation of the suitability of international respirator fit test panels, for design of respirators for South Africans.

Exposure to asbestos containing materials in public schools within the Gauteng Province

Principal Investigator: Gabriel Mizan

The aim of this ongoing PhD research study is to assess the health risk from exposure to asbestos containing materials (ACMs) in selected schools in Gauteng and to evaluate cost-effective alternatives that could be implemented to mitigate the risk.

Respirable dust exposure and respiratory symptoms in waste reclaimers at a Gauteng landfill site, South Africa.

Principal Investigator: Tebogo Maeteletja

The study was completed, and a dissertation was submitted to UP towards the completion of the third-year MSc research project. The overall aim of the study was to determine whether there is any association between personal respirable dust exposure of waste reclaimers at the landfill site and the respiratory symptoms they may experience.

Effectiveness of respirator protective equipment for nanoparticles exposure control (2000 - 2017): a systematic review and meta-analysis.

Principal Investigator: Lebogang Ntlailane

This ongoing review aims to assess whether the commonly used respirators are effective against nanoparticles exposure by systematically assessing and then meta-analysing the penetration levels observed in the penetration assessment studies.

Noise levels forklift operators are exposed to at the fresh produce market.

Principal Investigator: David Rangongo

The study was conducted during 2016 - 2017 and was submitted towards the completion of the BSc Honours Degree. The study was successfully completed, and the degree was awarded in May 2018. The study aimed to determine whether the noise levels forklift operators are exposed to at the fresh produce market complies with the Noise Induced Hearing Loss Regulations in the Occupational Health and Safety Act 85 of 1993.

Characterisation of respirable crystalline silica dust in abandoned mines around Roodepoort.

Principal Investigator: Thingahangwi Madzivhandila

The study was successfully completed, and a degree was awarded in December 2017. The study aimed to identify the dust composition at the selected abandoned mines and to characterise the seasonal exposure risks to the communities in the surrounding areas of the mines.

Effectiveness of airborne infection controls in four-tiered public health facilities in reducing transmission of tuberculosis, Gauteng Province, 2018.

Principal Investigator: Tebogo Nthoke.

This is an ongoing study that aims to compare the average concentration of air quality parameters, air ventilation movement, and airborne TB with the American Society of Heating, Refrigerating and Air Conditioning Engineer (ASHRAE) standards, to determine the association between CO2 and airborne TB in the selected tiered public health care facilities.

Image 3: Occupational Hygienists talking to informal workers about respiratory symptoms they may be experiencing at a landfill site south of Johannesburg.

COLLABORATIVE RESEARCH

The section is involved in a number of research projects, in collaboration with other NIOH sections. Occupational Hygiene is collaborating with the Epidemiology and Surveillance Section on a study titled "Exposure to particulate matter and respirable crystalline silica in two communities located in close proximity to a mine dump in Johannesburg". The study aims to describe the exposure to dust, crystalline silica and other air contaminants in a community that is located close to a mine dump, compared to a community located away from mine dumps. The protocol is in the final stage.

Mr Gabriel Mizan, in collaboration with the Epidemiology and Surveillance Section, Occupational Medicine and Pathology, is conducting a study titled: "Sources of asbestos exposure in patients with malignant mesothelioma in South Africa." The study aims to describe the forms of asbestos exposure in patients diagnosed with malignant mesothelioma in South Africa, over a two-year period (2017-2018).

Ms Karen du Preez and Mr Moses Mokone are collaborating with the Epidemiology and Surveillance Section, and Occupational Medicine Section, on a study titled: "Health and health care access of waste pickers in Johannesburg, South Africa." This is an ongoing study, which aims to generate knowledge on the working conditions and health outcomes associated with waste recycling at landfill sites in Johannesburg. The Occupational Hygiene team completed the data collection which will inform the occupational health and safety risk assessment.

The section, together with the HIV/TB Unit, are conducting a study titled: "Provision of occupational health services to the informal economy in Ekurhuleni Metropolitan". The study aims to support the informal economy including small-, medium- and micro- enterprises (SMMEs) in Ekurhuleni, through collaboration with the Ekurhuleni Metropolitan Municipality to develop and provide reasonable occupational health services to their employees. The Occupational Hygiene Team completed their component that forms part of the occupational health and safety risk assessment.

TEACHING AND TRAINING

Undergraduate and postgraduate

The section provided a number of training courses in the form of academic and practical support for the Diploma and BTech in Environmental Health at UJ, TUT and the Durban University of Technology (DUT), as well as the Master of Public Health, the OHD and the Postgraduate Diploma in Occupational Health at Wits.

Image 4: Respirator fit testing demonstration to WITS MPH students

Image 5: Equipment demonstration to DUT students

Non academic

Two health risk assessment training courses were provided to the NHLS laboratory staff in Potchefstroom and the SANDF in Bloemfontein.

The section's staff members contributed to several training sessions organised by other NIOH sections, including the Workplace Biorisk Management Course (facilitated by Immunology and Microbiology) and OEHS training for Lesotho delegates organised by NIOH and NEPAD. In addition, a two-day training course on asbestos fibre counting was presented in collaboration with a private consultancy and the British Occupational Hygiene Society (BOHS), UK. This module was the first of a series of BOHS-endorsed asbestos training modules that will be offered by the section. These courses aim to raise awareness, promote safe practices, and improve the quality of asbestos analysis by occupational hygiene professionals in South Africa and neighbouring countries.

During the last quarter of the reporting period, Mr Gabriel Mizan conducted a presentation titled: "A historic overview of Asbestos use in South Africa" at the DoL Draft Asbestos Abatement Regulations 2018 Workshop.

QUERY SERVICE

The section responded to more than 80 queries throughout the year, which included both telephonic and walk-in consultations. Consultations ranged from information on various workplace exposures, expert/career advice to community members' who had concerns about safe asbestos handling and disposal.

QUALITY

The Occupational Hygiene Section maintained its registration with the DoL, as well as its ISO 17020 accreditation with SANAS. The Asbestos Laboratory continued its participation in the Asbestos Fibre Regular Informal Counting Arrangement (AFRICA) asbestos proficiency testing scheme with the Institute for Occupational Medicine (IOM) in Edinburgh, UK. The laboratory also maintained a "1" grading.

The XRD/FTIR laboratory continued participation in the respirable crystalline silica Air & Stack Emissions Proficiency Testing Scheme, UK, and satisfactory results were achieved.

PROFESSIONAL DEVELOPMENT

Two postgraduates are enrolled for a PhD in Public Health at Wits, two for a Master of Science Degree in Community Health at UP; two for a Master of Public Health Degree in Occupational Hygiene at Wits, and two for a Master of Public Health Degree in Occupational Hygiene at UP. One postgraduate graduated with a BSc Honours in Occupational Hygiene and one completed an MSC Degree in Physics at Wits.

QUALITY ASSURANCE

Quality Assurance

Mr Bonginkosi Duma

The field of quality assurance (QA) involves ensuring that tasks, procedures and processes are executed accurately and achieve the intended outcomes. NIOH QA managed to maintain its accreditation in all three standards of accreditation. The section also conducts internal audits on an ongoing basis, to ensure that the quality management systems remain intact. To this end, we hold monthly accreditation meetings with each NIOH department.

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.

SERVICES

The NIOH received accreditation for three different standards namely: ISO 15189, ISO 17025 and ISO 17020. As a result, the NIOH is currently the only institute within the NHLS that is accredited for more than two standards.

Accreditation	Region	Lab No	Lab Name	Discipline
ISO 15189	NIOH	M0276	Analytical Services	Organic Chemistry
		M0276	Analytical Services	Inorganic Chemistry
		M0276	Immunology/Microbiology	Immunology
		M0276	Pathology	Histology
		M0276	Pathology	Cytology
ISO 17025	NIOH	T0660	Analytical Services	Water Testing Mercury
		T0660	Analytical Services	Water Testing Aluminium
ISO 17020	NIOH	OH0079	Occupational Hygiene	Noise
			Occupational Hygiene	Illumination
			Occupational Hygiene	Environmental testing
			Occupational Hygiene	Surveillance

IMPLEMENTATION OF ISO 9001:2015

A decision was made to implement the internationally recognised ISO 9001: 2015 standard in non-technical departments. Implementation will yield the following benefits for the organisation:

- Demonstrate our commitment to quality;
- Showcase our willingness to work towards improving service efficiency in both our core and non-laboratory processes;
- Afford the NIOH the opportunity to streamline and improve existing operations;
- Effectively improve the credibility of the organisation; and
- Achieve recognised certification that will enhance PR and improve the image of the NIOH among customers, shareholders and employees.

Departments that already committed to implementing ISO 9001: 2015, include:

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

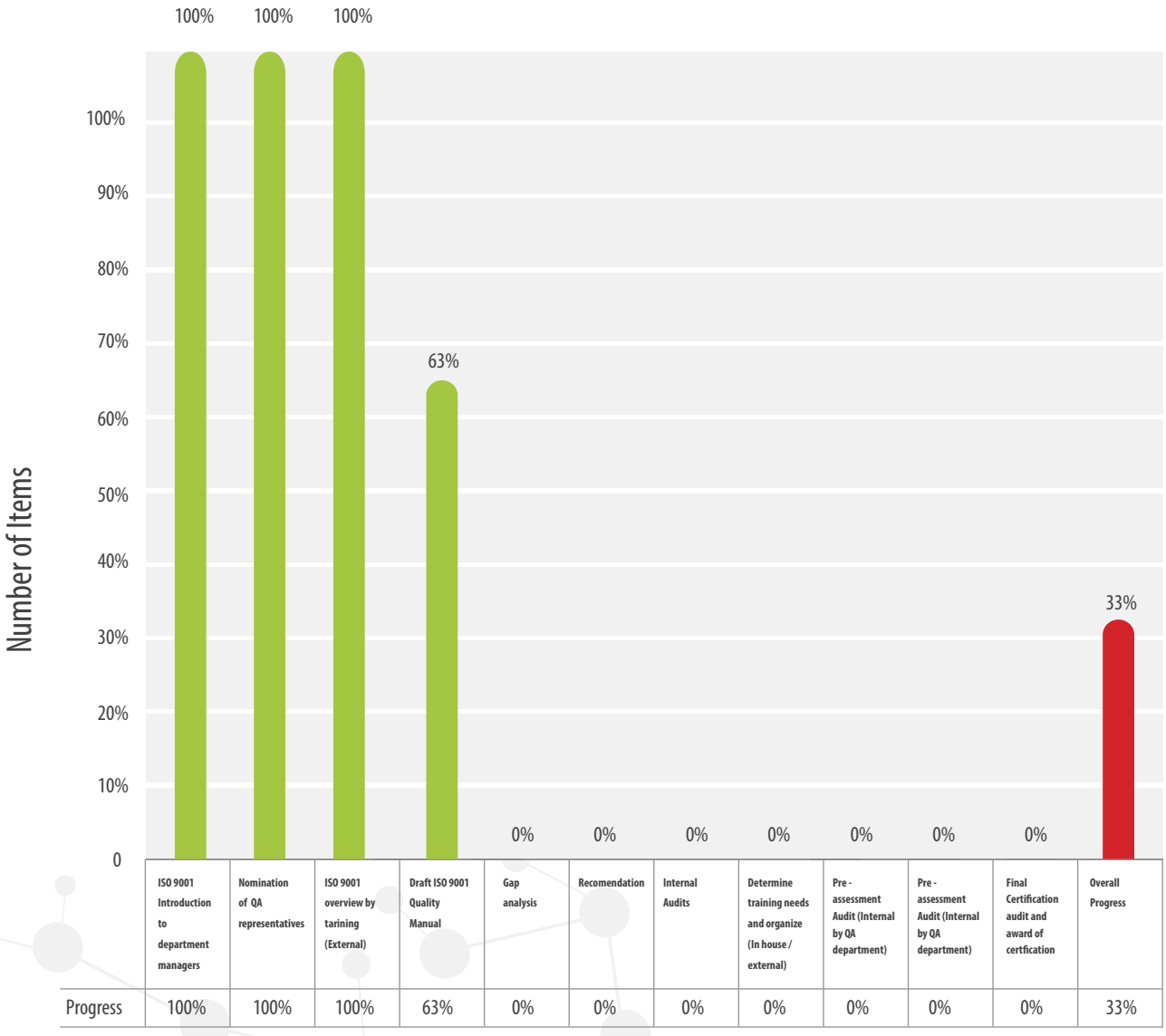


Figure 1: Implementation progress of ISO 9001:2015

TEACHING AND TRAINING

The section conducts internal training to strengthen its quality management systems. During the year under review, training was conducted on the following topics:

- How to log client complaints?
- Non-conforming events
- Non-conforming events
- Root cause analysis
- How to handle and use a spill kit
- Use of PPE
- Risk assessment:
- Monitoring quality indicators

PROFESSIONAL DEVELOPMENT

The KwaZulu-Natal area manager requested assistance and support from NIOH QA to prepare the food laboratory for Public Health Laboratory ISO 17025 accreditation. The process officially commenced in October 2016, and is still underway. QA staff members also presented a paper on the implementation of ISO9001 at the NIOH, at the 2017 Laboratory Medicine Congress that took place in Durban, in May.

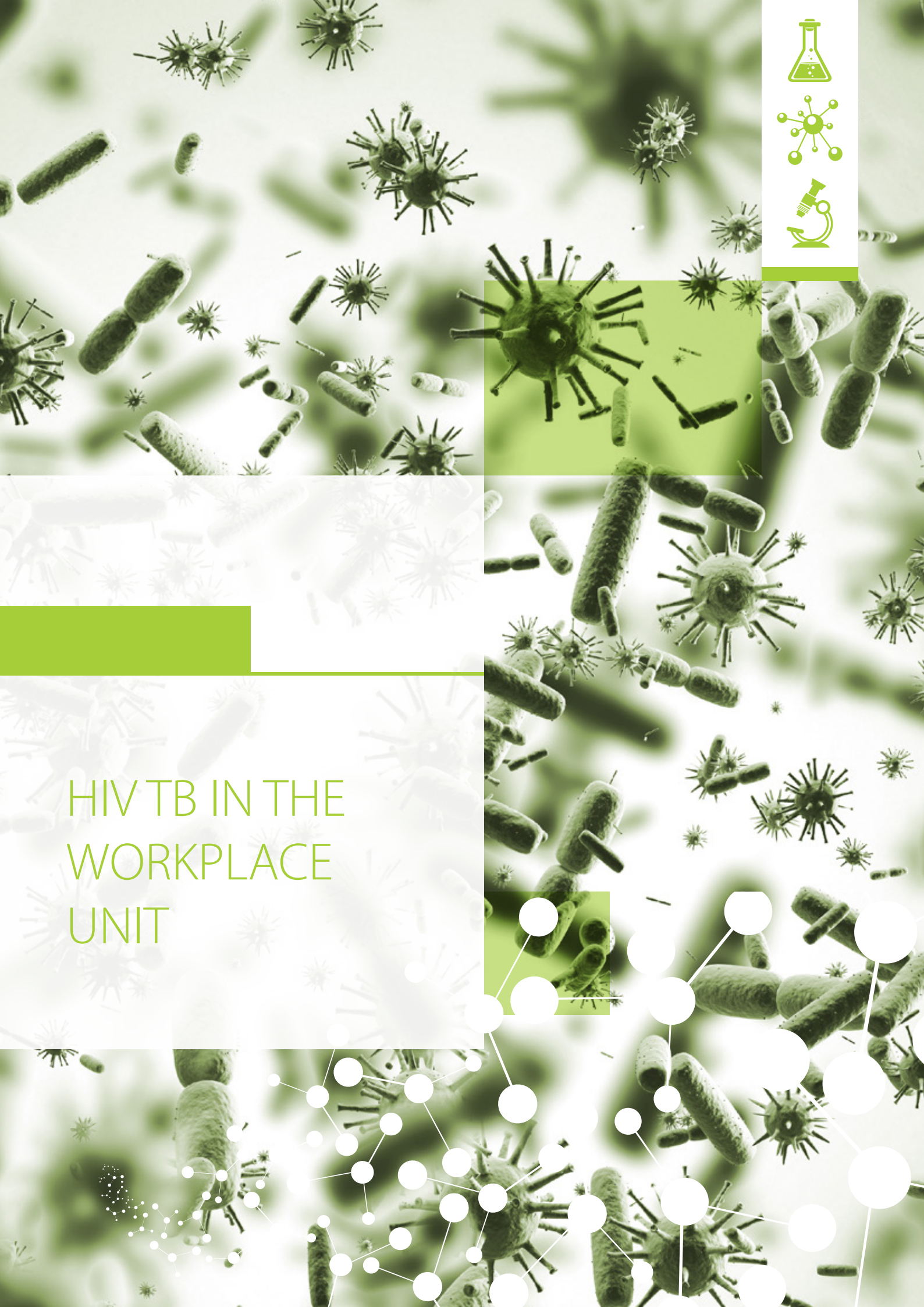
The QA staff attended the following courses, seminars, conferences and workshops as part of their professional development:

- Office Administration Certificate;
- ISO9001 QMS Auditing;
- Q- Pulse Orientation;
- B3 Africa Training Workshop;
- Emotional Intelligence;
- BCNET Symposium
- Programme in Total Quality Management;
- Conflict Management & Negotiation Skills At Work;
- Data Analysis Course Using Stata;
- Laboratory Medicine Conference (LMC);
- Scientific Writing Course; and

ACHIEVEMENTS

During the first quarter of the period under review, the QA department presented on: *NIOH Quality Management Systems* at the 2017 Laboratory Medicine Congress, where they won the award for quality implementation within the organisation.

Picture1: Award received by NIOH QA for quality implementation within the NHLS



HIV TB IN THE WORKPLACE UNIT

HIV TB in the Workplace Unit

Dr Muzimkhulu Zungu

Since the UN General Assembly adopted the "Resolution 70/1 Transforming our world: the 2030 Agenda for Sustainable Development" and the subsequent adoption of the SDGs in 2015, it has strengthened the goals of the National Development Plan (NDP) for South Africa and highlighted the role of OEHS in the creation of an equitable, prosperous, sustainable and just society for all. These global and local instruments are all concerned with the elimination of poverty and hunger, improving health, providing quality education and entrenching gender equity and equality, while providing decent jobs and economic growth.

OEHS, which includes the provision of HIV and TB services in workplaces, is a critical workplace intervention to help accomplish the objectives of the SDGs and the NDP. The NIOH established a dedicated HIV TB Unit to realise this intervention in workplaces. This unit provides services to all sectors of the economy, with specific priority to informal economy workers such as agricultural workers, as well as the health, mining and construction sectors that form part of the formal economy. The unit is also tasked with strengthening OEHS systems for the health sector. The unit therefore plays a pivotal role, not only by contributing to the wellbeing of workers through HIV and TB workplace interventions, but also by improving occupational health systems in South Africa, the African region and the world over.

SERVICES

Health Sector Occupational health and safety assessments

In partnership with the NIOH's Occupational Hygiene Unit, the HIV TB Unit conducted workplace assessments for TB infection prevention and control measures at various facilities in the Mpumalanga and Northern Cape Provinces. This includes the Piet Retief Hospital, Kimberly Hospital and West End TB Specialised Hospital. The assessments were concluded with technical reports and recommendations for managing TB infection and prevention control in healthcare environments.

Occupational health strengthening

In collaboration with the University of British Columbia (UBC) and the ILO, the unit is implementing the ILO and WHO HealthWISE tool at various institutions in several countries.

This includes:

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

The tool is also being implemented in five health districts in Lesotho, in partnership with ILO, NEPAD and the Ministry of Health. HealthWISE is a quality improvement tool to help guide the improvement of OHS in healthcare facilities/workplaces.

Occupational medicine clinic

The unit, in collaboration with the GDoH, provides OEHS services for health workers at Kalafong Provincial Tertiary Hospital. These services include occupational health risk assessments, risk based medical surveillance, OEHS teaching and training and waste management. The services have since been extended to provided support to Dr George Mukhari Academic Hospital as well.

Awareness of HIV and TB

The unit coordinated initiatives for commemoration of both the World HIV Day and the World TB Day on behalf of the NIOH. TB health messages were linked with the NHLS HIV TB workplace policy, to increase awareness about the policy and the HIV TB services that are available for our health workers. To celebrate World AIDS Day, the unit collaborated with the Muslim AIDS Programme, which is an NGO.

The joint initiative took on the form of HIV Counselling and Testing (HCT), screening for TB and sexual transmitted infections (STIs) and referral services for the NIOH, as well as the NHLS unit that is based in Braamfontein.

Advisory

The unit provides ongoing and ad hoc advisory support to health workers on OEHS issues, with special emphasis on HIV and TB for the national DoH, the DoL, the provincial DoH's and the trade unions in the health sector.

Mining Sector

Masoyise iTB – Surveillance programme for TB in the South African mines.

In collaboration with the University of Limpopo (UL), UP and Walter Sisulu University, the HIV TB Unit and the Epidemiology and Surveillance Section provide expert professional services, that includes occupational medicine and health systems, and epidemiology and biostatistics. The Masoyise iTB project is in line with the Stop TB-Partnerships: The Global Plan to End TB 2016 - 2020, among other global and national strategies.

This is achieved through:

1) Reaching at least 90% of all people with TB;
2) Reaching at least 90% of the key populations (most vulnerable, under-served, and at risk populations, such as miners); and
3) Achieving at least 90% treatment success.

Mine Health and Safety Council

The unit was served on a technical committee of the Mine Health and Safety Council (MHSC) for the revision of the Department of Mineral Resources' (DMR) 164 tool for TB and HIV in the mining industry. The technical committee was tasked with the review of the necessary TB and HIV data and advising the MHSC on which data elements should be included in the DMR 164, for reporting to the regulator.

HIV TB and silicosis training manual

The unit is developing a training manual on TB HIV and silicosis for mining and construction workers, in partnership with the National Union of Mineworkers (NUM). The unit also reached agreements with the Master Builders Association: North (MBA North) and the South African Forum of Civil Engineering Contractors (SAFCEC), to work together on occupational health issues that affect the construction industry. To this end, the NIOH, MBA and SAFCEC attend each other's OHS meetings as a standing arrangement.

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 UP. The unit also provides occupational health teaching and training to MPH students at the Walter Sisulu University in Umthatha. In addition, the unit was a rotation site for practical training of one public health medicine registrar from UP, during the reporting period.

Public health postgraduate research supervision

The unit is currently supervising the post graduate research projects of three MPH students, two MMed students and one MSc student. We are also supervising health research projects for about four students who are studying towards their Diploma in Occupational Medicine.

Training of workers and management in OHS short courses

The Unit conducted two training workshops on HIV and TB; one for 25 occupational health nurses from the Limpopo DoH and the other for 28 occupational health nurses from the Mpumalanga DoH. The training covered the following:

available for our health workers. To celebrate World AIDS Day, the unit collaborated with the Muslim AIDS Programme, which is an NGO. The joint initiative took on the form of HIV Counselling and Testing (HCT), screening for TB and sexual transmitted infections (STIs) and

referral services for the NIOH, as well as the NHLS unit that is based in Braamfontein.

- A basic introduction on the importance of workplace HIV TB programmes for health workers,
- What the HIV TB workplace programme constitutes of;
- Stigma and discrimination; and
- Monitoring and evaluation of the programme.

The unit also provided training on HIV, TB, Silicosis and Asbestosis in the workplace to 17 employees from two SMMEs in the construction arena. The unit furthermore participated in several other training initiatives organised by NIOH or other stakeholders such as:

- A workshop on: "The state of health and threats facing the health of South Africans" at the SANDF College;
- Health worker training at Hillbrow Hospital; and
- The NIOH workshop on "Basic health and safety" for waste pickers in the greater Johannesburg area.

The unit attended the ITC-ILO Gender Academy, a global event on gender, work and employment that took place in Turin, Italy from 13 – 24 November 2017, during the fourth quarter of the reporting period. The keynote speeches and workshops at the event focused on cutting edge topics, current ILO challenges and issues and policies on gender equality, decent work and sustainable development, from an international perspective. Subsequently, the unit has contributed to two training sessions on the topic of gender and the workplace, for the NIOH.

Figure1: ITC-ILO Gender Academy global event, Turin, Italy, 2017

RESEARCH

The unit is involved in a number of ongoing research projects in both the formal and informal economy within the health, mining, construction and other sectors.

ANALYTICAL SERVICES SECTION

Analytical Services Section

Dr Boitumelo Kgarebe

The Analytical Services Section continued 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 exposures 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.

SPECIALISED DIAGNOSTIC SERVICES

2153 tests (for diagnostic and research purposes) were completed during the reporting period. The tests included assays on toxic metals, mainly for aluminium, arsenic, beryllium, cadmium, chromium, cobalt, copper, iron, lead, manganese, mercury, nickel, selenium, uranium, vanadium, and zinc in blood, serum, urine, tissue, water and environmental samples. Organic assays requested on biological samples were mainly for toluene, dichloromethane, hexane, hydroxypyrene, mandelic acid, methanol, methylene diphenyl diisocyanate, methylhippuric acid, methyl ethyl ketone, phenol, toluene diamine isocynates, organophosphate metabolites, toluene, benzene, trichloroacetic acid, and t,t-muconic acid. The section also responded to external requests from Groote Schuur Hospital in Cape Town, for testing of post mortem samples of methanol ingestion as well as aluminium testing for renal patients. The Metals Section is engaged in contract research on multi-elements in blood, for Sefako Makgatho University.

SPECIALISED LABORATORY TESTING

To maintain its niche in the provision of laboratory testing services and in line with the strategic objectives of the NIOH, "to conduct 90% of all occupational and environmental health laboratory tests within specified turn-around times (TATs) by 2020," the Analytical Services Section achieved an overall average of 93% of tests conducted in specified TATs in the year under review.

This is a notable achievement when compared to the institutional target of 85% which was set for the 2017/2018 financial year. This was achieved through the improvement of efficiency in the conducting of laboratory tests. New kit-based methods were for example introduced for some of the tests in the Organics Section; which reduced the pre-analytical sample preparation, and halved the TAT from the former 20, to 10 days.

ADVISORY SERVICES

In line with the agreed upon annual performance indicators set, the section continued to render advice to both the private and public sectors. Some of the advisory services were provided in collaboration with the Occupational Medicine Section; such as the water testing services that were rendered to the mining communities at Shiva Coal and in the Buffelspoort (North West Province) area.

TEACHING AND TRAINING

The section increased its teaching and training profile in the year under review. The training of postgraduate students on good laboratory practice (GLP) and analytical techniques applied in chemical contaminants detection in the workplace and for biological monitoring continued as in previous years.

The section furthermore continues to assist national institutions to prepare students for laboratory–focused careers. We admitted two new postgraduate students for an MSc and Honours Degree and we continuously host students to provide them with exposure to various practical aspects of an accredited laboratory.

NEW DEVELOPMENTS

During the year under review, the section was tasked with compilation of a syllabus for a second-year undergraduate course in Applied Chemistry for Wits. The first edition of the course named "Introduction to Applied Chemistry in Occupational & Environmental Health" was taught in November 2017. In December 2017, the section formed part of a multidisciplinary NIOH team that provided OHS training for nationals of the Kingdom of Lesotho under the auspices of a Memorandum of Understanding (MoU) between the NIOH and the NEPAD Planning and Coordinating Agency (NPCA).

ACCREDITATION

The Metals and Organic Units maintained their annual ISO Code 15189 accreditation status. The section was also audited by SANAS and maintained its ISO/IEC 17025:2005 accreditation status for testing aluminium and mercury in water. SANAS commended the laboratory for the improvement in its quality management system. The Analytical Services Section remains the only laboratory within the NHLS with ISO/IEC 17025 accreditation. Regular internal audits were conducted throughout the year, to maintain safety, quality and competence in the laboratory.

In terms of benchmarking both quality and competence of the results and personnel, the section continued to participate in the following EQA programmes:

i. The NY State Department of Health for arsenic, cadmium, chromium, lead, manganese and mercury in blood and urine and aluminium in serum;
ii. The German EQA programme for mandelic acid, nickel, phenol, o- cresol, hexanedione, 1-hydroxypyrene and methyl hippuric acid in urine and aluminium in serum;
iii. The Thistle EQA programme for creatinine in urine;
iv. The LAMP Program CDC-USA for cadmium, lead and mercury in blood, and
v. The SABS-Water Check Scheme.

HONOURS

The Analytical Services Section continues to serve as a reference laboratory for the German External Quality Assessment Scheme (G-EQUAS), due to continued good performance in the determination of 2,5-hexandione in urine, which is a biomarker for exposure to hexane.

PROFESSIONAL DEVELOPMENT

Ms Bianca Southon and Ms Lerato Mochaki obtained full registration as medical scientists with the HPCSA. Ms Southon furthermore completed her MSc in Medicine at Wits in March 2018.

TOXICOLOGY & BIOCHEMISTRY SECTION

Toxicology & Biochemistry Section

Prof. Mary Gulumian

The activities of the Toxicology & Biochemistry Section during the period under review, include undertakings in research, teaching and training, as well as consultation with or service delivery to industry. We continued to collaborate with local and international institutions for the sake of training staff members, and postgraduate students in general occupational toxicology and, more specifically, in nanotoxicology. The section also continued to provide consultation to a number of governmental departments, as well as industry, on elements such as:

- Risk assessment of engineered nanomaterials;
- WHO guidelines to protect workers,
- Nanotechnology; and
- The health, safety and environment (HSE).

The section delivered these services through four specialised units, namely:

1. The Genotoxicity Unit,
2. The Health Risk Assessment (HRA) Unit;
3. The Nano- and Microparticle Toxicity Unit; and
4. The Toxicogenomics Unit.

In the last year, Prof Gulumian made a strategic move and transitioned to the Head of Research. In addition, Dr Natasha Sanabria was appointed in March as the HOD for the Toxicology and Biochemistry Section.

RESEARCH

International Collaborations

EU projects

Research conducted in the section in collaboration with a number of international colleagues, involved a study on toxicity and a risk assessment of engineered nanoparticles. Funding was obtained through the European Commission's Framework Programme 7 (EU FP7) and (EUH2020) by participating in the following projects:

i. "Nanosolutions": A completed project where contributions from the section resulted in publications and conference presentations on the hazard identification of different nanomaterials with different sizes and surface coatings and functional groups; and
ii. "caLIBRAte": A current project on the risk assessment and suitability of the existing models in the exposure assessment of nanomaterials in the work environment.

World Health Organization (WHO)

The section made a substantial contribution to the development and publishing of a guideline titled: "WHO Guidelines on protecting workers from potential risks of manufactured nanomaterials". Department of Public Health, Environmental and Social Determinants of Health ISBN 978 92 4 155004 8, Cluster of Climate and Other Determinants of Health, World Health Organization, Geneva, Switzerland. The guideline is available at: http://apps.who.int/iris/bitstream/10665/259671/1/9789241550048-eng.pdf

Organization for Economic Co-operation and Development (OECD)

The Toxicology Section participated in the activities of the OECD Working Party on Manufactured Nanomaterials (WPMN), which resulted in the publication of the following documents:

i. "Assessment of biodurability of nanomaterials and their surface ligands;" and
ii. "Gold Nanoparticles Occupational Exposure Assessment in a pilot scale facility."

International Organization for Standardization (ISO)

Through representation of the South African Bureau of Standards (SABS), the section participated in the ISO/TC 229 Working Group (WG3) activities that resulted in the publication of the following document:

i. "Nanotechnologies — Use and application of cellular *in vitro* tests and methodologies to assess nanomaterial biodurability."
The section also proposed the following new current project:
ii. "Label-free impedance technology to assess the toxicity of nanomaterials *in vitro*."

National collaborations

Department of Science and Technology (DST)

In collaboration with Mintek, North West University, CSIR and UP, the section continued to conduct research on two DST-funded projects namely:

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

South African Bureau of Standards (SABS)

The section continued to serve as head of the delegation of the TC229-Nanotechnologies on the ISO/TC 229 WG 3, Health, safety and environment as mandated by the SABS.

Green House Consultancy

Professor Gulumian was interviewed in September 2017 by the Green House Consultancy who, on behalf of the DST, is conducting a detailed review of the nanoscience and nanotechnology landscape in the country. The aim of the review is to identify challenges and provide insights into how existing support programmes can be improved and nanotechnology research and development can be advanced in South Africa.

SERVICE DELIVERY

With the development of the genotoxicity tests in the section, it was possible to perform specialised tests on urine and blood samples collected from populations residing near and around mine dump tailings in Johannesburg.

TEACHING AND TRAINING

Post graduate students

The section continued to provide postgraduate training to a number of students, as well as our own staff members. Of particular importance to the section, was the organisation of a one-day workshop on "Risk assessment of gold nanomaterials: An OECD sponsorship programme," which was conducted on the 2nd of February 2018 at Heia Safari Ranch, in Muldersdrift, South Africa. The following deliverables were discussed at the workshop:

- Intracellular uptake, localisation and new methodologies;
- Additional toxicity tests on newly acquired cell lines;
- Intracellular targets;
- Simulated inhalation and other toxicity tests;
- Ecotoxicology and assessment of delivered dose using the ISDD modelling; and
- Synthesis and physicochemical properties of the tested gold nanoparticles.

CAPITAL INVESTMENT

The section upgraded its existing Cytoviva HSI instrument to a 3-D system. This will enable us to locate particles in a three dimensional space relative to its surroundings, thereby greatly advancing studies of the uptake and mechanisms of toxicity of these particles. The upgrade was funded through a grant received from the MHSC. An xCELLigence RTCA DP instrument was procured from the section's budget.

PROFESSIONAL DEVELOPMENT

Six postgraduates are enrolled for studies; four for PhDs at Wits, one for an MSc at UJ and one for an MTech at TUT.

Professor Mary Gulumian, in association with the DST, organised the EU-SA Workshop of NanoSafety which was conducted on 4 December 2017 at the CSIR in Pretoria, South Africa. The EU delegation in attendance included the Director of the Horizon 2020 funding programme for nanotechnology, as well as representatives from all the following:

- The EU;
- The National Institute for Public Health and the Environment-RIVM (The Netherlands);
- Bundesinstitut für Risikobewertung- BfR (Germany);
- The Centre for Ecology and Hydrology (UK), and
- The National Research Centre for the Working Environment (Denmark).

Image: Participants at the EU-SA Workshop of NanoSafety, 4 December 2017, held at CSIR, Pretoria.

OCCUPATIONAL HEALTH, SAFETY & ENVIRONMENT (SHE) SERVICES

Occupational Health, Safety & Environment (SHE) Services

Mr David Jones

The year under review saw the filling of one vacant post, namely Occupational Medicine Practitioner (OMP) by Dr Graham Chin and one newly created post namely Waste Assurance Officer, by Ms Miekie Beetha. The section wishes to extend its deep appreciation to the NIOH Occupational Medicine Department who acted as the OMP for the NHLS, and in particular to Dr Odette Volmink, for invaluable guidance throughout the reporting period.

The section sadly also received the resignation of Sister Cynthia Mafolo, the OH Nursing Manager for Limpopo/ Mpumalanga. The vacant post was advertised and will be filled in the new financial year. A temporary nurse was appointed to assist in KwaZulu-Natal during Sister Marlinee Naidoo's maternity leave. We would like to express our gratitude towards to Sister Thobekile Sibisi for her accomplishments during this period and for "holding the fort".

CLINICAL SERVICES

The occupational medicine team of the SHE Unit continued to provide guidance and expert medical support on specific cases and incidents. The following were particularly noteworthy:

i. Possible exposure to Brucella;
ii. Possible exposure to Congo Fever;
iii. Employees diagnosed with TB;
iv. Employees with Hepatitis B; and
v. Exposure or possible exposure to chemicals, noise and other biological agents.

The occupational health nurses are continuing with the project, under the guidance of Dr Chin, to check the levels of compliance with regard to Hepatitis B immunisation and surveillance for TB within the NHLS. The information collected is captured into the OHASIS Workforce Health Module. The level of compliance for Hepatitis B immunisation, including those who are currently receiving vaccinations and are amongst employees who are potentially at risk, has now reached 94.8%.

Significant progress was made in ensuring that all employees are subjected to baseline chest x-rays. To date, 94.6% of employees have undergone their baseline chest x-rays. We would like to issue a sincere "thank you" to the relevant area executives for their kind assistance in making sure that the necessary processes are in place.

SPECIAL INVESTIGATIONS AND NIOH SUPPORT

There was continued expert support and guidance from the various departments in the NIOH including Occupational Hygiene, Occupational Medicine, Immunology, IT and Finance on matters such as:

- The fit testing of N95 respirators for staff;
- Compliance with legal requirements for 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
- The ongoing development of OHASIS.

OHASIS

The unit continues to train identified personnel at our facilities, through an online training platform that can be accessed via the intranet. To date, 880 employees have been trained and loaded as live users of OHASIS, which is an increase from 711 that were trained last year. In practise, this means that they are able to input data into the Incident Reporting and Investigations and/or Waste Tracking Modules and that they are able to access reports.

Last year, the functionality to self-report an incident was created in OHASIS. This has the advantage that any employee is now able to report an incident without having to wait for, or rely on another user. This in turn provides added convenience and allows for greater confidentiality. In the event of a disease, a self-report is perused by an occupational health nurse, and all other events are examined by a SHE officer. As can be seen from the below graph; this functionality is well used.

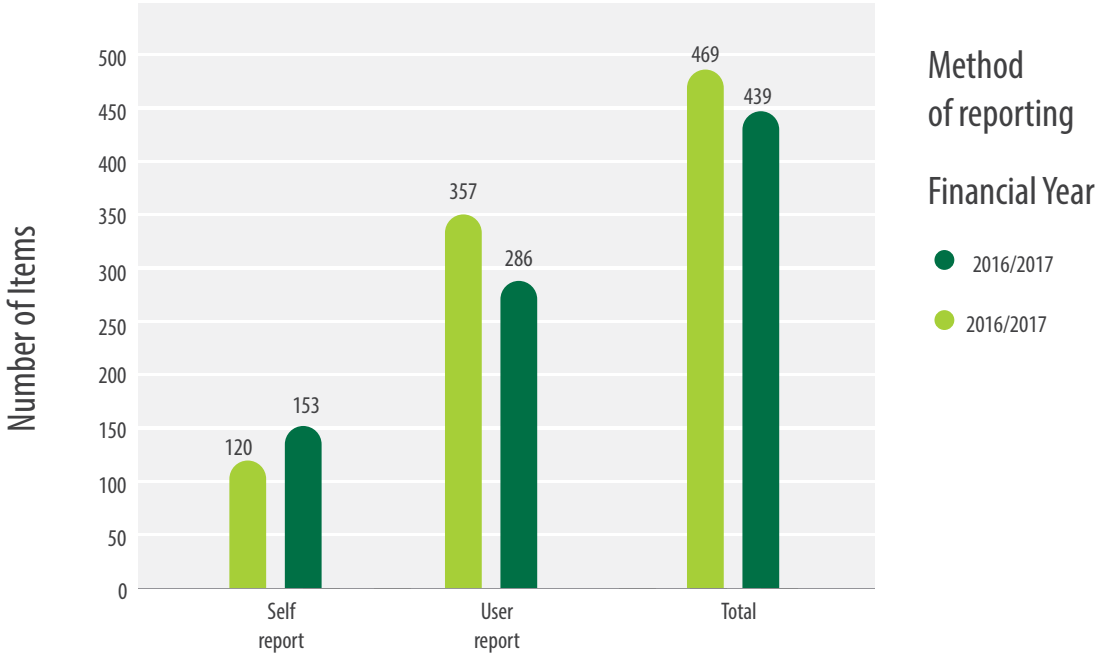


Figure 1: Number of incident self-reports and reports through users.

The value of the OHASIS system is increasingly being recognised beyond the NHLS and the system was also rolled out in the GDoH and the Namibian Institute for Pathology, during the period under review. Other entities that expressed an interest, include the national DoH, Western Cape DoH, Mpumalanga DoH, City of Cape Town and the CoJ. Formal quotes for rollout were issued to the Western Cape and Mpumalanga Departments of Health and the section is awaiting their response.

As per the figure below, there was a slight decline in the number of incidents reported on OHASIS, during the year under review.

Figure 2: Year-on-year reporting of incidents on OHASIS from 2011/2012, to the 2017/2018 financial year.

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 promote a culture of timely reporting, which will result in timely correction. Below is a breakdown of the types and number of preventative measures that were identified over the indicated period.

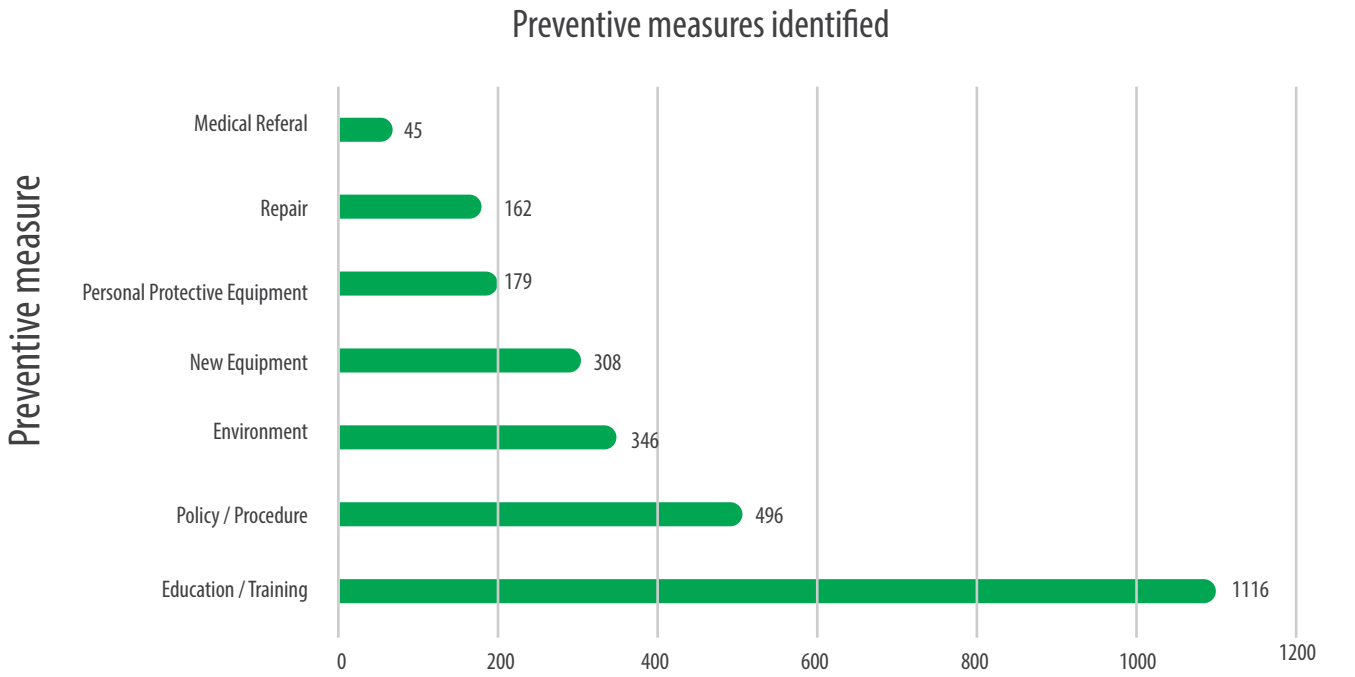


Figure 3: Preventive measures identified up to 31 March 2018

The NHLS continues to use OHASIS as an online health information system. Negotiations with the UBC are underway, for the NIOH to extend rollout of the system beyond Africa, and to other government institutions.

AUDITS AND RISK ASSESSMENTS

During the period under review, and under the guidance of Ms Michelle Morgan, the SHE officers audited all the facilities that scored less than 95% in the safety audit in the previous financial year. The audits were based on the type of information that will be scrutinised by the DoL, as well as the requirements of the OHS Act. One hundred and forty-three Safety audits were conducted, compared to 358 in the previous financial year. Such an audit comprises a total of 275 questions, and where relevant, areas of non-conformance are noted. All reports are generated through OHASIS, and are forwarded to both the facility manager and the business manager.

In an ongoing effort to comply with legislation and to assess the level of risk that employees are exposed to, the SHE Unit evaluated several risk assessments that were completed by the various facilities. The unit rendered support to the facilities who did not complete the risk assessments sufficiently, and facilitated improvements to those who were not yet compliant.

HAZARDOUS WASTE

The government is continuously introducing new legislation on the management of waste. As a generator of different categories of waste, the NHLS has to ensure that its policy and standards of waste management comply with the latest legislation. To continuously improve waste management standards in the NHLS and ensure that its documents and policies are in line with the relevant legal provisions, the Waste Assurance Section reviewed the NHLS waste policy and completed an audit checklist, as well as an online training course on waste management.

Specifications were drafted to issue requests for tenders for chemical and healthcare risk waste management, with the aim to appoint suitable service providers to remove, treat and dispose of the waste. The SHE Department, through the Waste Assurance Section, is assisting with compulsory briefing of potential service providers and will assist with the evaluation of the tenders that are submitted.

The Gauteng and the Western Cape Provincial Departments of Environmental Affairs require major generators of hazardous waste to develop and document waste management plans. These plans are aimed at reducing the amount of waste generated and where possible, recycling it.

The Waste Assurance Section, under the leadership of Ms Mashela Kgole, has been facilitating and assisting laboratories to ensure compliance with the relevant waste management regulations. There was an improvement in the reporting of waste quantities by facilities on OHASIS. This in turn enables the NHLS to:

- Gain an overview of the amount and categories of health care 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.

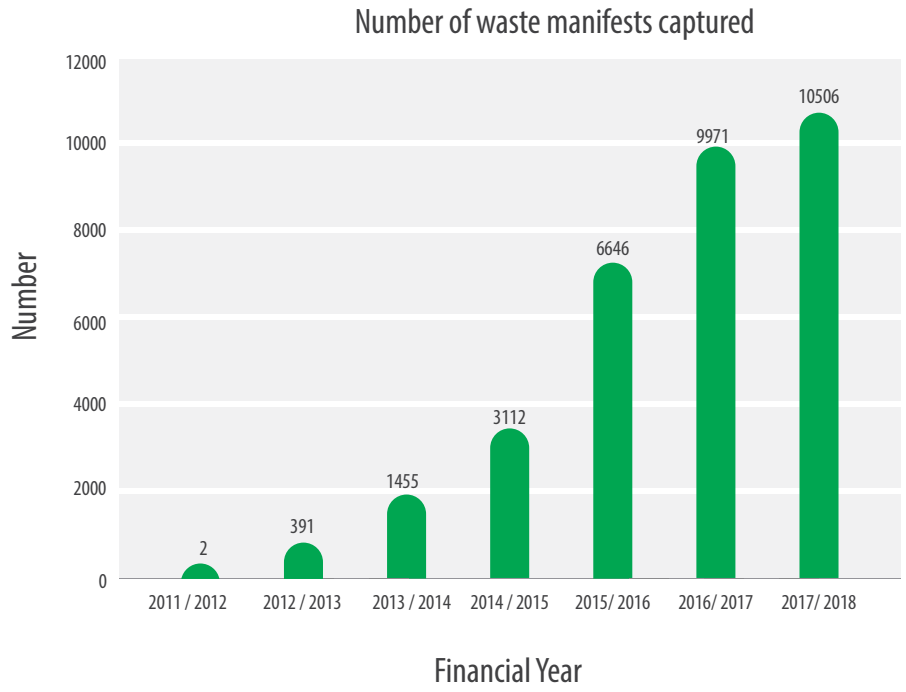


Figure 4: Number of waste manifest documents captured on OHASIS

The Waste Assurance Section continuously engages with the relevant authorities and service providers to ensure that the facilities comply with the provisions of the relevant legislation and to remain abreast of the latest developments in the waste management sector.

CONFERENCES AND TRAINING

Health and safety representative training

The SHE Department continued to coordinate the online training of health and safety representatives and managers, during the year under review. An ongoing effort was made to ensure that all new health and safety representatives complete the course, which is available via the intranet. There is

Other training and presentations

Two staff members, Sister Paulinah Letsoalo and Ms Ncebakazi Mvakade, were funded to attend the 2017 Annual American Biological Safety Association (ABSA) Conference in the US, as well as the three days of preconference training. The funding was provided by the Defense Threat Reduction Agency (DTRA).


NHLS
BIOBANK

NHLS BIOBANK

Mr Bonginkosi Duma

The Biobank has expanded significantly during the financial year, with the development of an extended storage facility, which caters for more specimens. This expansion is as a direct result of increased storage demands from clients.

Image1a and 1b: The newly renovated Biobank facility with increased storage capacity.

The Biobank also actively promotes its services through networking with potential clients and providing presentations on request. Ms Mantombi Maseme, a scientist working within the Biobank, conducted a presentation to new potential clients at the South African Tissue Bank (SATIBA) conference on biobanking that took place on 5 October 2017 at Leriba Hotel & Spa in Clubview, Centurion, South Africa. The Biobank also exhibits at conferences throughout the year.

In the previous reporting period and in terms of capacity, the biobank housed over 600 000 samples. This number is currently doubled, as the Biobank is now storing 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 micro banks, urine and buffy coats. A Biobank information system is in use that enables researchers to capture and store data. Staff members were formally trained on this information system by Biobanking IT expert Arjan Flierman, from Thermo Fischer Scientific, Netherlands.

Image 2a and 2b: Training provided to Biobank staff by Arjan Flierman from Thermo Fischer Scientific, Netherlands.

Capacity was increased through hiring a medical scientist and two laboratory clerks, who joined the Biobank during the period under review. The Biobank website can be accessed via: www.nationalbiobank.nhls.ac.za

TRAINING

Two Biobank scientists attended the WHO IARC-BCNet B3Africa Symposium in France, from 27 - November – 2 December 2017. The symposium was hosted under the theme: 'From Biobank Infrastructure to Research and presentations covered topics such as:

i. Ethical, legal and social issues in biobanking: Biobank ELSI in Nigeria;
ii. Cancer research reports [Nasopharengeal cancer screening algorithm (Indonesia) and breast cancer stem cells study(Egypt)]
iii. Biobank for research;
iv. Biobanking and genetics: Genetics of colorectal and breast cancer in Nigeria, genetic validation studies of hepatocellular cancer in Egypt;

v. IT for biobanking and research: LIMS (Ebola biobank in Sierra Leone) and data management systems (BCNet catalogue); and
vi. Biobank organisational challenges and quality.

PROFFESIONAL DEVELOPMENT

Biobank staff attended the International Society for Biological and Environmental Repositories (ISBER) Biobank Conference in Toronto, Canada in May 2017 and participated in both oral and poster presentation sessions.

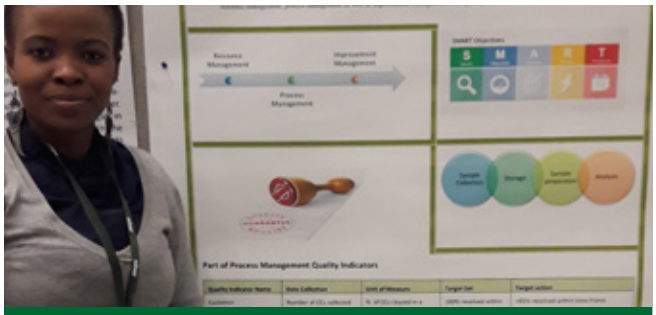


Image 3: Ms Mantombi Maseme presented a poster at ISBER Biobank Conference in Toronto in May 2017

Image 4: Mr Bongi Duma, Ms Mantombi Maseme met with officials from the SANDF at the Annual Research and Academic Conference.

The vacant bioinformatics position has been open since the previous reporting period. The selected candidate could not accept the position due to not being able to produce the documents required for the job. Another potential candidate is currently being pursued. As part of our continued support, the Biobank staff attended the Annual Research and Academic Conference of the SANDF which was held at the Bloemfontein Second Military Base, from 19 - 21 September 2017. The conference was organised by the South African Military Health Services (SAMHS): a branch of the SANDF. The Biobank also exhibited on behalf of the NHLS at the conference, and leveraged the opportunity to promote our services. The stand attracted a great deal of interest from the conference attendees.

The Biobank staff also presented oral sessions at the PathRED conference on: The Biobanking Complexity Matrix, Key Ethical and Governance Considerations For Emerging Biobanks: A South African Perspective. The presentation covered the following topics:

- An increased emergence of human biobanks being established for supporting research through:
  - Encouraging and ensuring that efficient storage and sharing of biomaterials and the associated data continues; and
  - Collecting samples, either on a small scale for study specific projects, or on a large scale at national level, for futuristic and multidisciplinary research.

BIOBANK MEMBERSHIPS

The NHLS Biobank continues to maintain its membership with ISBER and the European, Middle Eastern, and African Society for Biopreservation and Biobanking (ESBB). Memberships with these biobank societies help ensure that the department's operations remain in line with international standards. ISBER is developing a new biobanking standard, namely ISOTC276, which is earmarked for completion by the end of this year. This standard will help international biobanks to be audited and gain accreditation. Mr Duma is part of the ISBER Standards Committee and has delivered input on the development of the standards. The Biobank has also enrolled one postgraduate for an MSc in Ethics at Wits.

INFORMATION SERVICES SECTION

Information Services Section

Ms Angel Mzoneli

Information Services continues to serve as an integral support function 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. Information Services encompasses South Africa's national reference library for occupational health (AJ Orenstein Memorial Library), which is the only specialist reference library in Southern Africa that exclusively deals with occupational health topics and houses an extensive collection of information resources in occupational health.

The Information Services Section furthermore comprises all the following:

- A query-handling service that serves to respond to and facilitate access to technical and scientific occupational health information;
- Guidance and expert advisory services that are offered within the institute;
- An archive that is aimed at:
- Comprehensively collecting, documenting and preserving the character and identity of the organisation; and
- Providing evidence of the historical development and changes of the organisation over time.
- The institutional repository, which is a digital collection of the organisation's intellectual output.

In addition to providing 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, Information Services expanded its offering to include access to the library collections of the NHLS (formally known as the SAIMR Library) that is located in Braamfontein.

Through the library collections, we serve the needs of all NHLS staff, including those located in laboratories, and the eight medical schools throughout South Africa, as well as the NICD that provides a considerable remote information service to the NICD community, but whose collections are housed at the NIOH resource centre.

SERVICES

Information Services supports the promotion of good occupational health practice by offering its knowledge and information to all stakeholders, both internally and externally. Its mission is to:

- Ensure the provision of comprehensive resources and services in support of the research, teaching and training activities of the organisation, and
- Be a national resource and service dedicated to the collection, access to and dissemination of information on the prevention of occupational diseases and accidents in workplaces.

The primary objective of the service is therefore to collect; access and disseminate information in support of occupational health services and activities throughout South Africa and the SADC region. To achieve this, a wide variety of information resources is provided, which includes electronic databases and scientific periodicals and monographs; both in print and electronic formats.

Aligned with the key objectives of Information Services, the NIOH Library continued its principal function of sourcing, retrieving and disseminating information in support of occupational health services throughout South Africa and the SADC region. A number of library interventions were implemented to share the skills needed to source information in occupational health with occupational health professionals, university students, workers, management, health and safety representatives and labour union officials.

Information Services continually received and responded to requests for technical and scientific information on occupational health issues through its query-handling service. These queries originated from the interactive web based tool that enables users to capture occupational health information queries and requests that are lined up via a query ticket system to ensure a 24-hour turnaround time.

The tool is used by government departments, employers, employees, occupational health practitioners, labour unions and the general public. Queries received, includes, but are not limited to:

- Advice on how best to handle asbestos containing materials in homes; Risks related to asbestos containing materials in homes;
- Requests for advice from both employers and employees on occupational health related issues in the workplace;
- Requests for data on cancer in South Africa;
- Requests for occupational hygiene surveys and risks assessments;
- 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 by university students; .
- Information on training interventions offered by the institute;
- Information on autopsy services offered by the NIOH to ex-miners;
- Information held by the Medical Bureau for Occupational Diseases and outcomes on applications for compensation of second-degree benefits;
- Requests for information about the Diploma in Occupational Health and Master of Public Health Degree; and
- Referrals to the NIOH clinic.

It is worth noting that the queries received and captured on the system as a 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 other areas that were not indicated by the persons who submitted the requests. This reiterates the importance of the role of the Information Services Section, both nationally and internationally.

Collectively, the NIOH Library and the query-handling service received 827 queries in the year under review, of which 803 were successfully responded to. In growing and strengthening the library collections, thirty-eight (38) journal titles were subscribed to, of which sixteen (16) dealt with occupational health topics. In support of research activities and ease of access to full-text scientific journal articles, open-access electronic resources/databases were also added to the library collection; which researchers can easily access through the library page via the intranet.

Information Services continued to provide researchers with the necessary literature to execute their research projects. A total of twenty-five (25) scientific papers were produced and published by NIOH researchers. These publications were uploaded onto the website for ease of access. Information Services also disseminated eighteen (18) publication summaries from the research output to external stakeholders from various government departments, researchers from various SA universities and other occupational health companies.

Information Services played a crucial role in the Gender Committee activities including planning and coordinating a number of successful gender related events. This includes contributing to the article titled "The NIOH celebrates the first anniversary of its Gender, Health and the World of Work Program," published by the Gender Committee in the Occupational Health Southern Africa Journal.

The libraries commemorated world and national events by setting up displays/exhibitions of the various library resources available in support of various themes, e.g. World TB Month, World Aids Day, Cancer Awareness, Library week, etc.

TEACHING AND TRAINING

To fulfil the teaching and training function, Information Services delivered a lecture on sourcing occupational health information to Master of Public Health students at Wits. Moreover, as part of the Information Services Experiential Learning Programme, a total of nine (9) university students were hosted, of whom six (6) are from DUT and three (3) from the 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 provided training to new employees and interns on information search tools, such as TDNet, a portal for electronic journals and OPAC, an online library catalogue. Staff from various sections were trained in the use of the query ticket system. The training covered topics relating to capturing and responding to queries. Information Services also held library orientation sessions for occupational health nurses, registrars, and officials from provincial government departments, health practitioners, university students and international visitors.

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. Sabinet workshops. Staff also attended a number of in-house skills development courses that were organised by the organisation's learning academy. One postgraduate completed a Bachelor of Arts (Honours) in Information Science at the University of South Africa.

GRAPHICS, MARKETING & COMMUNICATION SECTION

Graphics, Marketing & Communication Section

Mrs Shanaz Hampson

Good communication is an essential tool within any workplace in achieving productivity, improving morale and commitment and maintaining 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 occupational health and safety practices through a preventive approach and through national and international training, outreach programmes and information dissemination.

The section coordinates training programmes of the NIOH, organises programmes for visitors, and provides an event management, marketing, communications, public relations and graphic design service internally and externally, locally and internationally.

As the custodian of the NIOH brand and public image, the section aspires to build the NIOH's reputation and brand awareness through pro-active 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 Continuing Professional Development (CPD) through the HPCSA, and provides support to the many 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 several 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 decreased its service capacity, with the resignation of the editorial specialist that was recruited in the previous financial year. Plans are underway to employ a communications officer in the new financial year and later a graphic designer that will serve as transversal support for both NIOH and its sister institute, NICD.

SERVICES

During the period under review, the section contributed to the management and provision of content for the websites of the NIOH, the NCR, and the NHLS's Biobank, as well as the NHLS intranet. The website platforms serve as robust information dissemination portals, and 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.

During the third quarter, the section embarked on a project to refresh the NIOH website in terms of design and development. The aim of the project is to enhance the brand identity and position the institute's website portal as a seamless 'touch point' for quality OHS information dissemination. This will be accomplished through topical website content, quick access to toolkits and information fact sheets and translation of research; thereby enabling focused, tailored communication to stakeholders. Following a request for quotation (RFQ), GRIAM Consulting was appointed to complete the project. The updated website will be launched in the new financial year.

In terms of channel management, the section aimed to not only ensure consistency of brand message and awareness to various stakeholder segmentation groups that were identified, but to also expand the NIOH digital footprint. In lieu of this, a Twitter account was generated with the handle: @nioh_sa and a YouTube channel was designed and developed for the institute. The launch of these two new communication channels will provide the opportunity for networking on a global scale, assist with targeting specific stakeholders 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 continued to build on existing relationships with the media, including TV, radio and various print outlets, by communicating key organisational events and activities, and responding to the media as and when the need arose. 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 section also ensured that marketing negotiations almost always allowed for editorial or 'thought-leader' content to be published, in addition to an advertisement being placed. This was purposefully done in an attempt to broaden our stakeholder reach and to position the institute strategically. The impact of such features and opinion pieces in the OHS arena is significant, as it provides opportunities to increase awareness, profile the institute, 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, both public and private, 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. Staff fostered online links with the web platforms of many occupational health-related organisations and societies, allowing the NHLS and NIOH to act as a single entry point for these information resources.

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

- RSA Government Directory;
- The JSE Publication;
- The Mail & Guardian;
- Mining Prospectus;
- SA Harvest;
- Business Day Earth;
- SOE Review;
- SA Profile;
- South African Business Integrator (SABI);
- Project Management SA (PMSA);
- Occupational Health Southern Africa (OHSA) Journal;
- RSA Government Directory, and
- The South African Local Government Association (SALGA).

Placements within these peer-reviewed and non-peer-reviewed publications assist with enhancing local and international integration and to allow for better intra- and inter-government communication. It also helps to synchronise business information, business cultures and align strategies and business goals between sectors, and ultimately bridging the gap of transformation and transparency between the public and private sector. 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 around the world of work and concepts of good OEHS practice.

INFORMATION DISSEMINATION

Staff members in the section were responsible for coordinating and arranging visits by key stakeholders, to re-establish links and initiate new collaborative endeavours. During the reporting year, meetings were held with representatives from the DoL, 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; MINA Foundation; Women in Informal Employment - Globalizing & Organizing (WIEGO); provincial occupational health coordinators; the Chamber of Mines; the MHSC; City of Johannesburg Municipality; Pikitup Johannesburg; the Railway Safety Regulator (RSR); the Asbestos Relief Trust (ART), and Kgalagadi Relief Trust (KRT).

The primary purpose of these visits is to provide insight into the occupational health and other specialised, relevant services provided by NIOH. In addition, a high level delegation, consisting of senior officials from the Government of Zambia Ministries of Health, Labour and Mines visited the institute during the first quarter to attend a knowledge exchange session and to discuss the potential areas for future collaboration and research between the two countries.

With the intention of building more OHS capacity within the country, the section also coordinated visitor programmes for both undergraduate and post graduate 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 DUT; visiting academics from Illinois State University in the USA.; officials from the City of Johannesburg Municipality; and colleagues from Pikitup in Johannesburg.

Special presentation sessions were given to NIOH staff by visiting academics on a variety of topics, including:

- *'Coal, Water and Mining'*, by Kally Forrest and Lesego Loate, Society, Work and Development Institute (SWOP) at Wits;
- *'Introduction to the U.S. Occupational Safety and Health Administration'*, by Prof Thomas P Fuller, Associate Professor, Safety Programme of Illinois State University, USA.;
- '*Lead Exposure amongst children in South Africa*', by Prof. Angela Mathee, Environment & Health Research Unit, Medical Research Council (MRC);
- '*Interstitial Lung Disease and Occupation: Beyond the Classic Pneumoconiosis*' by Paul Blanc, Endowed Chair in Occupational and Environmental Medicine at the University of California San Francisco; and
- '*Are occupational exposures a risk factor for pneumonia?*' by Prof Kjell Torén, University of Gothenburg, Sweden.

The Section also welcomed and participated in awareness raising campaigns and exhibitions at the following events throughout the reporting period: NUM OHS Awareness Event, Steelpoort & Limpopo; MBA North Asbestos Draft Regulation Workshop; SASOM Annual Conference; and the ArcelorMittal OHS Day.

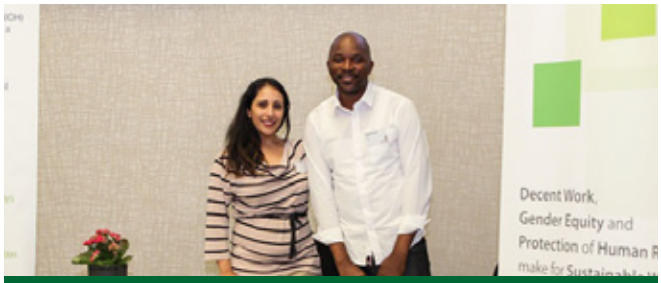


Image 1: Ms S Hampson & Mr S Yako exhibiting at the MBA North Asbestos Draft Regulation Workshop

Image 2: Ms M Mokoena and Ms S Hampson networking with delegates at the SASOM exhibition.

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 FIOH; the HSL of the UK, 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 - NEPAD

On 12 July 2017, the section hosted a half-day knowledge exchange visit by a NEPAD delegation on behalf of the NIOH and its departments. The delegation included officials from Lesotho, Malawi, Mozambique and Zambia. The knowledge exchange primarily focused on occupational health and safety and mine health regulation, with the aim to facilitate learning, partnerships and knowledge sharing and establish effective OHS and mine health regulatory systems within the participating countries. The project furthermore served to:

(i) Improve the coverage and quality of key TB control and occupational lung disease services in targeted geographic areas of the four participating countries; and
(ii) Strengthen regional capacity to manage the burden of TB and occupational diseases.

Following the knowledge exchange visit, it was noted that possible future collaborations may arise as a result thereof. Since then, NEPAD has indeed remained in contact with the NIOH, discussing possible collaborations between the institute and the countries identified. NEPAD also met with representatives from those countries to identify the gaps they believe exist in OHS in their respective countries.

The common thread emanating from these discussions seems to be that OHS systems needs to be strengthened. Areas of collaboration as identified and guided by NEPAD included:

- Support with TB and occupational lung disease components to strengthen health systems;
- Capacity building (human capital and infrastructure development);
- Assistance with teaching and training, including the ILO 2-day chest X-ray course;
- Inspectors and equipment identification; and
- OHASIS piloting.

Image 3: Prof D Rees and Ms S Hampson with the Lesotho delegates who attended the OHS Training.

Following discussions on building capacity in OHS in the African region, and particularly in the Sub-Saharan region, a MoU was drafted between NIOH and NEPAD in the fourth quarter. Lesotho was chosen as the pilot country for a training programme in OHS. Subsequently, the NIOH hosted 12 professionals from Lesotho working in health, labour and mining government departments from 4-8 December 2017.

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 needs.

World Day for Safety & Health at Work

In keeping with the preventive approach to OHS, the NIOH felt it particularly important to host a half-day seminar to commemorate the World Day for Safety and Health at Work. The day is celebrated every year on 28 April and serves to promote the prevention of occupational accidents and diseases globally. It is an awareness-raising campaign intended to focus international attention on the magnitude of the problem and on how promoting and creating a safety and health culture can help reduce the number of work-related deaths and injuries.

The event was held under the theme 'Optimise the Collection and Use of OHS Data'. which contributes to the implementation of SDG 8 . This goal emphasises the promotion of sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all. Target 8.8. of the SDG, requires countries to report on "Frequency rates of fatal and non-fatal occupational injuries, by sex and migrant status" which affirms the importance of optimising the collection and use of OHS data.

The seminar focused on discipline-specific approaches to data collection and use and covered various topics, including:

- *Surveillance Data in OEHS* – South African Perspective by Dr Muzimkhulu Zungu from the NIOH;
- *Medical Surveillance Data* by Karen Michell from the SASOHN;
- *Approved Inspection Authority and Exposure Data Collection* by Jaco van Rensburg from the SAIOH;
- *The NIOH Asbestos Database* by Ntebogeng Kgokong from the NIOH;
- *Occupational Health and Safety Information System (OHASIS)* by David Jones from the NIOH;
- *Lessons Learnt from Past Surveillance Programmes* by Prof David Rees from the NIOH, an

Delegates were in consensus that a more focused and strategic approach was necessary, with relevant support and buy-in form all stakeholders involved, to optimise data collection and use in South Africa. A resolution was undertaken by participants to leverage the existing data that was collected by Mr van Rensburg from the AIA Forum and Dr Jan Pienaar from The Health Source.

Image 4a: Delegates that attended the World Day for Safety & Health at Work event

Image 4b: Dr Sophia Kisting and the NIOH choir members who kept delegates enthused throughout the event.

Workplace Biorisk Management Workshop

The NIOH supports the Sustainable Development Goals (SDGs) adopted by the United Nations in September 2015. The SDGs include decent work, health, gender equity, youth employment, sustainable economies and sustainable environments. All of these are of great importance for healthier, sustainable and productive workplaces and protect the health of workers. The SDGs are intended to promote human rights, engender greater equity and peaceful and inclusive societies, create decent and sustainable jobs and address the enormous environmental challenges of our time, including climate change. According to the WHO, environmental pollution, secondary to industrial and other workplace activities, contributes enormously to the burden of non-communicable diseases in many countries, including our own. This should further encourage all workplace stakeholders to greater compliance with OEHS legislation and with effective and efficient preventive interventions at workplaces.

The NIOH remained committed to the concept of decent work and the protection and promotion of workers' health. In keeping with this priority, the NIOH hosted a 5-day Workplace Biorisk Management Training Course, during the third quarter of the period under review. Through the course, the NIOH addressed the risk to hazardous biological agents in the workplace as a critical element to the burden of disease and identified where preventing transmission and protecting worker exposure is highly needed.

The training took place from 20-24 November at the Sunnyside Park Hotel, Johannesburg and was well-attended by 46 delegates and 38 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 included 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.

WIEGO and NIOH Collaborations

The NIOH also strengthened relationships with WIEGO throughout the reporting period. This was done through collaborating on projects with waste reclaimers in the Johannesburg region and discussions on areas of research, and more specifically within the informal economy.On 20 February 2018, the NIOH, in collaboration with WIEGO, hosted a seminar titled 'Finding New Solutions to Intractable Problems: Approaches to Occupational Health & Safety in the Informal Economy, and the Extractives Industry'. This important Seminar aimed to explore these issues and identify possible solutions through presentations from the editors of two special editions of the progressive journal New Solutions: A Journal of Occupational and Environmental Health Policy.

They were:

- Professor Rajen Naidoo (Head: School of Occupational and Environmental Health, UKZN);
- Professor Francie Lund (Former Director: Social Protection Programme, WIEGO);
- Professor Leslie London (School of Public Health and Family Medicine, University of Cape Town); and
- Dr Sophia Kisting (Executive Director, NIOH).

The editors emphasised the need to understand the heterogeneity of the informal economy – that it is not an isolated sector, but a part of the mainstream economy, existing within all sectors of the labour force. This means that occupational health risks – and the solutions to them – are not uniform.

A second key issue which emerged was the importance of moving away from an approach to OHS that is focused solely on the individual worker. Dr Kisting highlighted the need to link occupational health and compensation systems for workers in the extractives industry (mainly men), to the women and children in the communities living around work sites.

The formal presentations were followed by a robust panel discussion with panellists taking questions from the audience; which included health professionals, worker organisations, NGOs, and government officials. The discussion served to point out the intersections of politics and economics on both the incomes and health of workers in South Africa, providing an important forum to unite the perspectives of different stakeholders.

Image 5: Seminar organisers and speakers (L-R): Laura Alfers; Francie Lund; Rajen Naidoo; Sophia Kisting and Leslie London.

Image 6: Robust panel discussion with the speakers and respondents from the informal and extractive industries. L-R: Sophia Kisting; Steven Leeuw ; Francie Lund; Rajen Naidoo; Leslie London and Richard Spoor.

Gender@Work Programme: Focus on Gender Responsive Workplaces

The institute continued to support the need for a greater focus on gender concerns in the workplace through the hosting of its third annual event on Gender, Health and the World of Work Programme during the fourth quarter of the reporting period. The programme aims to facilitate a greater gender responsive approach in workplaces by collaborating with government departments, role players in different sectors of the formal and the informal economy, employers and workers organisations, UN agencies, NGOs and institutions of higher learning, to contribute to gender mainstreaming, gender equity and greater prevention.

Part of the activities of the Gender@Work programme is to commemorate and celebrate International Women's Day, a day dedicated to sharing with working women and men worldwide to reflect on the progress made towards better occupational and workplace environmental health and safety for all workers. The day provided a golden opportunity to assess the contribution of workplaces towards public health and the SDGs, especially goal 3 (health), goal 5 (gender equality) and goal 8 (decent work). Workplaces reflect the complexity of our societal norms and standards and can play an important role in helping to overcome impediments towards greater equality and sustainable development. "New workplace knowledge in the form of research is fundamental to help prevent occupational injuries and diseases. New knowledge which is gender informed helps shape policy and practice in public health, in surveillance as well as the development of OHS services. It is also an investment in the future and promotes equity at work. Similarly, well targeted gender-informed OHS training and good OHS service delivery in the public and private sectors can result in the reduction of absenteeism, greater sustainability of workplaces and ultimately sustainability of economies. Above all, it engenders respect and the protection of human rights at work". - Dr Sophia Kisting.

Image 7: NIOH library services book exhibition of outstanding South African women with Ms Winkie Siebane (NIOH), Prof Himla Soodyall (NHLS), Dr Sophia Kisting (Executive Director, NIOH), Mr Bongani Nkuna (NIOH), and Mr Jacob Senamolela (NIOH)

Image 8: Participants networking with Redha Ameur (ILO), Sr Goitsimang Buffel (NIOH), Ms Lebogang Ramafoko (CEO Soul City), Dr Sophia Kisting (Executive Director, NIOH), and Naledi Mangqalaza (NIOH)

INTERNATIONAL LIAISON

International Liaison

Dr Tanusha Singh

The NIOH works closely with a number of international bodies including but not limited to the WHO, the ILO, OECD, and the ISO. These relations contribute to guidelines, standards and policy development and assist in filling the existing knowledge gaps in occupational health.

OUTREACH TO THE SADC AND REST OF THE AFRICAN REGION

Southern African TB and health systems support regional project

The NIOH hosted 11 high-ranking delegates from Zambia from 21-26 April 2017. The team comprised the following members:

- Dr Connard Mwansa, Director Occupational Health and Safety Institute (Ministry of Health);
- Mr Kaoma Chivunda, Director Occupational Health and Safety (Ministry of Labour);
- Dr Nathan Kapata, TB specialist (Ministry of Health);
- Dr Fwasa Singogo, Project Coordinator;
- Dr Morton Khunga, Chief TB officer (Ministry of Health);
- Mrs Patricia Chilaisha, Chief Factory Inspector (Ministry of Labour);
- Mrs Mercy Zulu (Ministry of Mines);
- Mrs Makasa Mulenga, Project accountant;
- Mrs Judith Mzyece, TB officer (Ministry of Health);
- Mr Patrick Banda, Chief Planner (Ministry of Health); and
- Mr Joseph Mwewa, Head Chest Laboratory (Ministry of Health).

The Government of the Republic of Zambia received funding from the International Development Association (IDA) for the implementation of the Southern African TB and health systems support regional project that involve four countries, namely: Lesotho, Malawi, Mozambique and Zambia. The overall objectives of the project are to:

- Improve coverage and quality of TB control and occupational lung disease services in targeted geographic areas of the participating countries; and
- Strengthen regional capacity to manage the burden of TB and occupational diseases.

The project also supports efforts to address regional learning and innovation, and project management. In preparation of the implementation of the project, the group (Zambia chapter) undertook a fully sponsored study and capacity building tour to South Africa, from 17- 28 April 2017. The tour covered the following:

- Introduction to the operations and role of the NHLS and the NIOH in preventing TB;
- Introduction to medical surveillance for miners;
- Visits to a one stop shop, the MBOD and the Workers Compensation Board;
- A visit to the Ministry of Labour to learn how it coordinates occupational health and safety services in the country;
- A visit to the Ministry of Mines on issues of dust control, incentives, inspections and penalties; and
- A visit to mine hospitals to learn how they deal with TB in the mines.

NEPAD delegation

Through the national DoH, the NIOH hosted a knowledge exchange visit for over 40 delegates from Lesotho, Malawi, Mozambique and Zambia. The project aimed to improve the coverage and quality of key TB control and occupational lung disease services in targeted geographic areas of the four participating countries; and to strengthen regional capacity to manage the burden of TB and occupational diseases.

The teams were very grateful for the information exchange and look forward to collaborating with NIOH on a number of areas. NEPAD is compiling a draft proposal to outline the potential areas of collaboration. NIOH will provide advisory and support services for the intended programme and a number of training programmes are being developed.

Following a request from NEPAD, the NIOH hosted an OHS training workshop for delegates from Lesotho during the last quarter of the financial year. Twelve OHS professionals, including environmental health specialists, nurses and Department of Labour inspectors, as well as Department of Mining officers attended the training. The programme comprised a combination of lectures and practical sessions. Topics covered by the multidisciplinary NIOH team included:

- Hazard identification, prevention and control (risk assessment);
- Hierarchy of control measures;
- Legislation governing occupational hygiene;
- Fundamentals of occupational hygiene (hazards);
- Occupational diseases medical surveillance;
- Biological monitoring;
- Quality assurance;
- Introduction to ergonomics and ergonomics standards; AND
- Introduction to the HealthWISE toolkit and OHASIS.

WHO

The NIOH hosted a two-day workshop titled *Knowledge Networks on Occupational Health and Safety for Vulnerable Groups and High Risk Sectors*. The purpose of the meeting was to discuss the NIOH workstream on the health of workers in the informal economy (e.g. identify key collaborators and actors, finalise the draft work plan, etc) and get perspectives from NGOs, which will inform the work plan. The workshop was attended by Dr Ivan Ivanov and Dr Frank Pega from WHO Geneva, as well as Dr Francie Lund and Ms Laura Alfers from WIEGO). On 6 April 2017, the WHO visitors and members of NIOH visited the Bigizela waste pickers site and a metal recycling site in Alexandra. The WHO's global programme is coordinated by Dr Sophia Kisting and Dr Tanusha Singh, NIOH. One of the outputs of the project, will be a literature review on OHS in the informal economy, which the NIOH is leading.

Professor Mary Gulumian attended the *WHO chemical risk assessment network meeting* that was held from 20 – 22 June 2017 at the European Food Safety Authority (EFSA), Parma, Italy. The meeting provided training in health risk assessment to both developed and developing countries. It also provided a forum for networking with 77 participants from 63 institutions, with the potential to add value in the detection and evaluation of emerging risks, exchange information and best practices, and enable collaboration on topics of mutual interest.

The agenda consisted of more than 20 different topics and discussions such as:

- A strategy for capacity building;
- Updates on network activities;
- Challenges and opportunities for collaboration in risk assessment;
- New methods in toxicology;
- WHO tools and methodologies for chemical risk assessment;
- Systematic review in chemical risk assessment;
- Proposals for new network activities;
- Awareness raising on new methods;
- Application of bioinformatics; and
- The development of targeted training packages to address the need of regulators.

IUTOX

Professor Gulumian, in her capacity as a member of the Education Committee, as well as a member of the Developing Countries and Membership Committee, also attended the *International Union of Toxicology (IUTOX)* meeting which was held in San Antonio, USA, from 10 – 11 March. Topics for discussion at this meeting included: training of toxicologists on risk assessments; and efforts to establish toxicology societies in a number of developing countries. In her capacity as the President of the African Branch of the Society of Risk Analysis (SRA), Professor Gulumian also discussed the upcoming international meeting which is set to take place in 2019, in Cape Town, South Africa.

EU FP20 eCallibrate Project

Over the past decade or so, nanoparticles and nanotechnologies have become a prominent global concern in occupational and environmental health. Their measurement and control, and their toxicity and potential health effects have been the subject of numerous projects and reports.

The NIOH has a substantial programme of work in this area that is led and largely implemented by the Toxicology Section. Much of the work is executed in collaboration with local and international partners and agencies, as illustrated by Prof. Gulumian's and Dr Wells' contributions to the third eCallibrate report. eCallibrate is an EU-based interdisciplinary group of researchers whose objective is to establish a versatile risk governance framework for assessment and management of human and environmental risks of nanomaterials and nanomaterial-enabled products.

A significant project to review the nanoscience and nanotechnology landscape in the country is underway to identify challenges and provide insights into how existing support programmes can be improved and nanotechnology research development and innovation can be advanced.

Image 01: Prof M Gulumian and EU delegation

The EU delegation included the EU representative and the Director of the Horizon 2020 Programme (EU funding agency, funding nanotechnology), as well as representatives from the National Institute for Public Health and the Environment-RIVM (The Netherlands), Bundesinstitut für Risikobewertung- BfR (Germany), the Centre for Ecology and Hydrology (UK), and the National Research Centre for the Working Environment (Denmark).

ILO

The HIV TB Unit hosted three workshops on *HealthWISE* in Mozambique (Hospital Geral De Mavalane, Hospital Geral Da Machava and Ndlavela Hospital), South Africa and Zimbabwe. These workshops were attended by government officials from the Departments of Health in the three countries, trade unions, health workers, hospital managers, ILO representatives, NIOH/NHLS experts, and our collaborating partners from the UBC, Columbia, Canada.

Dr Muzimkhulu Zungu from the HIV TB Unit and Mr Simphiwe Mabhele from the ILO, conducted a week's training session for the Ministry of Health in Lesotho, from 18 – 22 December 2017. The session was attended by 25 health workers from four districts in Lesotho and it covered basic training on modules 1 – 4 of the *HealthWISE* manuals.

The Occupational Medicine Section submitted a final draft of the situational analysis on OHS services in South Africa to the DoL, as the first step towards the ratification of the ILO Convention 161. The technical team, which consists of the NIOH, the regional ILO office, DoL, DoH, and DMR, will present the draft for adoption to the Advisory Council on Occupational Safety and Health (a tripartite forum).

ISO

Prof Mary Gulumian, in her capacity as Head of the South African delegation for WG3, held discussions on new ISO initiatives titled:

- "Nanotechnologies – Label-free impedance technology to assess the toxicity of nanomaterials in vitro;"
- "Carbon nanotubes (CNT) and carbon nanofibres (CNF) aerosol characterization for inhalation exposure studies proposed by South Korea;" and
- "Monitoring of protein secondary structure alteration following exposure by nanomaterials: Circular Dichroism Spectroscopy proposed by Iran".

She also contributed to the document titled: *"Nanotechnologies – Health and safety practices in occupational settings."*

OECD

In her capacity as a member of the OECD Working Party on Manufactured Nanoparticles (WPMN) Advisory Board on the Adverse Outcome Pathway (AOP) Development for Nanomaterial Risk Assessment and Categorisation project, Professor Mary Gulumian discussed the updated project with experts from the other OECD member countries and approved the initiation of the project. She is also a member of steering groups 2 and 8 and contributes on occupational health on exposure measurement and exposure mitigation in nanotechnologies that will form part of the following proposals:

- "Compilation of available tools and models used for assessing environmental and consumer exposures to Manufactured Nanomaterials and Evaluation of their Applicability in Exposure Assessments," proposed by Canada;
- "Assessment of Biodurability of Nanomaterials and their Surface Ligands," proposed by South Africa; and
- "Assessing the global readiness of regulatory and non-regulatory models for assessing occupational exposure to manufactured nanomaterials," proposed by Denmark. Professor Mary Gulumian attended the 18th OECD WPMN meeting that was held at the OECD headquarters in Paris from 12-16 February, during which she participated in the following topics and activities:
- Declassification of the document titled: "Assessment of Biodurability of Nanomaterials and their Surface ligands", which will be published on the OECD website soon;
- Inclusion of the new project proposal in the WPMN programme titled: "Compilation of available information on biopersistent/ biodurable manufactured nanomaterials (MNs), using their ability to induce autophagy and lysosome dysfunction and Lysosomal Membrane Permeabilization (LMP) as a prediction of their long term toxic effects". This will be conducted in collaboration with the US;
- Contribution to the following international projects: "Adverse outcome pathways (AOPs): Their application in the regulatory arena" and "Safer Innovation Approach for Sustainable Nanomaterials and Nano-enabled Products;" and
- A workshop on "Risk assessment of gold nanomaterials: An OECD sponsorship programme" was also conducted on 2 February 2018 at Heia Safari Ranch, in Muldersdrift, South Africa.

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RP252/2018
ISBN: 978-0-621-45701-8