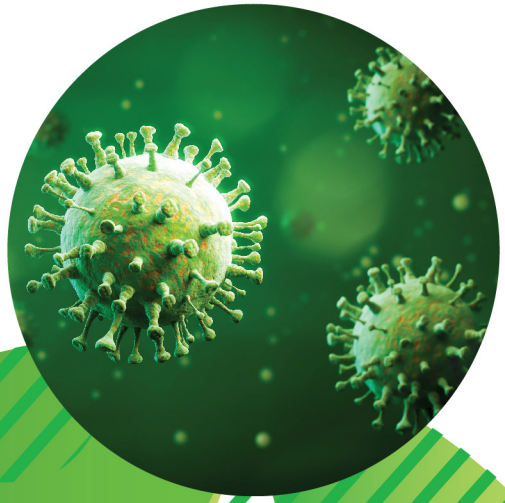
NATIONAL INSTITUTE FOR COMMUNICABLE DISEASES

Division of the National Health Laboratory Service

ANNUAL OVERVIEW

2024/2025



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LIST OF ABBREVIATIONS

AFP	Acute flaccid paralysis
Africa PGI	Africa Pathogen Genomics Initiative
AFRO	African Region Offices
AMR	Antimicrobial Resistance
ANC	Antenatal care
ARL	Arbovirus Reference Laboratory
ART	Antiretroviral Therapy
BMGF	Bill and Melinda Gates Foundation
BSc	Bachelor of Science
BSL	Biosafety Level
CCHF	Crimean-Congo Haemorrhagic Fever
CDC	Centres for Disease Control and Prevention
CDW	Corporate Data Warehouse
CED	Centre for Enteric Diseases
CEZPD	Centre for Emerging Zoonotic and Parasitic Diseases
CHARM	Centre for Healthcare-Associated Infections, Antimicrobial Resistance and Mycoses
CHIVSTI	Centre for HIV and STIs
CoVICIS	Combating SARS-CoV-2 Pandemic
CRDM	Centre for Respiratory Diseases and Meningitis
CSIR	Council for Scientific and Industrial Research
CTB	Centre for Tuberculosis
CVI	Centre for Vaccines and Immunology
DATCOV	Daily Hospital Surveillance for COVID-19 Report
DBB	Division of Biosafety and Biosecurity
DHIS	District Health Information System

DoH	Department of Health
DPHSR	Division for Public Health Surveillance and Response
DRC	Democratic Republic of the Congo
DTRA	Defence Threat Reduction Agency
DUT	Durban University of Technology
EIA	Enzyme Immunoassay
EOC	Emergency Operations Centre
EPBCR	Ekurhuleni Population-Based Cancer Registry
ESBL	Extended Spectrum Beta-Lactamase
ESKAPE	Enterococcus faecium, Staphylococcus aureus, Klebsiella pneumoniae, Acinetobacter baumannii, Pseudomonas aeruginosa, and Enterobacter species
FETP	Field Epidemiology Training Programmeme
GERMS	Group for Enteric, Respiratory and Meningitis Surveillance – South Africa
GIISER	Global Immunology and Immune Sequencing for Epidemic Response
GLASS	Global AMR Surveillance System
IAEA	International Atomic Energy Agency
IANPHI	International Association of National Public Health Institutes
IARC	International Agency for Research in Cancer
IgG	Immunoglobin G
IgM	Immunoglobulin M
INH	Isoniazid/ Isonicotinic Acid Hydrazid
IT	Information Technology
LSHTM	London School of Hygiene and Tropical Medicine
MRC	Medical Research Council
MSM	Men-who-have-sex-with-men

LIST OF ABBREVIATIONS

NCR	National Cancer Registry
NDoH	National Department of Health
NGS	Network for Genomic Surveillance in South AFRICA (NGS-SA)
NHLS	National Health Laboratory Service
NICD	National Institute for Communicable Diseases
NIHR	National Institute for Health and Care Research
NIOH	National Institute for Occupational Health
NMC	Notifiable Medical Conditions
ORU	Outbreak Response Unit
PCR	Polymerase Chain Reaction
PET	Provincial Epidemiology Team
PGI	Pathogen Genomics Initiative
POPIA	Protection of Personal Information Act
RCoEBB	Regional Centre of Excellence for Biosafety and Biosecurity
RfA	Results for Action
RNA	Ribonucleic Acid
RVF	Rift Valley Fever
SABSSM	South African National HIV Prevalence, Incidence, Behaviour, and Communication Survey
SACCESS	South African Collaborative COVID-19 Environmental Surveillance System
SADC	Southern African Development Community
SAFETP	South African Field Epidemiology Training Programmeme
SAHPRA	South African Health Products Regulatory Authority
SAMVAC	South African mRNA Vaccine Consortium
SANAC	South African National AIDS Council
SANAS	South African National Accreditation Systems

SARS	Severe Acute Respiratory Syndrome
SBI	Surveillance and Business Intelligence
SBPRL	Special Bacterial Pathogens Laboratory
SCF	Sequencing Core Facility
SDW	Surveillance Data Warehouse
STI	Sexually Transmitted Infection
SVPL	Special Viral Pathogens Laboratory
TB	Tuberculosis
TPT	TB Preventative Therapy
UNAIDS	Joint United Nations Programmeme on HIV/AIDS
UP	University of Pretoria
US	United States of America
VCLR	Vector Control Laboratory Research
VHF	Viral Haemorrhagic Fevers
WGS	Whole Genome Sequencing
WHO	World Health Organization
WRC	Water Research Commission

EXECUTIVE DIRECTOR'S OVERVIEW

PROF. ADRIAN PUREN

Executive Director

In the 2024/2025 financial year, the National Institute for Communicable Diseases (NICD) continued to fulfil its mandate by providing early detection, containment, and response to infectious disease threats across South Africa, the Southern African Development Community (SADC), and the broader African region. Guided by its national and regional role, the Institute supported the National Department of Health (NDoH), the World Health Organization (WHO), Africa Centres for Disease Control and Prevention (Africa CDC), and other partners through expertise in communicable disease surveillance, outbreak response, specialised diagnostics, research, training, capacity building, and provincial epidemiology support.

Several public health events and disease outbreaks marked the year under review. The NICD provided critical epidemiological, communications, and technical support to the NDoH and provincial health departments for outbreak preparedness and response activities of national significance. The Institute played a central role in the containment and management of outbreaks, including cholera, measles, rubella, tanapox, chickenpox, mpox, various foodborne poisoning incidents, conjunctivitis, hand, foot and mouth disease (HFMD), and diphtheria.

The following section outlines how the NICD's seven disease-specific centres, the National Cancer Registry, the Division of Public Health, Surveillance and Response, and the support departments have performed for the 2024/2025 financial year.

CENTRE FOR EMERGING ZOONOTIC AND PARASITIC DISEASES (CEZPD)

The CEZPD Special Viral Pathogens Laboratory (SVPL) is the national reference laboratory for human rabies in South Africa. The laboratory offers testing for ante-mortem and post-mortem diagnoses through various ISO-accredited tests. The SVPL curates a database of epidemiological and clinical information for all confirmed, probable, and suspected rabies cases, thereby supporting accurate reporting of rabies as a Category 1 Notifiable Medical Condition (NMC) through passive surveillance. A rabies dashboard was developed on the NICD website in 2024, which

includes human case data and animal cases in dogs and cats. In collaboration with the national health and agriculture departments and the Rabies Action Group, the CEZPD disseminated a one-health-based risk communication and community engagement action plan related to rabies in seals in the Western and Northern Cape provinces. For the period under review, there were eight deaths due to human rabies associated with dog bites/exposures in South Africa.

In response to the rapid spread of artemisinin-resistant parasites across central, eastern, and the Horn of Africa, the WHO has recommended that all African malaria-endemic countries strengthen their surveillance for confirmed molecular markers of antimalarial drug resistance. In 2024, the Laboratory for Antimalarial Resistance Monitoring and Malaria Operational Research incorporated a targeted amplicon deep-sequencing workflow into its drug- and diagnostic-resistance analytical platform. Only three of 1,200 samples analysed carried validated artemisinin resistance markers. These data confirm the continued efficacy of both the recommended diagnostics and treatments. However, the strong selection for artemisinin resistance markers in several Southern African Development Community (SADC) countries is concerning and highlights the need for continued surveillance. The relatedness analysis suggested limited local transmission in KwaZulu-Natal and Mpumalanga provinces, emphasising the need for strong cross-border collaborations if South Africa is to achieve its elimination targets.

Between May 2024 and March 2025, 31 mpox cases were reported in South Africa. The CEZPD provided diagnostic referrals, including rapid clade assignment and sequencing of cases. Additionally, the Centre supported the national Mpox Incident Management Team and assisted with developing policies, procedures, and materials for risk communication and community engagement. The CEZPD also supported several initiatives through the WHO and the Africa CDC to help contain the mpox outbreak in South Africa and across the continent.

CENTRE FOR ENTERIC DISEASES (CED)

The Centre actively monitors and responds to alerts of suspected enteric disease outbreaks reported through the NMC system and other surveillance sources. The routine application of whole genome sequencing as a surveillance tool has enhanced the detection of disease clusters, including small, localised outbreaks. This has enabled targeted epidemiological investigations in collaboration with the provincial health departments and contributed to a deeper understanding of the complex epidemiology of certain endemic enteric diseases. The Centre provided both epidemiological and laboratory support to assist with outbreak investigations.

Between 01 April 2024 and 31 March 2025, 45 suspected cholera cases were reported through the NMC system nationwide. Of these, 96% (43/45) had a specimen collected for screening, and 9% (4/43) were confirmed as cases of *Vibrio cholerae*.

A total of 134 laboratory-confirmed cases of enteric fever were reported from eight provinces during the reporting period. Most cases were from Gauteng (51%, 69/134), followed by the Western Cape (17%, 23/134) and KwaZulu-Natal (13%, 17/134). No cases were reported from the Northern Cape. Additionally, 21 cases of enteric fever caused by *Salmonella enterica* Paratyphi A (*Salmonella* Paratyphi A) were reported during the period under review, the highest number of annual S. Paratyphi A cases observed since 2003. Gauteng reported 19 cases of Paratyphi A, while the Free State and North West provinces each reported a single case. Finally, 67 laboratory-confirmed cases of listeriosis were reported from nine provinces. Most

cases were from the Western Cape (33%, 22/67), followed by Gauteng (30%, 20/67) and KwaZulu-Natal (21%, 14/67).

CENTRE FOR HEALTHCARE-ASSOCIATED INFECTIONS, ANTIMICROBIAL RESISTANCE AND MYCOSES (CHARM)

CHARM is responsible for national surveillance of healthcare-associated infections, antimicrobial resistance (AMR), and fungal diseases, supporting evidence-based policy and clinical decision-making. The Centre provides strategic leadership in detecting, preventing, and controlling these threats through laboratory-based surveillance, outbreak investigation, research, training, and expert consultation. By generating high-quality data and insights, CHARM informs national guidelines and response strategies, contributes to the global AMR agenda, and strengthens the country's capacity to combat communicable diseases in healthcare and community settings.

For the year under review, CHARM made significant strides in strengthening surveillance, capacity building, and regional collaboration to address healthcare-associated infections, antimicrobial resistance, and mycoses. An important milestone was the launch of the national AMR dashboard in September, enhancing access to real-time surveillance data for stakeholders across the country. The Centre also led several key surveillance projects, including monitoring of flucytosine-resistant Cryptococcus isolates, clinical surveillance for carbapenem-resistant Enterobacterales (CRE), environmental surveillance through a CRE wastewater pilot study, a pilot study for hypervirulent *Klebsiella pneumoniae* and surveillance for *Candida auris* colonisation in the SADC region.

In support of capacity development, the CHARM delivered multiple training programmes to enhance laboratory and clinical capacity to detect and respond to priority pathogens. The Centre hosted the first mycology training workshop for technologists in November 2024. As a designated WHO Collaborating Centre for AMR and Mycology, the CHARM contributed to global technical guidance and supported regional strengthening of surveillance and response systems.

The CHARM was involved in three healthcare-associated outbreaks during the year 2024, viz., (1) an outbreak of *Candida krusei (Pichia kudriavzevii)* in a neonatal unit at Mthatha Regional Hospital, Eastern Cape, February-March 2024; (2) a *Candida auris* outbreak investigation in the neonatal ward, Mankweng Hospital, June-October 2024; and (3) a suspected *Acinetobacter baumannii* outbreak in the intensive care unit of Pietersburg Hospital.

CENTRE FOR HIV AND SEXUALLY TRANSMITTED INFECTIONS (CHIVSTI)

CHIVSTI has a strong track record in the disciplines of HIV virology, HIV immunology, HIV/STI epidemiology, HIV/STI diagnostics, and HIV-STI interactions. The Centre continues to play a pivotal role in assessing viral escape and humoral immune responses in SARS-CoV-2-infected individuals and in vaccines, and in defining correlates of protection, with global implications for the design of second-generation vaccines.

The Antenatal Clinic (ANC) HIV survey is a biannual survey aimed at monitoring trends in HIV prevalence, incidence, coverage of HIV testing, viral load suppression, and the syphilis cascade among pregnant women attending antenatal care at 1589 public sector primary care facilities (sentinel sites). A detailed analysis of the 2022 ANC survey data and plans for the 2024/25 edition of the ANC survey were prepared. SARS-CoV-2 serological testing of a subset

of stored plasma samples from the 2022 ANC survey was conducted. This sub-study aimed to determine the prevalence of immunity (both natural and vaccine-derived) among pregnant women attending antenatal care in 2022. The analysis found high levels of natural and vaccine-derived immunity, which were similar across all the provinces but were lowest among pregnant women living with HIV who were not virally suppressed at a threshold of 1000 copies per millilitre.

The Centre supports the NDoH by analysing and reporting HIV-related National Health Laboratory Service (NHLS) data from the NICD Data Warehouse as part of paediatric surveillance. This includes secure online distribution via the NICD's Self-Service Portal of Results for Action reports as per National HIV Guidelines; maintenance of the NHLS HIV Monitoring and Evaluation Dashboard; and monthly aggregated reporting on early infant diagnosis and paediatric, adolescent, and maternal HIV viral load monitoring.

The aetiological STI surveillance was undertaken at three primary healthcare facilities in Gauteng, KwaZulu-Natal, and the Western Cape. The data continue to validate the current STI syndromic management guidelines with evidence of the low specificity of the vaginal syndrome algorithm. *Neisseria gonorrhoeae* (82%) remained the most typical cause of male urethritis discharge syndrome, while bacterial vaginosis (54%) was more prevalent in vaginal discharge syndrome.

CENTRE FOR RESPIRATORY DISEASES AND MENINGITIS (CRDM)

The Centre conducts surveillance, diagnostic testing, outbreak support, and research on communicable respiratory diseases and meningitis in South Africa and the African continent. The Centre provides data and expertise to the NDoH and healthcare providers, as well as regional and international collaborators, to assist with planning public health policies and programmes and responding to respiratory and meningitis disease outbreaks. The CRDM is a source of capacity building within South Africa and the African region. The Centre is responsible for six Category 1 NMCs — acute rheumatic fever, COVID-19, diphtheria, meningococcal disease, pertussis, and respiratory disease caused by a novel respiratory pathogen — and two Category 2 NMCs — *Haemophilus influenzae* type b (Hib) disease and legionellosis. These diseases, in addition to other important diseases such as influenza, respiratory syncytial virus, and pneumococcus, are monitored through ongoing syndromic and laboratory-based surveillance programmes and the NMC programme.

The Centre assisted with the outbreak response to an ongoing diphtheria outbreak across the country (Western Cape, Gauteng, Limpopo, and Mpumalanga), providing alerts to clinicians, responding to media queries about the increase in cases, and producing regular situation reports. The CRDM also conducted ad hoc testing for suspected avian influenza cases. The Centre provided laboratory support for African partners in response to meningitis outbreaks, respiratory illness (including pertussis), and diphtheria. As a WHO COVID-19 international regional reference laboratory, the CRDM continued to provide technical support and training to many African countries. The CRDM staff consult on numerous expert committees and working groups for the WHO, the Africa CDC, and the WHO African Region.

CENTRE FOR TUBERCULOSIS (CTB)

The Centre has made significant contributions towards national and global TB policies and guidelines in collaboration with the NDoH and WHO. For the year under review, the CTB provided critical support to the

National TB Programme, including supporting the development of the National Strategic Plan for HIV, TB, and STIs 2023-2028, the National TB Programme's TB Strategic Plan 2023-2028, the TB Recovery Plan, and the revision of the National TB diagnostic algorithms. The Centre is designated as a WHO Prequalification Unit for the performance evaluation of TB-Nucleic acid Amplification in vitro for diagnostics.

During the year under review, the Centre continued to support the National Tuberculosis Programme by providing advanced diagnostic services, laboratory-based surveillance, and policy-oriented technical support. The Centre also made substantial contributions to regional and global TB control efforts, particularly through diagnostic innovation and the strengthening of laboratory systems.

The CTB refined and expanded its laboratory-based surveillance programme to reflect the evolving diagnostic landscape in South Africa. In alignment with the NHLS diagnostic expansion, automated quarterly surveillance reports were updated to incorporate data from newly introduced molecular assays, including GeneXpert MTB/XDR, BD MAX™ MDR-TB, and Roche cobas® MTB-RIF/INH. These updates enabled a more granular understanding of diagnostic yield and drug resistance trends nationwide.

Furthermore, the CTB developed enhanced surveillance reports for 12 high-priority districts, which include detailed facility-level epidemiological data, geospatial distribution maps, and longitudinal trajectory analyses. These reports have been instrumental in guiding targeted interventions by district-level TB programmes and are now earmarked for expansion across all 52 districts of South Africa. One of the most significant developments during this period was the launch of targeted Next-Generation Sequencing (tNGS) for the diagnosis and management of drug-resistant TB. This represents an important step in the country's molecular diagnostic capability. The tNGS platform enables high-resolution identification of resistance-conferring mutations to support treatment decisions for drug-resistant TB earlier.

CENTRE FOR VACCINES AND IMMUNOLOGY (CVI)

The Centre provides support and expertise in the epidemiology and virology of vaccine-preventable viral diseases. From 01 April 2024 to 31 March 2025, 27230 specimens were received via the national fever-rash-based surveillance programme, in which each sample is tested for measles and rubella simultaneously. For this period, 3.3% (887/27230) were measles Immunoglobulin M (IgM) positive, and 46.5% (12674/27230) were rubella IgM positive cases. Many of the measles cases were in Gauteng (18.9%; 2400/12674), KwaZulu-Natal (18.2%; 2316/12674), and North West (18.9%; 2393/12674), and most of the rubella cases were in Gauteng (41.6%; 369/887). Measles genotypes circulating in the country are D8 and B3, particularly in Gauteng (31/56) and Mpumalanga (8/56) provinces.

Many rubella cases (98%) were seen in children under the age of 15 years. With the nationwide circulation of rubella, an advisory was sent to the NDoH at the end of 2024, issuing a cautionary alert to women of reproductive age and pregnant women about congenital rubella syndrome (CRS). From 01 January to 17 March 2025, there have been 50 CRS notifications on the NMC system, with the majority from KwaZulu-Natal (16), Western Cape (9), Gauteng (9), and Eastern Cape (5). To date, one internal case review meeting has been held, during which 21 cases were reviewed, some of which are pending classification due to a lack of required information. The CVI continues its effort to receive clinical notes on suspected CRS cases.

From 01 April 2024 to 31 March 2025, 924 faecal samples (from 485 Acute Flaccid Paralysis (AFP) cases) were received from South Africa. No polioviruses of concern were detected. The latest non-polio AFP detection rate for South Africa, from January to March 2025, was 2.7 per 100,000 population among those under 15 years of age. Of the nine provinces, the Eastern Cape has yet to reach the WHO target of 2/100 000 population, while the Free State, Gauteng, KwaZulu-Natal, Limpopo, North West, Northern Cape, and Western Cape have reached it. Mpumalanga was the only province that exceeded the South African target of 4/100 000 population. The stool adequacy rate for South Africa was 73.8%, below the WHO target of 80%.

The CVI assisted with the HFMD outbreak in February 2025. By 31 March 2025, the Centre had received 48 samples from five provinces: 16 from the Eastern Cape, 19 from Gauteng, 8 from KwaZulu-Natal, 4 from Mpumalanga, and 1 from the North West. Of these, 44 samples tested positive for enterovirus using real-time reverse transcription polymerase chain reaction. Genotyping of two samples from the uMgungundlovu District in KwaZulu-Natal identified Coxsackievirus A6 and Coxsackievirus A16.

DIVISION FOR PUBLIC HEALTH SURVEILLANCE AND RESPONSE (DPHSR)

The DPHSR plays a pivotal role in surveillance and response activities related to communicable disease threats in South Africa. The DPHSR comprises the following units: the GERMS-SA surveillance programme (which has been running for over 21 years), the Provincial Epidemiology Team (PET), the NMC Surveillance Unit, and the Outbreak Response Unit (ORU), which hosts the Emergency Operations Centre (EOC). Together, these units, in conjunction with the NICD specialist centres, carry out national communicable disease surveillance, pandemic preparedness, and response. This is done through real-time alerts and notifications of diseases of public health importance through the NMC platform, monitoring trends in disease burden, antimicrobial susceptibility, and circulating isolates (GERMS-SA), as well as providing technical expertise to national, provincial, and district departments of health through PET and ORU sections. The DPHSR also facilitates communication and data sharing between the NDoH and provincial health departments, the NICD, and regional and international partners.

During the period under review, the DPHSR provided epidemiological and communications support and technical expertise to the NDoH and provinces related to several outbreak preparedness and response activities of national importance, such as cholera, measles, rubella, tanapox, chickenpox, mpox, several foodborne poisoning events, conjunctivitis, HFMD, diphtheria, agricultural stock remedy poisoning, and rabies in seals. The DPHSR provided epidemiological expertise through various teams and maintained data platforms to monitor trends in cases, tests, hospitalisations, and deaths. Epidemiological support from the EOC, ORU, and PET led to a well-coordinated and structured data flow, management, and analysis.

The EOC staff conducted emergency management training nationally and in several other African countries. At the national level, several staff members were involved in efforts to implement integrated disease surveillance and response and South Africa's WHO second Joint External Evaluation. The NMC surveillance system continues to provide coordinated collection, collation, analysis, interpretation, and dissemination of public and private-sector data in real time. The NMC provides information on targeted public health response, decision-making, and resource allocation. The GERMS-SA collaborates with NICD centres to offer a national active surveillance programme for laboratory-confirmed bacterial and

fungal infections, complemented by enhanced surveillance at sentinel hospital sites. This provides a robust platform for monitoring disease trends, which guides public health policy decisions.

NATIONAL CANCER REGISTRY (NCR)

The NCR continued to provide technical support to the recently launched KwaZulu-Natal Population-Based Cancer Registry (KZN-PBCR). The first annual report from this registry (2023 report) was published in March 2025 alongside the routinely published annual reports for the NCR (Ekurhuleni PBCR, Pathology-based cancer registry, and Childhood cancer registry). The NCR has been supporting cancer registries within the continent by training them on record linkage for cervical cancer elimination and childhood cancer registration. From the record linkage training held in August 2024, participants from South Africa, Mauritius, Tanzania, Rwanda, and Eswatini successfully linked their records. They were invited to present at the EUROGIN International HPV Multidisciplinary Conference in March 2025.

The NCR published its fourth report on childhood cancer incidence for 2021 in March 2025. This latest report includes the 15-19 age group for the first time. The inclusion of adolescents aged 15-19 years aligns with international standards for childhood classification. A total of 1 378 cancers were diagnosed in children aged zero to 19 years in South Africa in 2021. This equated to an overall age-standardised rate of 63.5 cases per million (95% CI: 53.1-75.7). It was found that the most common cancer group diagnosed was leukaemias, and the second most common cancer group was lymphomas. Approximately 32% of the cases (n=437) were diagnosed in children aged zero to four years, followed by the 15-19-year-old age group (n=339; 24%).

SUPPORT FUNCTIONS

The NICD's transversal departments – Human Resources, Communications, Information Technology, Finance, Procurement, Surveillance Data Warehouse (SDW), and the Division of Biosafety and Biosecurity and Sequencing Core Facility (SCF) – have played a tremendous role in support of the Institute. The SDW, which provides health data and analytics support to NICD centres, the NMC system, NCR, and other stakeholders through routine, automated reports, has developed several dashboards for internal and external use.

The Quality Assurance Department continued to strengthen NICD's commitment to excellence by implementing an Integrated Quality Management System encompassing ISO 9001, ISO 15189, ISO 17025, and ISO 13485 standards. All NICD laboratories-maintained accreditation under the South African National Accreditation System: ISO 15189 for medical laboratories and ISO 17025 for both the SCF and the Vector Control Reference Laboratory. These two accredited laboratories remain the only known accredited facilities for their specific tests and service offerings.

Over the past financial year, the Communications Unit has played a pivotal role in bridging information gaps through a blend of earned and paid media strategies. By amplifying the voices of NICD experts, the team significantly expanded the Institute's reach and visibility across traditional and digital platforms. The NICD website remains a key resource for the public and healthcare professionals, attracting over 494,514 visitors and generating 971,752 page views during the period under review. The team also promoted NICD research through the quarterly *Science Focus* publication, led the production of *15 Public Health Bulletin South Africa* (PHBSA) editions, and produced the quarterly *Pulse newsletter.*

The Division of Biosafety and Biosecurity (DBB), the Data for Health Initiative, Information Technology, the Field Epidemiology Training Programme (FETP), and Occupational Health Services continued to demonstrate exceptional commitment to their functions. The DBB provides specialised services to the NICD and NHLS for biorisk management, namely biosafety, biosecurity, and biocontainment engineering, to ensure the safe and secure operation of high- and maximum-containment laboratory infrastructure. The Division has built a team of biocontainment engineering and biorisk specialists who provide subject-matter expertise to various national institutions in the African region and internationally. This year saw the inaugural training offerings in maintenance and management of high-containment facilities (Biocontainment Engineering) and in the selection, installation, maintenance, and certification of Biological Safety Cabinets (Level 1) under the Regional Training and Certification Programme for Biosafety and Biosecurity Professionals.

The NICD partnered with the Data for Health (D4H) initiative in 2019 to focus on three activities: advancing Data to Policy (D2P), development of the Public Health Bulletin South, and improving Scientific Communications. In 2024, six new policy briefs were produced and presented at the Policy Forum in November 2024 as part of the D2P programme. A further 10 new mentors from the 2024 D2P graduate cohort will enrol in the foundations course in 2025, ensuring the continued growth and sustainability of technical expertise. The PHBSA recorded several key successes for the year under review.

The NICD IT Department demonstrated strategic foresight, operational efficiency, and a sustained commitment to innovation. A key area of focus was the prioritisation of cybersecurity and digital transformation to future-proof the institution against rising digital threats.

The South African Field Epidemiology Training Programme (SAFETP) uses an established applied epidemiology curriculum, providing an accredited Master of Science (MSc) degree from either the University of Pretoria or the University of the Witwatersrand with practical field experience. In addition to the Advanced tier, the SAFETP offers the Frontline and Intermediate tiers. The significant output of the SAFETP was the graduation of 26 FETP Intermediate trainees, 75 Frontline trainees, and 46 health professionals trained in provinces and Eswatini in using applied epidemiology methods to improve surveillance capacity.

The SCF serves as a central platform for Next-Generation Sequencing support, providing essential services for research and genomic surveillance. During the 2024/25 financial year, the SCF provided support across multiple activities, including routine surveillance, outbreak response, research, and diagnostics (proof-of-concept studies). The SCF processed and sequenced 25,075 samples during the period under review. The SCF provided critical support for multiple outbreaks, including *Salmonella typhi, Vibrio cholerae, Corynebacterium diphtheriae*, and mpox. For each of these outbreaks, the SCF delivered comprehensive support encompassing sequencing and subsequent data analysis, thereby facilitating rapid public health decision-making.

APPRECIATION

I extend my sincere appreciation to the NHLS leadership, the Board, and the NDoH for their steadfast support and guidance throughout the 2024/25 financial year. We are equally grateful to our partners, funders, and collaborators – your contributions and encouragement have been invaluable. Above all, I commend the NICD staff for their dedication, expertise, and unwavering commitment to advancing public health. Despite the challenges of the past period, your resolve, commitment, and dedication have remained resolute.

DEPUTY DIRECTOR'S OVERVIEW

DR NATALIE MAYET

Deputy Director

THE DIVISION OF BIOSAFETY AND BIOSECURITY

The Division of Biosafety and Biosecurity (DBB) provides specialised services to the NICD and NHLS for Biorisk Management, i.e., Biosafety, Biosecurity, and Biocontainment Engineering, to ensure the safe and secure operation of high- and maximum-containment laboratory infrastructure. The Division has built the capacity of a team of biocontainment engineering and biorisk specialists who provide subject matter expertise for various national institutions, the African region, and internationally. The Division manages the issuing and reports on the use of legislative National Department of Health (NDoH) Diagnostic and Research Import/Export Blanket Permits.

The Regional Diagnostics Demonstration Centre (RDDC) that was certified as the first Regional Centre of Excellence for Biosafety and Biosecurity (RCoEBB), serving primarily the Southern Africa Region, continues to be a benchmark with its regional subject matter experts providing mentorship for the newly established centres of excellence for the Eastern Africa Region (in Dar es Salaam, Tanzania) and in Western Africa (Dakar, Senegal). This year saw the inaugural training offerings of the Maintenance and Management of High Containment Facilities (Biocontainment Engineering) and the Selection, Installation, Maintenance, and Certification of Biological Safety Cabinets (BSC Certification) Level 1 courses of the Regional Training and Certification Programme for Biosafety and Biosecurity Professionals (RTCP-BBP). The division expanded its human capital and skills diversity with the appointment of two biorisk specialists, a project co-ordinator, and a communications specialist to bolster the team's efforts to implement the RTCP-BBP with the Africa Region.

Key milestones and activities include:

National

- Membership of the Biological Weapons Working Committee (BWWC) of the South African Council for the Non-Proliferation of Weapons of Mass Destruction (NPC).

- Membership of the national World Health Organization Joint External Evaluation (WHO JEE), National Action Plan for the Implementation of the International Health Regulations (IHR), and Biosafety and Biosecurity Technical Working Group.

- Voting membership on South Africa Bureau of Standards (SABS) technical working committees and sub-committees in the development of BSC national standards.

Training activities

- Hosted a five-day Biorisk Management for Containment Facilities Handling Biological Agents course from 8–12 April 2024. The 21 participants included 11 interns and 10 self-funded University of Pretoria personnel. The interns were trained for an additional week, 15–19 April 2024, with practical training on packaging and shipping infectious materials, as well as on working safely in high-containment facilities.

- Hosted the Enhancing Biosecurity for Facilities Handling High-Consequence Pathogens and Toxins workshop from 20–22 August 2024 in collaboration with Health Security Partners (HSP). The 21 participants represented several national departments and institutions involved in the implementation and/or performance of oversight functions on biosafety and biosecurity legislation.

- In collaboration with HSP, hosted the Regional Biosafety and Biosecurity Legal Framework Gap Analysis Workshop from 26–29 August 2024. The national multi-sectoral biosafety and biosecurity legislative review workshop identified gaps in legislation across regulations and developed an action plan to address them. The 25 participants represented several national departments and institutions involved in the implementation and/or performance of oversight functions on biosafety and biosecurity legislation. The Africa Centres for Disease Control and Prevention (CDC) Biosafety and Biosecurity Officer and the Legal Officer were in attendance to support the benchmarking effort against the Regional Legal Framework.

- Shipping of Class 6.2 infectious materials in line with IATA requirements – online webinar (attended by 38 NHLS and NICD employees) on the 27th of January 2025, followed by exam sessions on the 28th and 29th of January 2025.

- BSL3 Containment Laboratory Biorisk Management training – 4–6 February 2025 (attended by 16 NICD staff who work in containment labs).

- Bioethics basics: the ethics of using residual samples for research – 13th of February 2025 (attended by 88 registered participants nationally).

Regional

Regional Training and Certification Programme for Biosafety and Biosecurity Professionals (RTCP-BBP):

- Hosted the Curriculum Development of the Maintenance and Management of High Containment Facilities (Biocontainment Engineering) and the Selection, Installation,

Maintenance, and Certification of Biological Safety Cabinets (BSC Certification) RTCP areas of specialisation from 9–11 April 2024. This involved coordinating the support of 12 experts across Africa to review the training material and develop the examinations.

- Hosted the RTCP-BBP BioRisk Management (BRM) Level 1 training course from 22–26 April 2024. The 12 participants were drawn from eight Southern African region countries and included a member of the RTCP-BBP Examination and Certification Committee (ECC).

- Hosted the RTCP-BBP Maintenance and Management of High Containment Facilities (Biocontainment Engineering) Certification – Level 1 Training, held from 16–20 September 2024. The 21 participants were drawn from eight Southern African region countries, and a member of the RTCP-BBP Examination and Certification Committee (ECC), the Vice Chairperson, was in attendance.

- Hosted the RTCP-BBP Selection, Installation, Maintenance, and Certification of Biological Safety Cabinets (BSC Certification) – Level 1 Training, held from 14–25 October 2024. The 14 participants were drawn from eight Southern African countries and included an ECC member.

- Hosted the RTCP-BBP BioRisk Management (BRM) Level 1 training course from 2–6 December 2024. The course was attended by nine (9) Batswana participants funded by the Ministry of Health (MOH) in Botswana.

- Supported the facilitation of the RTCP-BBP BSC Certification – Level 1 Training, held from the 25th of November to the 6th of December 2024. The 11 participants were drawn from five Eastern African region countries and included a member of the ECC. The support also included mentoring local course facilitators.

- Supported the facilitation of the RTCP-BBP Maintenance and Management of High Containment Facilities (Biocontainment Engineering) Certification – Level 1 Training, held from 2–6 December 2024. The 19 participants were drawn from seven Eastern African region countries, and a member of the ECC and a representative from the Africa CDC were in attendance to observe the training and examinations. The support also included mentoring local course facilitators.

- Hosted a 13-member delegation from the Eastern Africa RCoEBB for a benchmarking visit from 9–13 December 2024. The delegation included the Director of Laboratory Services at the Tanzania Ministry of Health (MOH) and the Director of the National Public Health Laboratory (NPHL).

- In collaboration with the Africa CDC, hosted the RTCP-BBP BioRisk Management Level 1 Training, held from 17–21 February 2025. The 18 participants were drawn from seven Southern African region countries and Ghana, and included a member of the ECC.

- Hosted the two RTCP-BBP BioRisk Management (BRM) Level 1 training course sessions, one held in English and the other in Portuguese, from 24–28 March 2025. The 24 participants were drawn from all 10 Southern African countries and included an ECC member.

RTCP-BBP Aligned Training Activities:

- In collaboration with Sandia National Laboratories (SNL), DTRA/BTRP hosted the first cohort of the Southern Africa BRM Trainers' Network. The 20 participants were drawn from nine Southern

African countries and attended the five-day BRM Foundational Training from 15–19 April 2024.

- The cohort attended a five-day Core Training from 15–19 July 2024, which built on the Foundation Training. The course material included advanced courses in Engineering Controls and Laboratory Equipment, PPE, Decontamination, and Shipping of Infectious Substances.

- In collaboration with SNL/DTRA/BTRP, hosted a BioRisk Management: Train-the-Trainer (TTT) Strategies Meeting on the 2nd, 3rd, and 9th of May 2024, for an institutional expert group to develop a TTT for the Africa CDC RTCP-BBP BRM Level 1 course.

- In collaboration with Sandia National Laboratories (SNL)/DTRA/BTRP, hosted the BioRisk Management Trainer Development Programme (BRM-TDP) from 6–10 May 2024. The course was an introduction to biorisk management, biohazard identification, and the ISO 35001:2019 Standard (Biorisk management for laboratories and other related organisations) will be integrated, using GBRMC courses, into core principles for effective and sustainable training. The 18 participants were drawn from Southern African region countries, with five coming from the Ethiopian Animal Health Institute (AHI).

- In collaboration with SNL/DTRA/BTRP, hosted a Train-the-Shipper-Trainer Course from 20–24, and 27–28 May 2024. The 17 participants were drawn from 7 Southern African countries. The certified trainers then trained an additional 22 local participants for the Shipper-Trainer Course from 27–28 May 2024.

- In collaboration with SNL/DTRA/BTRP, hosted a Principles, Strategies, and Tools for Advancing Biorisk Management Training from the 29th of July to the 2nd of August 2024. This workshop targeted senior Biorisk Management practitioners from Southern Africa, Africa CDC-designated regional Biorisk Management and Biological Waste Management subject matter experts (Af-RSMEs), and representatives from other centres of excellence who are instrumental in the execution of the Africa CDC Regional Training and Certification Programme for Biosafety and Biosecurity Professionals (RTCP-BBP). The purpose of the workshop was to highlight mentoring, project management, and risk communication as critical skills for advancing Biorisk Management in South Africa and the Southern African region.

- In collaboration with SNL/DTRA/BTRP, hosted a Biorisk Management Documents and Resources to Address Biosafety & Biosecurity Gaps course, from 5–8 August 2024. The course brought together Africa CDC-designated regional Biorisk Management and Biological Waste Management subject matter experts (Af-RSMEs), who are currently serving as mentors, to highlight documents available as resources and guidance for evaluating, implementing, and improving biorisk management systems.

- In collaboration with SNL/DTRA/BTRP, hosted a Using BRM Documents & Resources to Address BS&S Gaps course from 12–15 August 2024. The course brought together Level 1 certified professionals in Biorisk Management and Biological Waste Management, under the RTCP-BBP, with the purpose of highlighting documents available as resources and guidance for evaluating, implementing, and improving biorisk management systems.

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- In collaboration with SNL/DTRA, hosted a Using BRM Documents & Resources to Address BS&S Gaps course from 11–15 November 2024. The course brought together 17 BRM professionals

to highlight documents available as resources and guidance for evaluating, implementing, and improving biorisk management systems.

- In collaboration with Emergency Management Training and Consulting (EMTC) and the U.S. Department of State, Office of Cooperative Threat Reduction, Biosecurity and Engagement Program (BEP), hosted a three-day Biorisk Management Training for Biosafety and Biosecurity Professionals from 10–12 December 2024. The course brought together 18 senior BRM practitioners from Southern Africa, Africa CDC-designated regional Biorisk Management and Biological Waste Management Level 1-certified, as well as subject matter experts (Af-RSMEs).

- Regulatory and Certification Framework for Institutions Handling High Risk Pathogens for the Africa Region: Africa CDC-led containment facility assessment – Uganda Virus Research Institute (UVRI) BSL3 Laboratory.

- Membership of the Africa CDC Southern Africa Regional Collaborating Centre (SA-RCC) Regional Biosafety and Biosecurity Regional Technical Working Group (RBB-TWG).

- Attended a multi-country consultative/ project launch meeting of the Health Security Partnership Project (HSPA) at the African Union Headquarters, Addis Ababa, Ethiopia. The project is a collaboration between the World Health Organisation (WHO)/AFRO/Hub, Africa CDC, RKI, and six African Union Member States (including South Africa) to strengthen surveillance and early warning capabilities in African countries.

International

- Qualified Experts for the United Nations Secretary-General's Mechanism for the Investigation of the Alleged Use of Chemical, Biological, or Toxin Weapons (UNSGM).

- Member of the World Health Organisation's (WHO) Technical Advisory Group on Biosafety (TAG-B).

- Co-hosted UNSGM Basic Training Course for qualified experts on the UNSGM Roster, the only training of this nature offered in Africa.

- Attended (virtually) the WHO, acting through its Department of Epidemic and Pandemic Preparedness Technical Advisory Group on Biosafety and Biosecurity (TAG-B) Meeting.

- Membership of the Planning Committee supporting the Global Research Agenda for Evidence-Based Biosafety, a collaborative project between Gryphon Scientific and the U.S. Department of State.

- Attended the Global Partnership Against the Spread of Weapons and Materials of Mass Destruction (GP)'s Plenary Meetings held in Rome, Italy, and in Ottawa, Canada.

- The Biorisk Specialist serves on the committee developing the adjunct BRM standard for biosafety professionals (adjunct to ISO35001).

PUBLICATIONS AND CONFERENCE ATTENDANCE

- Attended the Global Health Security (GHS) Conference in Sydney, Australia, from the 18th to the 21st of June 2024. Gave a presentation to share the perspectives from the Centres of Excellence in Biosafety and Biosecurity on growing efforts to build human resource capacity with demonstrable competencies in Biosafety and Biosecurity during a workshop hosted by Africa

CDC, on Regional Approaches to Strengthening Biosafety and Biosecurity Capacities: Lessons from Implementation of the Africa CDC Biosafety and Biosecurity Initiative.

- A member of the WHO Technical Advisory Group on Biosafety (TAG-B) that played a significant role in the development of the WHO Laboratory Biosecurity Guidance (2024), providing input and insights to create comprehensive guidelines that enable institutions to manage biosecurity risks in collaboration with national regulatory bodies effectively.

Click Here

https://www.who.int/publications/i/item/9789240095113

- CDC, on Regional Approaches to Strengthening Biosafety and Biosecurity Capacities: Lessons from Implementation of the Africa CDC Biosafety and Biosecurity Initiative.

- A member of the WHO Technical Advisory Group on Biosafety (TAG-B) that played a significant role in the development of the WHO Laboratory Biosecurity Guidance (2024), providing input and insights to create comprehensive guidelines that enable institutions to manage biosecurity risks in collaboration with national regulatory bodies effectively.

- Attended the 8th World One Health Congress, from the 20th–23rd of September 2024, and gave an oral presentation: "WOHC2024: SCS-17: Pandemic preparedness: detection and response" and a poster titled: "Biological Preparedness and Resilience through Evolution and Innovation of Laboratories (BIOPREVAIL): A One Health Security Innovation Initiative for Sustainable Laboratories."

- Feature article in the Global Partnership Against the Spread of Weapons and Materials of Mass Destruction Newsletter Issue No. 18: *Safeguarding health security through the strengthening of biosafety and biosecurity systems* -

Click Here

https://www.gpwmd.com/safeguarding health security?nocache=f2763003

Presentations

Attended the 66th Annual Biological Safety Conference (ABSA) in Phoenix, Arizona, USA: Delivered an oral presentation on "Establishing a Regional Training and Certification Program: *Selection, Installation, Maintenance and Certification of Biological Safety Cabinets.*"

CENTRE FOR EMERGING ZOONOTIC AND PARASITIC DISEASES (CEZPD)

CENTRE FOR EMERGING ZOONOTIC AND PARASITIC DISEASES (CEZPD)

DR JACQUELINE WEYER

Centre Head

BACKGROUND

The CEZPD is a national and regional hub of expertise for reference laboratory testing, surveillance, research, and training in the fields of viral and bacterial zoonoses and parasitic diseases. The diseases of concern to the Centre include those caused by high-consequence zoonotic pathogens, but also neglected tropical infections. These diseases include:

1. Diseases listed as Category 1 notifiable medical conditions (NMCs), such as viral haemorrhagic fevers (VHFs) (i.e., Ebola virus disease, Crimean-Congo haemorrhagic fever, Lassa fever Marburg virus disease), anthrax, botulism, yellow fever, plague, Rift Valley fever (RVF), rabies, mpox and malaria.

2. Diseases listed as Category 2 NMCs, including brucellosis, schistosomiasis (or bilharzia), and soil-transmitted helminthic infections (STHs).

3. Category 3 NMCs such as endemic and non-endemic arboviral infections, other neglected tropical diseases (NTDs), including leptospirosis and opportunistic parasitic infections, and other emerging zoonoses such as Nipah virus disease.

To respond to its mandate, the CEZPD operates ISO 15189:2022 and ISO 17025:2018 accredited laboratories, biosafety level 3 and level 4 facilities, as well as insectaries (including a mass-rearing facility). The CEZPD supports public health responses, including policy advice and technical support to the National Department of Health (DoH) and many other national and international stakeholders, including the World Health Organization (WHO) and Africa Centres for Disease Control and Prevention (Africa CDC). An illustrative example of this support was evident in the mpox outbreaks (see section 3).

SURVEILLANCE

HUMAN RABIES SURVEILLANCE

The CEZPD Special Viral Pathogens Laboratory (SVPL) is the national reference laboratory for human rabies in South Africa. The laboratory offers testing for ante-mortem and post-mortem diagnoses through a range of ISO 15189:2022 accredited tests. The SVPL curates a database of epidemiological and clinical information for all confirmed, probable, and suspected rabies cases and contributes to the accurate reporting of rabies as a Category 1 NMC through a passive surveillance approach. A rabies dashboard was developed on the NICD website in 2024, which includes human case data as well as data on animal cases in dogs and cats. In this reporting period, there were eight deaths due to human rabies associated with dog bites/exposures in South Africa.

SURVEILLANCE SUPPORTING MALARIA ELIMINATION IN SOUTH AFRICA - ANTIMALARIAL DRUG AND DIAGNOSTIC RESISTANCE MONITORING

In response to the rapid spread of artemisinin-resistant parasites across Central, East, and the Horn of Africa, the WHO has recommended that all African malaria-endemic countries strengthen their surveillance for confirmed molecular markers of antimalarial drug resistance. In 2024, the Laboratory for Antimalarial Resistance Monitoring and Malaria Operational Research (ARMMOR) incorporated a targeted amplicon deep sequencing workflow into its drug and diagnostic resistance analytical platform. In addition to providing enhanced accuracy regarding the prevalence of drug and diagnostic resistance markers, this workflow generates parasite-relatedness data. Both the PCR and deep sequencing workflows confirmed the absence of hrp2/3 double gene deletions, which enable falciparum parasites to evade detection by HRP2-based falciparum-specific rapid diagnostic tests, the point-of-care diagnostic in South Africa. Only three of 1,200 samples analysed carried validated artemisinin resistance markers. These data confirm the continued efficacy of both the recommended diagnostics and treatments. However, the strong selection for artemisinin-resistance markers in several Southern African Development Community (SADC) countries is concerning and highlights the need for continued surveillance. The relatedness analysis suggested limited local transmission in KwaZulu-Natal and Mpumalanga, emphasising the need for strong cross-border collaborations if South Africa is to achieve its elimination targets.

SURVEILLANCE SUPPORTING MALARIA ELIMINATION IN SOUTH AFRICA: MONITORING THE OCCURRENCE AND DISTRIBUTION OF MALARIA VECTORS AND INSECTICIDE RESISTANCE

The Vector Control Reference Laboratory (VCRL) monitored and mapped the Anopheles mosquito species. Surveillance data across all three of South Africa's malaria-endemic provinces (KwaZulu-Natal, Mpumalanga and Limpopo) showed the perennial presence of several malaria vector species, indicating continued high risk and receptivity for malaria. Vector surveillance and mapping are especially important because the insecticide regimen indicated for malaria vector control in endemic districts is undergoing a shift away from the use of DDT to next-generation insecticides, and because South Africa's malaria elimination campaign requires accurate vector distribution maps for forward micro-planning and outbreak response. The VCRL is additionally alerted to the range expansion of the South Asian malaria vector mosquito Anopheles stephensi, a species that poses a significant threat to malaria control and elimination in sub-Saharan Africa.

Fortunately, there are no records of this species in South Africa to date, but ongoing vigilance by vector surveillance personnel is indicated.

PLAGUE SURVEILLANCE

The Special Bacterial Pathogens Reference Laboratory (SBPRL) performed diagnostic testing for plague in susceptible rodent populations in the Nelson Mandela Bay (Coega area) to alert public health authorities to the possibility of increased human plague risk. None of the 174 rodents submitted for testing were positive for plague anti-F1 antibodies.

SURVEILLANCE FOR VIRAL HAEMORRHAGIC FEVERS

The SVPL provides referral diagnostics for Ebola virus disease, Marburg virus disease, Crimean-Congo haemorrhagic fever, Lassa and other *Mammarenavirus* infections, and yellow fever, through a passive surveillance approach. No cases of VHF were reported for the period.

NEGLECTED TROPICAL DISEASES – LABORATORY-BASED SURVEILLANCE FOR SCHISTOSOMIASIS AND SOIL-TRANSMITTED HELMINTHIASIS (STH).

The Parasitology Reference Laboratory (PRL) conducts laboratory-based surveillance for *Schistosoma* species and STHs (caused by *Ascaris lumbricoides, Trichuris trichiura, Necator americanus*, or *Ancylostoma duodenale)*. This includes the submission and retesting of stool and urine specimens at the NICD PRL. From April 2024 to March 2025, of the 617 urine and stool specimens submitted for Schistosoma ova and soil-transmitted helminth testing, 572 were positive for *Schistosoma*. No parasitic helminths were observed. Molecular analysis is to be undertaken with a focus on the detection of hybrid schistosome species.

OUTBREAKS

The CEZPD supported responses through laboratory analysis of suspected cases and assistance in case investigations in various zoonotic disease outbreaks, most notably that of mpox.

MPOX

From May to September 2024, a total of 25 mpox cases were reported in South Africa. These cases were all associated with the Clade IIb B1.20 sub-lineage of the mpox virus but were poorly linked and had no travel history except for one case (with a travel history to Peru). From February to March 2025, a total of six mpox cases were diagnosed, associated with the Clade Ib mpox virus. The index case reported a travel history to Kampala, Uganda, in January 2025. The CEZPD provided referral diagnostics, including rapid clade association and sequencing of cases. The CEZPD supported the national Mpox Incident Management Team and aided with the development of policies, procedures, and materials for risk communication and community engagement. Several lectures were provided in support of creating awareness and promoting knowledge of mpox, a rare condition in South Africa. The CEZPD supported several initiatives via the WHO and Africa CDC to aid the containment of the mpox outbreak in South Africa and elsewhere.

By the end of March 2025, the mpox outbreak was still ongoing in 15 of the 55 African Union member countries.

MALARIA

Odyssean malaria is acquired when infective *Anopheles* mosquitoes are accidentally transported to non-endemic areas, where they transmit the parasites. In March 2025, a case of odyssean malaria in Polokwane, Limpopo , was investigated by the Limpopo Department of Health with laboratory, clinical and epidemiological support from PRL and the NICD provincial epidemiologist. A national database of known odyssean malaria cases is maintained by the CEZPD.

SEAL RABIES

In collaboration with the national departments of health and agriculture and the rabies action group, the CEZPD disseminated a one-health-based risk communication and community engagement action plan relating to rabies in seals in the Western and Northern Cape.

POLICY CONTRIBUTIONS

The CEZPD serves on a number of national and regional boards, committees and advisory groups, including the WHO Global Outbreak and Response Network (GOARN) Steering Committee and Research Subcommittee; WHO Emerging and Dangerous Pathogens Laboratory Network (EDPLN); WHO Global Partnerships; WHO Malaria Policy Advisory Group (MPAG); WHO Global Malaria Programme Guidelines Development Group; WHO Orthopox Laboratory Network; Africa CDC Southern Africa Regional Integrated Laboratory and Surveillance Network (SA-RISLNET) and National Public Health Institutes (NPHI) mpox group; the South African Malaria Elimination Committee (SAMEC) Vector Control Subcommittee and Case Management Technical Working Group; Steering Committee of the Tanzanian Malaria Surveillance Initiative; the SADC Elimination 8 (E8) Vector Control Technical Working Group, Research Subcommittee and Malaria Molecular Surveillance Coordinating Group; the UNEP DDT Expert Group; the expert technical advisory group of the Mitigating Antimalarial Resistance Consortium for South-East Africa; the Roll Back Malaria (RBM) vector control working group; National mpox incident management team (IMT); National Action Plan for Health Security in South Africa (NAPHS); National Animal Health Forum (NAHF) Brucellosis Steering Committee; National Institute of Health Innovation Equity Forum; the multinational Public Health Bulletin community of practice; Natural Science Collection Facility Coordinating Committee; National Rabies Advisory Group; Joint External Evaluation Technical Working Group for Biosafety and Biosecurity (as Technical Lead); National Advisory Group on Immunisation (NAGI) mpox vaccine technical working group; ASSAf Standing Committee on Biosafety and Biosecurity; and National One Health Steering Committee. The Centre contributed to the review and development of policies, guidelines, operating procedures, and strategies, including the following:

- Legislative review for biosafety and biosecurity in South Africa.
- Guidelines on management and control of human anthrax in South Africa.
- Guidelines on the prevention of rabies in humans in South Africa.
- High consequence agents and toxins (HCATs) regional guidance document for Africa CDC/ African Society for Laboratory Medicine.
- The Africa CDC validation of African health research governance and coordination, and prioritisation framework.

DIAGNOSTIC SERVICES

The CEZPD provides specialist referral diagnostic services for the diseases mentioned in the introduction of this report. A summary of diagnostic services during the report period is provided in the CEZPD section. The PRL provided specialised diagnostic services for parasites of medical importance, employing microscopy, PCR and sequencing. Over 400 diagnostic tests were performed. Most malaria PCR tests were identified as *Plasmodium falciparum*, but *P. malariae*, *P. ovale*, and *P. vivax*, as well as dual infections, were also detected. Other interesting and unusual parasites identified included *Anthemosoma garnhami*, *Balamuthia mandrillaris*, *Bertiella* sp., *Blastocystis hominis*, *Cordylobia* sp., *Entamoeba histolytica*, *Leishmania tropica*, *Lucilia* sp., *Mansonella perstans*, *Toxoplasma gondii* and *Trypanosoma brucei* (Fig. 1).

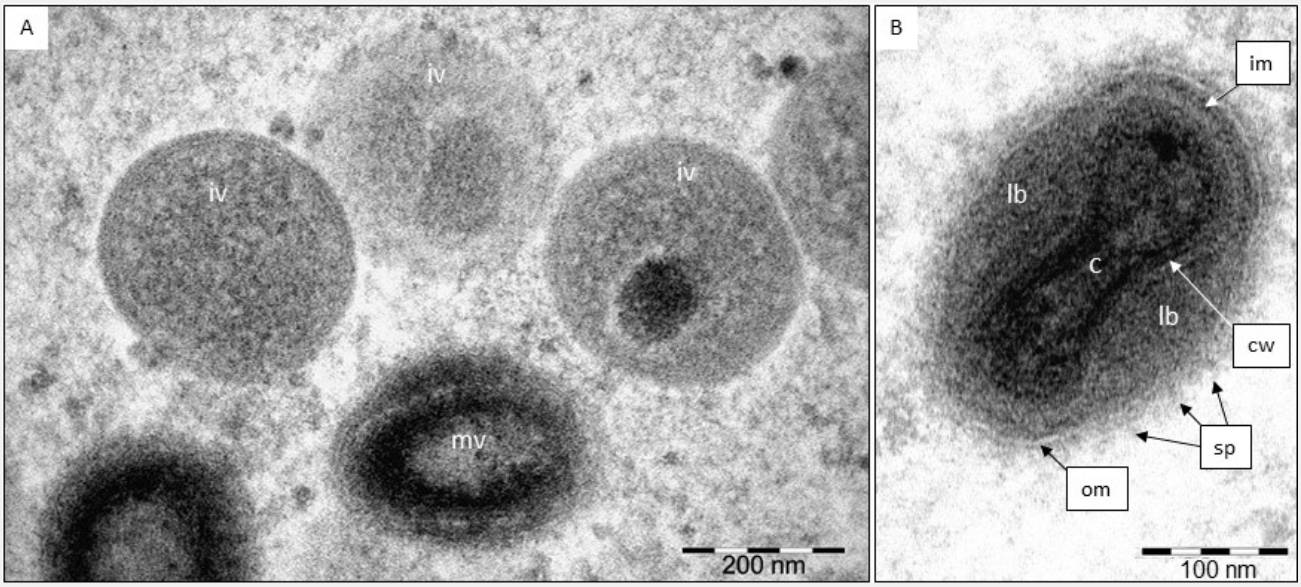


Figure 1. Photomicrographs of selected pathogens identified in the parasitology reference laboratory.

Figure 1. Photomicrographs of selected pathogens identified in the parasitology reference laboratory. (A) *Anthemosoma garnhami* (tick-borne piroplasm): 100x, Giemsa-stained thin blood smear. (B) *Trypanosoma brucei*: 100x, Giemsa-stained thin smear. (C) *Mansonella perstans* (microfilaria): 50x, Giemsa-stained thick blood smear. (D) *Echinococcus granulosis* (hydatid): 40x, protoscolex from ruptured liver cyst. Inset: rostellar hooklet. (E) *Bertiella species* (tapeworm): 40x, direct saline stool wet preparation.

Malaria microscopy quality assurance checks for the malaria control provincial program (MCP) microscopists totalled 584. The PRL, with financial support from the Global Fund and the E8 countries, continued to maintain and manage the regional malaria slide bank and proficiency testing scheme for supporting malaria laboratory diagnosis in southern African countries, as well as in Equatorial Guinea. More than 16,500 slides were manufactured for microscopist training and external quality assessment of the 21 participating regional laboratories.

The SBPRL provided specialised diagnostic services for zoonotic bacterial pathogens causing diseases, including anthrax, plague, leptospirosis, botulism and brucellosis. Of the 314 tests performed, there were 21 probable cases of leptospirosis and two laboratory-confirmed cases of brucellosis. No cases of anthrax, botulism or plague from South Africa were detected during the reporting period.

The SVPL tested 1,668 specimens, including 1,158 for mpox virus (Fig. 2). Thirty-two cases of mpox were confirmed. Twenty-five cases were diagnosed between May and September 2024, with three associated deaths. These cases were in men aged between 17 and 43, and were all typed as Clade IIb. The remaining seven mpox cases (two linked clusters of n=3 and n=4) were diagnosed in Gauteng in 2025, and all typed as Clade Ib.

Over 250 rabies tests were conducted (for both exposures and antibody immunity testing).

Figure 2. Transmission electron micrographs of the aetiological agent of mpox (*Orthopoxvirus monkeypox*). (A) Immature (im) and maturing virions (mv) are developing within the cell cytoplasm. (B) Section through an intracytoplasmic mature virion with the bi-concave core (c) of DNA and viral proteins, enclosed within a core wall (cw). lb = lateral bodies; im = inner membrane; om = outer membrane; sp = surface proteins.

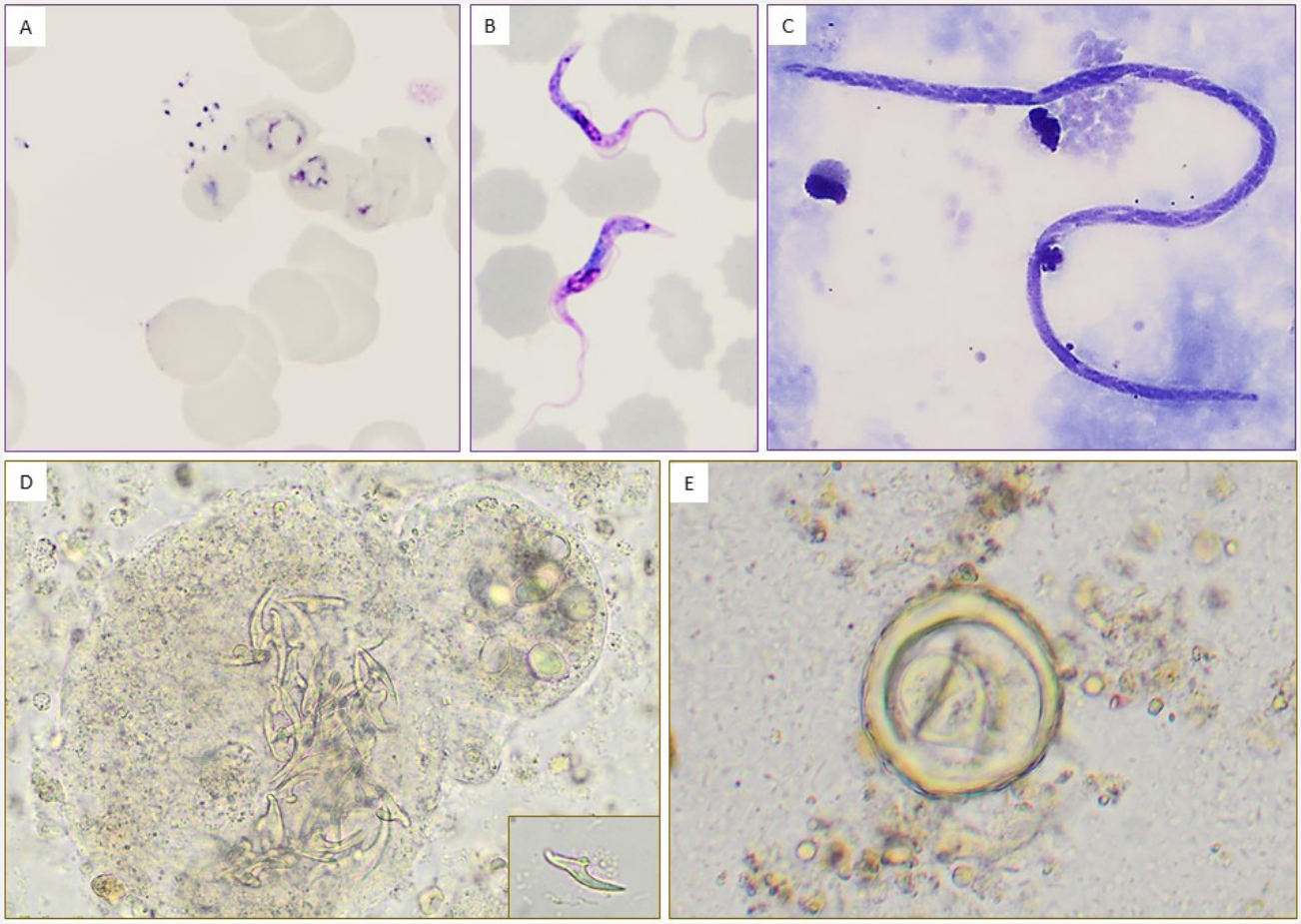


Figure 2. Transmission electron micrographs of the aetiological agent of mpox (Orthopoxvirus monkeypox)

A total of 4,321 Anopheles mosquitoes were referred to the VCRL from sentinel sites in the KwaZulu-Natal, Mpumalanga and Limpopo provinces. The presence of five malaria vector species – *Anopheles arabiensis*, *An. merus*, *An. Vaneedeni*, *An. funestus*, *An. Parensis*, which contribute to ongoing residual malaria transmission in South Africa, was identified amongst these collections.

RESEARCH ACTIVITIES

Synopses of selected research activities (also refer to research outputs under section 8):

Strengthening malaria genomic surveillance in five Elimination Eight countries

NICD investigator: J Raman
Collaborators: B Greenhouse, A Aranda-Diaz, J Smith (University of California-San Francisco), A Wesolowski (Johns Hopkins University), the National Malaria Programmes of Angola, Eswatini, Namibia, South Africa and Zambia, and M Chisenga, B Mangena, and C Sikaala (E8)

A total of 4,643 samples from five Elimination Eight countries (see https://sadce8.org/) were sequenced and analysed using a next-generation targeted amplicon sequencing and analytic platform. The P441L artemisinin resistance marker was highly prevalent in Namibia and Zambia, exceeding 30% at certain healthcare facilities, prompting the WHO to classify them as countries with possible artemisinin resistance and recommend additional testing to confirm artemisinin resistance. No *hrp2/3* gene deletions were detected, suggesting HRP2-based rapid diagnostic tests remain effective in the five participating countries. The high prevalence of *Plasmodium falciparum* co-infections with either *P. ovale* or *P. malariae* in all participating countries requires further investigation to inform case management policy.

Assessing novel/alternative methods of malaria vector control in South Africa

NICD investigators: S Oliver, C-Y Chen, A Singh, K Noeth, S Misser, A Ismail
Collaborators: W-Y Chan (Wits Diagnostic Innovation Hub), M Sibanda (African Associated Chemicals)

Available evidence shows that outdoor-resting mosquito vectors play a highly significant role in malaria transmission in South Africa's malaria-endemic regions. Indoor residual spraying (IRS) of insecticides is less effective where outdoor-resting vectors occur, enabling low levels of transmission to continue despite IRS-based control operations. This problem is compounded by insecticide resistance in target vector populations. Novel interventions are therefore needed to complement existing frontline control strategies. VCRL personnel are assessing novel control methods, including paratransgenesis. This is a form of biological control that reduces the vector competence of mosquitoes by altering their gut microbiota. We have identified a suite of bacteria common in malaria vector mosquito species across all of South Africa's malaria-endemic regions and analysed the effect of the environment on their persistence. This is an important step towards identifying potential bacterial biocontrol agents.

Towards a better understanding of human Brucellosis in South Africa

NICD investigators: J Rossouw, H Geyer, V Msimang
Collaborators: C Cordel (ExecuVet Pty Ltd), M Rostal (One Health Research Consulting), and W Karesh (One Health Concepts)

Brucellosis is a significant anthropozoonotic disease and an occupational hazard for individuals such as veterinarians, farmers, abattoir workers and laboratory technicians, who frequently handle animals or animal products.

This study aimed to improve the understanding of human brucellosis in South Africa by examining the seroprevalence and exposure factors among occupationally exposed groups, including farmworkers, veterinary professionals and abattoir workers, in parts of the Free State and Northern Cape provinces from 2015 to 2018. Additionally, a household survey including livestock owners was conducted in northern KwaZulu-Natal province during 2022 and 2023. Seroprevalence rates ranged from 4.6% to 11.6% across these groups, highlighting critical risk factors and informing targeted public health strategies to protect at-risk populations and reduce the burden of brucellosis.

Understanding Rift Valley Fever through Epidemiology, Ecology, and Socio-Economics Research in South Africa

NICD investigators: V Msimang, J Kgatitsoe, J. Coertse, J Weyer

Collaborators: C Cordel (ExecuVet Pty Ltd), P Thompson (University of Pretoria), MK Rostal (One Health Research Consulting), WB Karesh (One Health Concepts)

Rift Valley fever virus (RVFV) is endemic in South Africa, resulting in repeated and sometimes widespread outbreaks, the most recent of which was an outbreak confined to a single farm in 2018. In 1950 to 1951, 1974 to 1975 and 2008 to 2011, widespread Rift Valley fever (RVF) outbreaks were reported across South Africa, with central South Africa being the most severely affected. The 2008 to 2011 outbreaks affected at least 19,390 head of livestock and resulted in 302 laboratory-confirmed human cases. In 2015 and 2017, we conducted serological surveys of people, cattle, sheep, and goats in a 200 x 200 km area of the Free State and Northern Cape provinces in South Africa as part of a 10-year collaborative research programme. We sampled 5,541 cattle and 973 farm workers/farmers and discovered that overall seroprevalence did not change significantly over time in either community (20.4% vs 20.4% in livestock and 9% vs 9% in people). It was estimated that over 4,000 people living in the research area during 2015-16 were previously infected with RVFV based on positive RVFV serology, implying that zoonotic exposure in people working with ruminants is significantly underestimated. In addition, from July 2022 to May 2023, a survey of randomly sampled households with and without livestock was conducted in the north-eastern wards of uMkhanyakude, the northernmost district of KwaZulu-Natal province, which borders Mozambique and the Kingdom of Eswatini at a subtropical latitude and near the Indian Ocean. A total of 688 participants from 311 households of varying sizes (1-11 persons) were evaluated. Of the 673 participants, 396 (59%) were female, with an average (SD) age of 39 (18) years. The adjusted RVFV seroprevalence was 3.4% (95% CI: 2.2%-5.2%). This study assisted in the understanding of the epidemiology and ecology of RVF, particularly during the inter-epidemic period, but also provided knowledge on the socio-economic impacts of the disease in the country.

TEACHING AND TRAINING

The CEZPD supported diverse teaching and training activities on zoonotic diseases and medical parasites, as well as aspects of these related to epidemiology, vaccinology, bioinformatics, biostatistics, clinical case management, biosafety and surveillance. These efforts were aimed at enhancing the capabilities of healthcare professionals and students, not only within South Africa but also regionally. Training inputs included lectures and practicals for national (University of the Witwatersrand) and international (UK, MSF) diplomas in Tropical Medicine and Hygiene (DTM&H); a genome data analysis workshop for the SADC Elimination 8 molecular scientists; and,

together with staff of the Division of Biosafety and Biosecurity, notable inputs included the training of 17 international experts nominated to the roster of the UN Secretary-General's mechanism for investigation of alleged use of chemical, biological and toxin weapons (UNSGM), as well as International Air Transport Association (IATA) workshops for trainees from both South Africa (22 participants) and the SADC region (14 participants). Numerous lectures for tertiary academic institutes, as well as training for various DoH national and provincial programmes, were conducted. During the period under review, CEZPD staff supervised or co-supervised 41 postgraduate students (17 PhD, 21 MSc/MTech/MPH/SAFETP, and three BSc (Hons)), and graduated six PhDs, five MScs, three BSc (Hons), and two SAFETP students.

PROFESSIONAL DEVELOPMENT, AWARDS, AND HONOURS

Prof. Lizette Koekemoer was awarded the 2024 Wits Vice-Chancellor's research award in recognition of her contributions to the study of malaria and other vector-borne diseases.

RESEARCH OUTPUT

The CEZPD contributed to the publication of 41 manuscripts in peer-reviewed journals during the report period:

1. Aranda-Diaz A, Neubauer Vickers E, Murie K, Palmer B, Hathaway N, Gerlovinia I, Boene S, Garcia-Ulloa M, Cistero P, Katairo T, Semakuba FD, Nsengimaana B, Gwarinda H, Garcia-Fernandez C, Louie W, Esayas E, Da Silva C, Datta D, Kiyaga S, Wiringilimaana I, Feleke SM, Bennet A, Smith JL, Gadisa E, Parr JB, Conrad MD, Raman J, Tukwasibwe S, Ssewanyana I, Rovira-Valbona E, Tato CM, Briggs J, Mayor A and Greenhouse B. Sensitive and modular amplicon sequencing of *Plasmodium falciparum* diversity and resistance for research and public health. Sci Rep. 2025 Mar 28; 15:10737. DOI: 10.1038/s41598-025-94716-5.

2. Balestrino F, Bimbilé Somda NS, Samuel M, Meletiou S, Bueno O, Wallner T, Yamada H, Mamai W, Vreysen MJB and Bouyer J. Mass irradiation of adult Aedes mosquitoes using a coolable 3D printed canister. Sci Rep. 2024 Feb 22;14(1):4358. DOI: 10.1038/s41598-024-55036-2.

3. Berguido FJ, Settypalli TBK, Mbuyi CGT, Bakhom MT, Janse van Vuuren P, Paweska JT, Cattoli G, Grabherr R and Lamien CE. Development of a Luminex-based assay for the detection of anti-capripoxvirus and Rift Valley fever virus antibodies in domestic ruminants. Virol J. 2024; 21:335. DOI: 10.1186/s12984-024-02602-9.

4. Bosa HK, Muttamba W, Bakamutumaho B, Rwagasore E, Runumu J, Bbuye M, Sabiiti W, Nyanzi A, Weyer J, Francis J and Kapologwe NA. High prevalence and non-suppression of HIV/AIDS in the East and Central African region heighten the risk of severe outcomes for Clade I monkeypox virus infection and may be a driver for subsequent adaptation. IJID One Health. 2025; 6:100050. DOI: 10.1016/j.ijidoh.2024.1000050.

5. Chen C-Y, Chan W-Y, Ismail A and Oliver SV. Characterization of the tissue and strain-specific microbiota of *Anopheles funestus* Giles (Diptera: Culicidae). Tropical Medicine and Infectious Disease. 2024;9(4):84. DOI: 10.3390/tropicalmed9040084.

6. Chen CY and Oliver SV. The effect of larval exposure to acids and detergents on the life history of the major malaria vector *Anopheles arabiensis* Patton (Diptera: Culicidae). Pest Manag Sci. 2024 May 27. DOI: 10.1002/ps.8189.

7. Dada N, Simpson VJ, Amenga-Etego LN, Oriero E, Miotto O, Torok ME, Juma EO, Williams NA, Rajatileka S, Ariani CV, Raman J and Ishengoma DS. Towards integrated malaria molecular surveillance in Africa. Trends Parasitol. 2024 Nov;40(11):964-969. DOI: 10.1016/j.pt.2024.09.005.

8. Dangor Z, Birkhead M, Verwey C, Gray DM, Vanker A, Githinji L, Goga A, Masekela R and Zampoli M. Primary ciliary dyskinesia: meeting the challenges of diagnosis in South Africa. S Afr Med J. 2024;114(8): e2069. DOI: 10.7196/SAMJ. 2024.v114i8.2069

9. Fallah MP, Dereje N, Temfack E, Byonanebye DM, Weyer J, Mutombo PN, Misaki W, Candace E, Njai A, Strub-Wourgaft N and Sewankambo N. A call for health R&D prioritisation and governance mechanisms in Africa. The Lancet. 2025;405(10482):889-890. DOI: 10.1016/S0140-6736(25)00242-9.

10. Featherston J, Grobbelaar AA, Glass A, Goedhals D, Hoek K, Maritz J, Govender K, Govender N, Ismail A, le Roux C, Marshall T, Morobadi D, Moodley M, Moolla N, Mtshali S, Msimang V, Varda E and Weyer J. Preliminary report on the molecular epidemiology of mpox, South Africa 2024. bioRxiv 2024;11. DOI:10.1101/2024.11.07.622575.

11. Ishengoma DS, Gosling R, Martinez-Vega R, Beshir KB, Bailey JA, Chimumbwa J, Sutherland C, Conrad MD, Tadesse FG, Juliano JJ, Kamya MR, Mbacham WF, Ménard D, Rosenthal PJ, Raman J, Tatarsky A, Tessema SK, Fidock DA and Djimde AA. Urgent action is needed to confront artemisinin partial resistance in African malaria parasites. Nat Med. 2024;30(7):1807-1808. DOI: 10.1038/d41591-024-00028-y.

12. Jansen van Vuren P, Parry RH and Pawęska JT. Detection of Dengue Virus 1 and Mammalian Orthoreovirus 3, with novel reassortments, in a South African family returning from Thailand, 2017. Viruses. 2024;16(8):1274. DOI: 10.3390/v16081274.

13. Kleinhans I, Mahanjana S, Els F, Mabona M, Pitso LA, Malatje G, Kok G and Raman J. The prevalence and distribution of malaria in Mpumalanga province before and during COVID-19 (2017 - 2022). S Afr Med J. 2024;114(8):1736. DOI: 10.7196/SAMJ. 2024.v114i8.173

14. Lekota KE, Hassim A, Ledwaba MB, Glover BA, Dekker EH, Van Schalkwyk LO, Rossouw J, Beyer W, Vergnaud G and Van Heerden H. *Bacillus anthracis* in South Africa, 1975-2013: are some lineages vanishing? BMC Genomics. 2024;25(1):742. DOI: 10.1186/s12864-024-10631-5.

15. Mabona M, Baloyi RE, Shandukani MB, Mogadime M, Wanjala S and Raman J. A review of malaria trends in South Africa for the 2022-2023 malaria season based on the notifiable medical conditions surveillance system. Public Health Bulletin South Africa. 2024 (April):1-15

16. Makhanthisa TI, Guarido MM, Kemp A, Weyer J, Rostal MK, Karesh WB and Thompson PN. Characterization of mosquito host-biting networks of potential Rift Valley fever virus vectors in north-eastern KwaZulu-Natal province, South Africa. Parasit Vectors. 2024;17(1):341. DOI: 10.1186/s13071-024-06416-0.

17. Marubini E, Musekiwa A, Maposa I, Mazarire T, Sekgele W, Mabaso N, Dlamini D, Mdose H, Kuonza L and Munhenga G. *Anopheles arabiensis* larval habitats characterization and Anopheles species

diversity in water bodies from Jozini, KwaZulu-Natal province. Malar J. 2025 Feb 20;24(1):52. DOI: 10.1186/s12936-025-05287-9.

18. Maurya VK, Kumar S, Maurya S, Ansari S, Paweska JT, Abdel-Moneim A and Saxena SK. Structure-based drug designing for potential antiviral activity of selected natural product against Monkeypox (Mpox) virus and its host targets. Virus Dis. 2024; 35:589–608. DOI: 10.1007/s13337-024-00900-y

19. Mazarire TT, Lobb L, Newete SW and Munhenga G. The impact of climatic factors on temporal mosquito distribution and population dynamics in an area targeted for sterile insect technique pilot trials. Int J Environ Res Public Health. 2024 Apr 28;21(5):558. DOI: 10.3390/ijerph21050558.

20. Mazwi KD, Lekota KE, Glover BA, Kolo FB, Hassim A, Rossouw J, Jonker A, Wojno JM, Profiti G, Martelli PL, Casadio R, Zilli K, Janowicz A, Marotta F, Garofolo G and Van Heerden H. Whole genome sequence analysis of *Brucella* spp. from human, livestock, and wildlife in South Africa. Journal of Microbiology. 2024:10.1007/s12275-024-00155-8. DOI:10.1007/s12275-024-00155-8.

21. Moolla N, Baloyi RE, Coertse J, Grobbelaar A, Mogadime M, Msimang V, Ramkrishna W, Shandukani M and Weyer J. Surveillance of viral haemorrhagic fevers, Rift Valley fever and yellow fever in humans, South Africa, 2019-2023. Public Health Bulletin South Africa. 2024;(05):1-12

22. Mwamba TM, Dahan-Moss Y, Munhenga G, Maposa I and Koekemoer LL. Host preferences and impact of climate on blood feeding in *An. Funestus* group from South Africa. Tropical Medicine and Infectious Diseases 2024; 9:251. DOI: 10.3390/tropicalmed9100251.

23. Naidoo K and Oliver SV. Gene drives: an alternative approach to malaria control? Gene Ther. 2025; 32:25-37. DOI: 10.1038/s41434-024-00468-8.

24. Noeth KP, Kaiser ML, Mashatola T, Dahan-Moss YL, Matamba PA, Spillings B, Christian R, Erlank E, Tshikae BP, Jamesboy E, Sibambo S, Nkosi BG, Silawu BT, Mkhabela LJ, Ndlovu FS, Mgwenya TP, Coetzee M, Brooke BD, Koekemoer LL, Munhenga G and Oliver SV. A review of historical trends in *Anopheles gambiae* Giles (Diptera: Culicidae) complex composition, collection trends and environmental effects from 2009 to 2021 in Mpumalanga province, South Africa. Med Vet Entomol. 2025 Mar;39(1):103-114. DOI: 10.1111/mve.12761.

25. Ntuku H, Whittemore B, Dausab L, Jang IK, Golden A, Sheahan W, Wu X, Slater H, Domingo GJ, Das S, Duarte E, Eloff L, Bousema T, Lanke K, Gueye CS, Prach LM, Raman J, Uusiku P, Katokele S, Gosling R, Greenhouse B, Mumbengegwi D and Hsiang MS. Post-treatment duration of positivity for standard and ultra-sensitive *Plasmodium falciparum* antigen-based rapid diagnostic tests, a cohort study from a low-endemic setting in Namibia. eBioMedicine. 2025;11: 105489 DOI: 10.1016/j.ebiom.2024.105489

26. Odero JO, Nambunga IH, Masalu JP, Mkandawile G, Bwanary H, Hape EE, Njalambaha RM, Tungu P, Ngowo HS, Kaindoa EW, Mapua SA, Kahamba NF, Nelli L, Wondji C, Koekemoer LL, Weetman D, Ferguson HM, Baldini F and Okumu FO. Genetic markers associated with the widespread insecticide resistance in malaria vector *Anopheles funestus* populations across Tanzania. Parasit Vectors. 2024;17(1):230. DOI:10.1186/s13071-024-06315-4

27. Patel NF, Letinić BD, Lobb L, Zawada J, Dlamini DM, Mabaso N, Munhenga G and Oliver SV. Comparison of the effect of bacterial stimulation on the global epigenetic landscape and transcription of immune genes in primarily zoophilic members of the *Anopheles gambiae* complex (Diptera: Culicidae). Mol Biochem Parasitol. 2024 Jun 4;260: 111631. DOI: 10.1016/j.molbiopara.2024.111631.

28. Patel NF and Oliver SV. Generation of specific immune memory by bacterial exposure in the major malaria vector *Anopheles arabiensis* (Diptera: Culicidae). Curr Res Insect Sci. 2024 May 9;5: 100085. DOI: 10.1016/j.cris.2024.100085.

29. Pawęska JT, Storm N, Jansen van Vuren P, Markotter W and Kemp A. Attempted transmission of Marburg virus by bat-associated fleas *Thaumapsylla breviceps* breviceps (Ischnopsyllidae: Thaumapsyllinae) to the Egyptian Rousette bat *(Rousettus aegyptiacus)*. Viruses. 2024; 16(8):1197. DOI: 10.3390/v16081197.

30. Raman J and Frean J. The management of malaria in South Africa. Infectious Diseases update. 2024;13(3):6-8.

31. Singh A, Misser S, Allam M, Chan WY, Ismail A, Munhenga G and Oliver SV. The effect of larval exposure to heavy metals on the gut microbiota composition of adult Anopheles arabiensis (Diptera: Culicidae). Trop Med Infect Dis. 2024 Oct 21;9(10):249. DOI: 10.3390/tropicalmed9100249.

32. Sriruttan-Nel C, Brooke B, Dahan-Moss Y, Mabona M, Baloyi RE, Blumberg L and Frean J. Odyssean malaria in South Africa, 2014 – 2023. Public Health Bulletin South Africa. 2024 (July): 1-9

33. Sriruttan-Nel C, Cairns C, Boughan S, Moodley B, Sun LM, Chan WY, Ismail A, Mwazha A, Bennimahadeo P, Manickchund N, Moyo M, Nkwanyana T, Msimang MZ, Essa A, Frean J and Moosa M-Y. Central nervous system infection by free-living nematode *Cephalobus cubaensis* in a human host in Africa. Tropical Medicine and Infectious Disease. 2025; 10(2):37 DOI: 10.3390/tropicalmed10020037.

34. van Meer V, Pawęska JT, Swanepoel R, Grobbelaar A and Bastos AD. Genome sequencing of historical encephalomyocarditis viruses from South Africa links the historical 1993/4 savanna elephant *(Loxodonta africana)* outbreak to cryptic *Mastomys* rodents. Pathogens. 2024;13(3):261. DOI: 10.3390/pathogens13030261

35. van Zyl L, Burke AM, Koekemoer LL and Coetzee BWT. Only incandescent light significantly decreases feeding of *Anopheles funestus* s.s. (Diptera: Culicidae) mosquitoes under laboratory conditions. Parasitology Research 2024; 123:355. DOI: 10.1007/s00436-024-08370-3.

36. Vardas E, Naidoo M, Chopda, NAI, Weyer J, Ranchod AI, Moosa L, Glass AJ, Blumberg LH, Elskie J, Grayson W and Pitjadi TM. Severe mpox in an immunocompromised patient, South Africa 2024. South African Medical Journal. 2024;114(10):33-37. DOI: 10.7196/SAMJ. 2024.v114i10.2407.

37. Viljoen N, Sabeta C, Markotter W and Weyer J. Temporal and spatial analysis of rabies virus lineages in South Africa. Viruses. 2025;17(3):340. DOI: 10.3390/v17030340.

38. von Gottberg A, Kleynhans J, de Gouveia L, Tempia S, Meiring S, Quan V, du Plessis M, von Mollendorf

C, Crowther-Gibson P, Avenant T, du Plessis N, Kularatne R, Chibabhai V, Madhi SA, Klugman KP, Whitney CG, Cohen C and GERMS-SA (J Frean and C Sriruttan). Long-term effect of pneumococcal conjugate vaccines on invasive pneumococcal disease incidence among people of all ages from national, active, laboratory-based surveillance in South Africa, 2005-19: a cohort observational study. Lancet Glob Health. 2024;12(9):1470-1484. DOI:10.1016/S2214-109X(24)00263-8.

39. Watson SJ, van der Watt ME, Theron A, Reader J, Tshabalala S, Erlank E, Koekemoer LL, Naude M, Stampolaki M, Adewole F, Sadowska K, Pérez-Lozano P, Turcu AL, Vázquez S, Ko J, Mazurek B, Singh D, Malwal SR, Njoroge M, Chibale K, Onajole OK, Kolocouris A, Oldfield E and Birkholtz LM. The tuberculosis drug candidate SQ109 and Its analogs have multistage activity against Plasmodium falciparum. ACS Infect Dis. 2024 Sep 13;10(9):3358-3367. DOI: 10.1021/acsinfecdis.4c00461. Epub 2024 Aug 14.

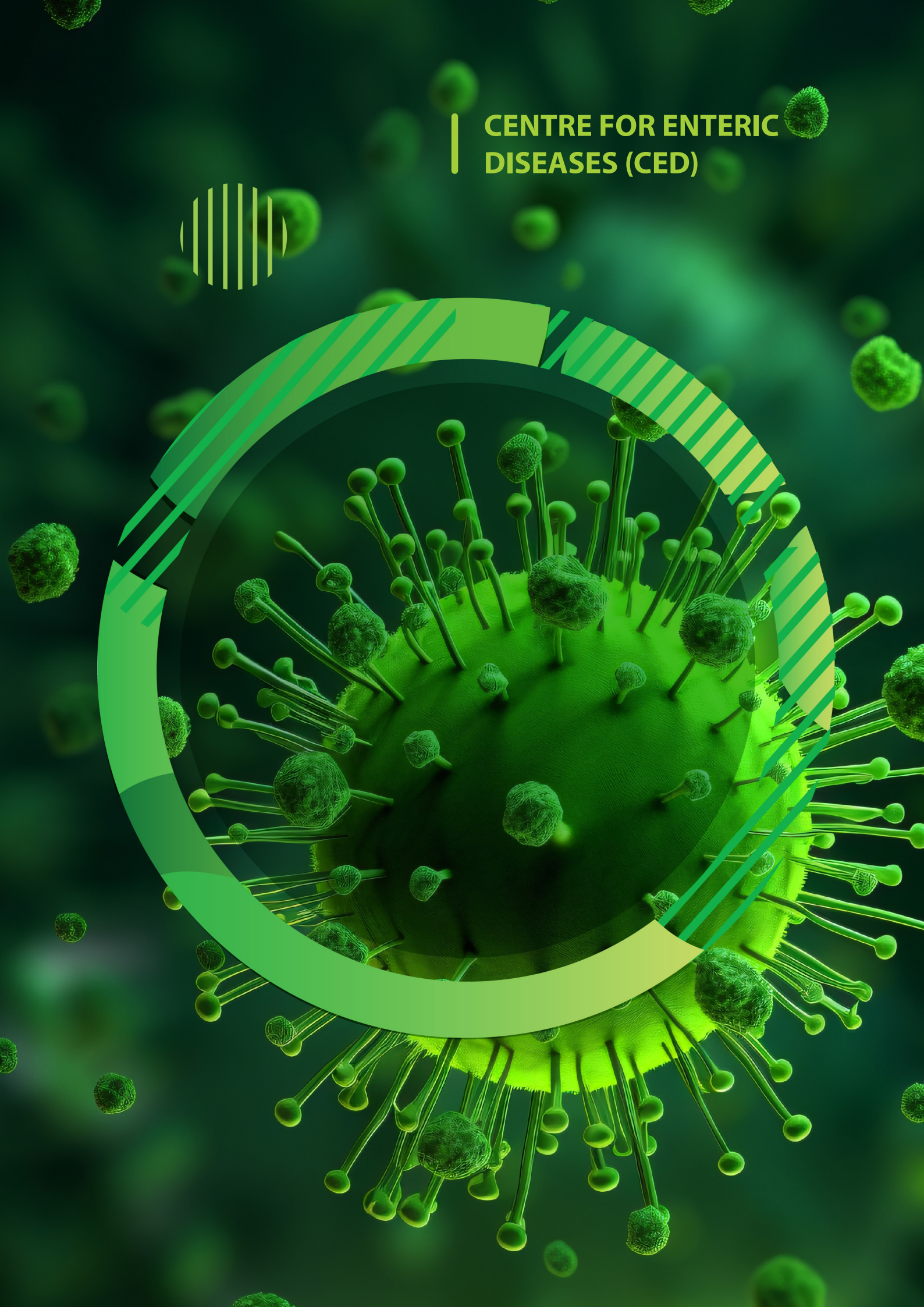
40. Weyer J, Njuguna J, Nantulya V and Wayengera M. Limit of detection of Vero-7 cell propagated Zaire Ebolavirus virions by a prototype Panfilovirus antigen rapid diagnostic test. DOI: 10.2139/ssrn.5163354

41. Woolley S, Nel J, Weyer J, Neary A, Blumberg L and Beadsworth M. Now is the time to set up formal forums for clinical advice with emerging and zoonotic infections: A shared experience. Travel Medicine and Infectious Disease. 2024; 60:102738. DOI: 10.1016/j.tmaid.2024.102738.

CONGRESSES/CONFERENCES

1. International conferences: 21
2. National and local congresses: 30

CENTRE FOR ENTERIC DISEASES (CED)



CENTRE FOR ENTERIC DISEASES (CED)

PROF. NICOLA PAGE

Acting Centre Head

BACKGROUND

The Centre is dedicated to delivering timely, locally relevant information to support the understanding, management, and prevention of enteric diseases affecting the South African population. The centre's work is driven by six key research streams:

1. **Category 1 Notifiable Medical Conditions (NMCs)** – Includes epidemic-prone diseases such as cholera, enteric fever, and listeriosis, which are under routine national surveillance.

2. **Foodborne Diseases** – Recognised globally as a major threat to food safety and security.

3. **Waterborne Diseases** – Impacting large segments of the population and often linked to widespread outbreaks, particularly in areas where access to safe water is limited.

4. **Rotavirus** – A vaccine-preventable disease with ongoing monitoring to support immunisation strategies.

5. **Syndromic Surveillance of Diarrhoeal Diseases** – Conducted at selected sites to track the prevalence of key viral and bacterial enteric pathogens.

6. **Genomic Surveillance of Priority Enteric Bacterial Pathogens** – Enables the identification of unknown outbreaks and the detection of disease clusters through advanced molecular tools.

Notable events from 1 April 2024 to 31 March 2025 included the ongoing prompt monitoring, follow-up, and screening of suspected cholera cases nationally, the emergence of *Salmonella enterica* Paratyphi A cases in the Gauteng Province, and the use of whole genome sequencing (WGS) data to detect an unreported salmonellosis outbreak caused by Salmonella Muenchen in the Gauteng Province. Centre staff regularly interact and collaborate with provincial and district structures to ensure the prompt dissemination of public health information.

SURVEILLANCE

NATIONAL CHOLERA SURVEILLANCE

From 1 April 2024 to 31 March 2025, a cumulative total of 45 suspected cholera cases were notified through the NMC system from all nine provinces. Of these, 96% (43/45) had a specimen collected for screening, and 9% (4/43) were confirmed as cases of *Vibrio cholerae*. Two of the four cases were Zimbabwean nationals who presented at Messina Hospital, Limpopo, near the Beitbridge border. Both cases were identified in April 2024 and were likely imported cases from Zimbabwe. The two other cases were identified in Nelspruit, Mpumalanga, in November 2024, and in Gauteng in February 2025. The Mpumalanga cases did not report any unusual travel history, while the Gauteng case was an Ethiopian national suspected to be a victim of human trafficking with an uncertain travel history. Three of the four isolates were confirmed as *Vibrio cholerae* O1 serovar Ogawa, with the remaining case confirmed as toxin-producing *Vibrio cholerae* using PCR on a stool specimen. For this case, no corresponding isolate was referred to CED.

Antimicrobial susceptibility testing was performed on three Vibrio cholerae isolates, and all were susceptible to azithromycin and ciprofloxacin. Three Vibrio cholerae O1 isolates were further investigated using whole-genome sequencing (WGS) analysis. In addition, 27 notifications did not meet the case definition of cholera, and these included specimens or isolates that were characterised as non-toxigenic, non-O1 *Vibrio cholerae*, *Vibrio cholera* negative, and erroneously notified cases.

Sixty-eight non-human isolates from water and food samples were also tested; 59 were non-toxigenic non-O1 *Vibrio cholerae*, one was identified as *Aeromonas hydrophila*, and the remaining eight isolates were non-viable. All suspected cholera cases reported through the NMC system or other channels were promptly investigated upon receipt of an alert or notification. The process involved close coordination with microbiologists, laboratory technologists, and clinicians, as well as the expedited referral of specimens or isolates to the CED for urgent diagnostic testing.

NATIONAL ENTERIC FEVER SURVEILLANCE

A total of 134 laboratory-confirmed cases of enteric fever were reported from eight provinces during the reporting period. The majority of cases were from Gauteng (51%, 69/134), followed by the Western Cape (17%, 23/134) and KwaZulu-Natal (13%, 17/134) provinces. No cases were reported from the Northern Cape Province. Twenty-one cases of enteric fever caused by *Salmonella enterica* Paratyphi A (*Salmonella* Paratyphi A) were reported during this period, the highest number of annual S. Paratyphi A cases observed since 2003. Nineteen cases of Paratyphi A were reported in Gauteng Province, while the Free State and North West provinces each reported single cases.

Through core-genome multilocus sequence typing (cgMLST) analysis of WGS data, a new cluster of 13 *Salmonella* Paratyphi A isolates was identified,

with cases occurring between April and October 2024. Twelve of the 13 cases resided within the City of Tshwane, Gauteng Province, with 85% (11/13) residing in the Hammanskraal area. The remaining case was from Klerksdorp, North West Province. The cases were aged between 0 and 34 years, with a median age of 9 years (IQR: 7, 12). Eighty-five per cent (11/13) of the cases were children aged below 15 years. Where gender was known, males constituted 82% (9/11) of the cases.

Four new typhoid cases belonging to the Klerksdorp cluster were identified between July and November 2024, bringing the total number of cases in this cluster to 100 since November 2020. The new cases were all reported from the Gauteng Province, which accounted for most of the cases in this cluster (GP=49, NW=37, MP=6, KZN=3, WC=3, FS=2).

Bacterial isolates were received for 84% (112/134) of total cases. Antimicrobial susceptibility testing was performed on 94 *Salmonella* Typhi isolates and 12 *Salmonella* Paratyphi A isolates. Of the 94 Salmonella Typhi isolates tested, 10 were non-susceptible to ciprofloxacin, and one isolate was multidrug-resistant. All the *Salmonella* Paratyphi A isolates were susceptible to azithromycin and ciprofloxacin. At the time of this report, WGS had been conducted on 98% (110/112) of the isolates received, including 90 *Salmonella* Typhi and 20 *Salmonella* Paratyphi A isolates. The CED continued to provide technical advice and support to the provincial and district departments of health with outbreak investigations.

NATIONAL LISTERIOSIS SURVEILLANCE

Sixty-seven laboratory-confirmed cases of listeriosis were reported from nine provinces. Most cases were from the Western Cape (33%, 22/67), followed by Gauteng (30%, 20/67) and KwaZulu-Natal (21%, 14/67). Cases were aged between 0 and 91 years, with a median age of 39 years. Persons aged 15-49 years accounted for 27% (18/67) of cases, followed by neonates aged ≤28 days (24%; 16/67) and children aged 1 month-14 years (16%; 11/67). Where sex was known, females accounted for 53% (35/66) of the cases. Seventy-five per cent (50/67) of the cases were diagnosed at public sector laboratories.

Listeria monocytogenes isolates were received for 79% (53/67) of the cases and were further investigated using WGS analysis. Isolates were characterised into 14 different sequence types, and no WGS clusters were detected. All cases of listeriosis alerted through the NMC system and NHLS corporate data warehouse (CDW) were followed up by the centre's staff to ensure the collection of additional data, a comprehensive food history, and isolate referral for WGS.

NATIONAL SURVEILLANCE FOR NON-TYPHOIDAL *SALMONELLA*

The national non-typhoidal *Salmonella* (NTS) surveillance programme is currently supported through the SeqAfrica grant from the Fleming Fund. From 1 April 2024 to 31 March 2025, 1660 NTS isolates from GERMS-SA sites were investigated using WGS analysis on the EnteroBase *Salmonella* database.

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(http://enterobase.warwick.ac.uk/species/index/senterica)

The integrated tools provided information on *Salmonella* serovar, antimicrobial resistance (AMR) determinants, multilocus sequence typing (MLST), and core-genome MLST (cgMLST). Seventy-one distinctive serovars/subspecies of Salmonella were identified. As per global trends, *Salmonella* Enteritidis and Salmonella Typhimurium were the most prevalent serovars, accounting for 72.3% of all isolates. The following serovars/subspecies completed our top six: *Salmonella* Typhi (5.1%), *S. enterica* subspecies *salamae* (2.9%), *Salmonella* Muenchen (1.9%), and

Salmonella Isangi (1.4%). Twelve per cent of isolates showed the presence of antimicrobial resistance (AMR) determinants associated with ≥1 class of antimicrobials. *Salmonella* Isangi showed the highest prevalence of AMR, was always multidrug-resistant, and showed AMR determinants associated with ≥7 classes of antimicrobials. The phylogeny of isolates was also investigated using the EnteroBase cgMLST tool to search for clusters of disease and to support outbreak investigations. Notable investigations supported by WGS included the investigation of salmonellosis cases caused by a genetically related strain of *Salmonella* Muenchen in the Gauteng Province, January–April 2024.

ACUTE DIARRHOEAL DISEASE SURVEILLANCE

Diarrhoeal disease sentinel surveillance was active at seven sites in five provinces. During the reporting period, 717 cases were enrolled (289 from Mpumalanga, 172 from the Western Cape, 129 from Gauteng, 110 from North West, and 17 from Free State) with sufficient specimens for screening in 99% of cases (716/717). Children ≤5 years constituted 67% of cases (482/717), with a median age of 11 months. Patients >5 years comprised 33% (235/717) of enrolments, with a median age of 30 years. Most cases (420/717, 59%) were inpatients. Where results were available, among children up to 15 years of age, 1.6% (7/443) were HIV-infected, while 38% (60/160) of adults 16 years or older were HIV-infected. Outcome data were available for 77% (553/717) of the enrolments, with 92% (509/553) of the cases discharged and five deaths recorded, all in children <5 years.

Rotavirus was detected in 11% of the specimens screened (77/716), with detection rates and case numbers highest between June and September 2024. Multiplex PCR testing, and bacteria was also performed. Excluding rotavirus, the most common enteric viruses detected were adenovirus (106/620; 17%; enteric and respiratory human adenovirus), norovirus (42/620; 7%), and astrovirus (35/620; 6%). Shigella spp. was the most common enteric bacterial pathogen identified (135/619; 22%), followed by *Campylobacter* spp. (26/619; 4%) and *Salmonella* spp. (11/619; 2%).

Rotavirus, norovirus, and shigellosis remain the three most common causes of diarrhoea in hospitalised children under 5 years, a finding consistent with reports in many low- and middle-income countries. Unlike children and adolescents, a large proportion (slightly more than a third) of adults hospitalised or seeking treatment for diarrhoea are HIV-infected. In these individuals, Shigella spp. are frequently detected.

OUTBREAKS

The Centre's team actively monitors and responds to alerts of suspected enteric disease outbreaks reported through the NMC system as well as other surveillance sources. The routine application of WGS as a surveillance tool has enhanced the detection of disease clusters, including small, localised outbreaks. This enabled targeted epidemiological investigations in collaboration with the Provincial Departments of Health and contributed to a deeper understanding of the complex epidemiology of certain endemic enteric diseases. As needed, the Centre provided both epidemiological and laboratory support to assist with outbreak investigations.

From 1 April 2024 to 31 March 2025, the Centre assisted with the investigation of 14 enteric outbreaks affecting 1,084 people with three deaths, and included:

- Investigations of salmonellosis cases caused

by a genetically related strain of *Salmonella* Muenchen in the Gauteng Province, January–April 2024 (n=14; no deaths reported).

- An outbreak of *Salmonella* Paratyphi A in Hammanskraal, City of Tshwane, Gauteng Province, April–October 2024 (n=17; no deaths reported).
- A foodborne disease outbreak of norovirus among police officers at the Hammanskraal Police Academy, Gauteng Province, June 2024 (n=20 cases; no deaths reported).
- Suspected foodborne disease outbreak at Waverly Care Centre, Gauteng Province, May–June 2024 (n=20; two deaths reported).
- Suspected foodborne disease outbreak among inpatients at Pelonomi Hospital, Free State , June 2024 (n=24; no deaths reported).
- Investigation of increased community-acquired diarrhoea cases presenting at Chris Hani Baragwanath Academic Hospital, Gauteng Province, July 2024 (n=50; no deaths reported).
- Investigation of a foodborne disease outbreak at Zwavelstream Mental Health Clinic, Pretoria, Gauteng Province, August 2024 (n=27; no deaths reported).
- Investigation of a suspected waterborne disease outbreak in Barberton, City of Mbombela, Mpumalanga, August 2024 (n=687; no deaths reported).
- Investigation of a foodborne disease outbreak of *Salmonella* Enteritidis in Mkhondo, Mpumalanga, September 2024 (n=61; no deaths reported).
- Suspected foodborne disease outbreak affecting primary school learners in the North of Pretoria, Gauteng Province, October 2024 (n=48; no deaths reported).
- Suspected outbreak of shigellosis in Pollsmoor Correctional Centre, Western Cape Province, November 2024 (n=5; no deaths reported).
- Foodborne disease outbreak of *Salmonella* Typhimurium, Ga-Matlala, Limpopo, November 2024 (n=6; one death reported).
- Foodborne disease outbreak of *Salmonella* Enteritidis among patrons at a restaurant on the West Coast, Western Cape Province, December 2024 (n=11; no deaths reported).
- Foodborne disease outbreak of *Salmonella* Enteritidis among mental healthcare users at Kirkwood Care Centre, Eastern Cape Province, March 2025 (n=94; one death reported).

A total of 452 foodborne outbreaks were reported on the NMC system from 1 April 2024 to 31 March 2025, of which 60% (270/452) met the NMC case definition (Table 1). The 270 verified outbreaks resulted in 3,141 enteric cases and 12 deaths, with a case fatality rate of 0.4 (Table 2).

Table 1: The number of foodborne disease (FBD) outbreak notifications on NMC by province, 1 April 202431 March 2025. PPV – positive predictive value (number of true outbreaks/total outbreaks reported).

Province	FBD outbreak case definition met	FBD outbreak case definition NOT met	Follow-up unsuccessful	Total FBD outbreaks	PPV (%)
Eastern Cape	23	18	5	46	50.0
Free State	15	2		17	88.2
Gauteng	79	54	13	146	54.1
KwaZulu-Natal	55	25	8	88	62.5
Limpopo	39	11		50	78.0
Mpumalanga	21	7	3	31	67.7
North West	22	19	1	42	52.4
Northern Cape	0	0	0	0	0.0
Western Cape	16	14	2	32	50.0
Grand Total	**270**	**150**	**32**	**452**	**59.7**

Table 2: The number of foodborne disease outbreak notifications that met the case definition and the number of reported deaths by province, 1 April 2024–31 March 2025.

Province	Foodborne disease outbreaks	Number of cases	Number of admissions	Number of reported deaths	Case fatality rate (%)
Eastern Cape	23	483	22	4	0.8
Free State	15	459	4	0	0.0
Gauteng	79	639	145	5	0.8
KwaZulu-Natal	55	689	65	1	0.1
Limpopo	39	379	43	2	0.5
Mpumalanga	21	158	6	0	0.0
North West	22	227	13	0	0.0
Northern Cape	0	0	0	0	0.0
Western Cape	16	107	4	0	0.0
Grand Total	**270**	**3141**	**302**	**12**	**0.4**

POLICY CONTRIBUTIONS

Centre staff attended the Provincial Consultative Workshop in March 2025 in Johannesburg and contributed to the Review of the National Environmental Health Policy and Strategy, the Environmental Health Norms and Standards Assessment Tool, and the Environmental Health Information Systems.

DIAGNOSTIC SERVICES

The Centre's reference laboratories offer a comprehensive range of specialised virology and bacteriology testing services. These services support diagnostic laboratories across both the public and private healthcare sectors, enabling rapid diagnostic and confirmatory testing for epidemic-prone pathogens. Testing is conducted on isolates obtained from clinical, environmental, or food specimens, as well as directly on faecal samples when appropriate. The testing portfolio includes the following:

1. Specialised rotavirus testing and rotavirus typing.
2. Specialised testing for additional enteric viruses, including astrovirus, norovirus, and sapovirus.
3. Specialised adenovirus detection and typing for acute hepatitis of unknown cause cases during 2024/25 (n=7).
4. Specialised molecular screening for enteric bacteria.
5. Specialised testing for *Vibrio cholerae*, including phenotypic and molecular testing to identify cholera-toxin producing *V. cholerae O1*.
6. Specialised phenotypic characterisation and molecular testing for diarrhoeagenic *E. coli,* including Shiga toxin-producing *E. coli*.
7. Specialised testing for *Salmonella* species, including serotyping.
8. Specialised testing for *Listeria* species.
9. WGS for enteric bacterial pathogens where indicated.

TEACHING AND TRAINING

During the reporting period, CED staff actively participated in and contributed to various teaching and training initiatives, including the following:

- **Postgraduates graduated:** One MSc and one BSc (Hons).
- **Postgraduate supervision:** Staff from the centre currently supervise five PhD students, seven MSc/MMed/MPH students, and one BSc (Hons) student.
- **Postgraduate teaching:** Field Epidemiology Training Programme (FETP); MSc Epidemiology and Biostatistics, MSc Vaccinology, MMed tutorials at the University of Pretoria, lectures at the University of Cape Town, and BSc (Health System Sciences) Public Health lectures at the University of Witwatersrand.
- **Registrar training:** Staff contributed to Microbiology and Virology registrar training courses hosted by the NICD.
- **Intern medical scientist training:** Two intern medical scientists were hosted in the centre (one Microbiology, who obtained registration in 2024, and one Virology); four intern medical scientists rotated through the centre.
- **Training in support of the Department of Health:** Cholera training for the Gauteng Province, foodborne illnesses training for eThekwini Municipality, typhoid fever training for the Limpopo, and enteric diseases surveillance for the Mozambican Ministry of Health.

PROFESSIONAL DEVELOPMENT

Two postgraduate candidates were enrolled, comprising the following:

1. MSc: 1
2. MPH: 1

Three centre staff members graduated, comprising the following:

1. Advanced Diploma in Business Management: 1
2. Postgraduate Diploma in Business Management: 1
3. Diploma in Office Administration: 1

One staff member upgraded to a B2 NRF rating.

RESEARCH OUTPUT

JOURNAL ARTICLES

1. Shirinda H, **Smith AM**, Prinsloo B, Kock MM, Moodley M, Said M, Ehlers MM. Clostridioides difficile hypervirulent strain ST1 isolated from clinical stool specimens obtained from three provinces in South Africa. Anaerobe 2025; 91:102926. DOI: 10.1016/j.anaerobe.2024.102926.

2. Kanzi AM, Smith SI, Msefula C, Mwaba J, Ajayi A, Kwenda G, Tanui CK, **Smith AM**, Bester LA, Derra FA, Yamba K, Banda DL, Kalule JB, Kumburu HH, Fakim YJ, Sithole N, Njage PMK, Chikuse FF, Ondoa P, Tessema SK, Foster-Nyarko E. Expediting pathogen genomics adoption for enhanced foodborne disease surveillance in Africa. Lancet eBioMedicine 2025; 111:105500. DOI: 10.1016/j.ebiom.2024.105500.

3. Brummer B, **Smith AM**, Modise M, Thomas J, Mdose H, Mokoena R, Baleni D. Whole genome sequencing-assisted outbreak investigation of Salmonella Enteritidis at a hospital in South Africa, September 2022. Access Microbiology 2024; 6: 000835.v3. DOI: 10.1099/acmi.0.000835.v3.

4. Mohammed SE, Hamid O, Abdelrahim M, Ismail A, **Smith AM**, Allam M. Genomic sequence data of a drug-resistant Pseudomonas aeruginosa producing Tripoli Metallo-β-lactamase 1 isolated from Sudan. Data in Brief 2024; 57:111040. DOI: 10.1016/j.dib.2024.111040.

5. Kalule JB, Bester LA, Banda DL, Abera-Derra F, Msefula C, **Smith AM**, et al. Molecular epidemiology and AMR perspective of diarrhoeagenic Escherichia coli in Africa: A systematic review and meta-analysis. Journal of Epidemiology and Global Health 2024; 14:1381-1396. DOI: 10.1007/s44197-024-00301-w.

6. Ogundare ST, Fasina FO, Makumbi J-P, Van Der Zyl GA, Geertsma PF, Kock MM, **Smith AM**, Ehlers MM. Epidemiology and antimicrobial resistance profiles of pathogenic Escherichia coli from commercial swine and poultry abattoirs and farms in South Africa: A One-Health approach. Science of the Total Environment 2024; 951:175705. DOI: 10.1016/j.scitotenv.2024.175705.

7. **Smith AM**, Ramudzulu M, Munk P, Avot BJP, Esterhuyse KCM, van Blerk N, Kwenda S, **Sekwadi P**. Metagenomics analysis of sewage for surveillance of antimicrobial resistance in South Africa. PLOS One 2024; 19(8): e0309409. DOI: 10.1371/journal.pone.0309409.

8. Hamiwe T, White DA, Kwenda S, Ismail A, Klugman S, van Bruwaene L, Goga A, Kock MM, **Smith AM**, Ehlers MM. Detection of the epidemic Pseudomonas aeruginosa AUST-03 (ST 242) strain

in people with cystic fibrosis in South Africa. Pediatric Pulmonology 2024; 59:3340-3348. DOI: 10.1002/ppul.27202.

9. Strasheim W, Lowe M, **Smith AM**, Etter EMC, Perovic O. Whole-genome sequencing of human and porcine Escherichia coli isolates on a commercial pig farm in South Africa. Antibiotics 2024; 13(6):543. DOI: 10.3390/antibiotics13060543.

10. **Sekwadi P, Ngomane HM, Disenyeng B, Tau N, Smouse SL, Smith AM**, Thomas J, Page NA, Erasmus L. Enteric fever surveillance report, South Africa, 2020-2023. Public Health Bulletin South Africa 2024; 1;

Click Here

https://www.phbsa.ac.za/enteric-fever-surveillance-report-2020-2023/

11. Mattock J, Chattaway M-A, Hartman H, Dallman TJ, **Smith AM**, Keddy KH, Petrovska L, Manners EJ, Duze ST, **Smouse SL, Tau NP**, Timme R, Baker DJ, Mather AE, Wain J, Langridge GC. A OneHealth perspective on Salmonella enterica Serovar Infantis, an emerging human multidrug-resistant pathogen. Emerging Infectious Diseases 2024; 30:701-710.

Click Here

https://wwwnc.cdc.gov/eid/article/30/4/23-1031_article.

12. Preiser W, Venter M, **Page NA**, Burt FJ. The Southern African Society for Virology. S Afr J Infect Dis 2024; 30;39(1):672. DOI: 10.4102/sajid.v39i1.672.

13. **Page N, Nadan S**, Johnstone S, **Kruger T, Netshikweta R, Strydom N, Sekwadi P**, Groome M. Trends in enteric virus circulation in children <5 years of age at selected sentinel sites in South Africa from 2009 to 2023. Public Health Bulletin South Africa 2024; Oct.

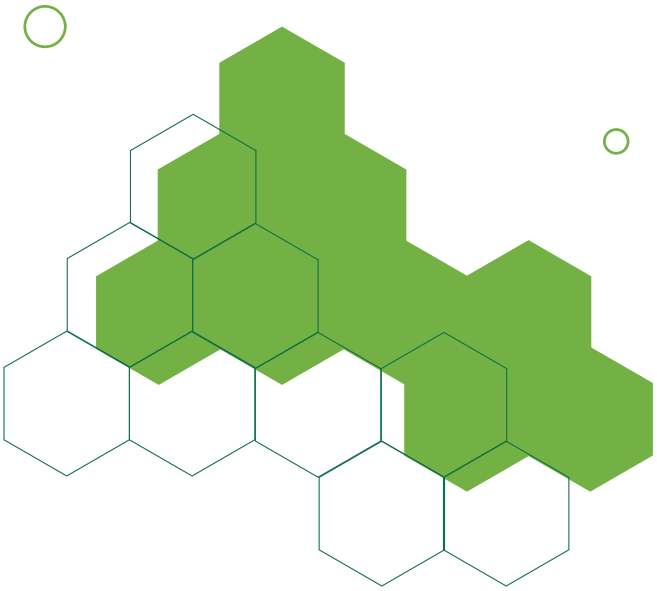
Click Here

https://www.phbsa.ac.za/understanding-enteric-virus-trends-insights-from-2009-to-2023/.

PRESENTATIONS AND CONFERENCES

Centre staff presented the following presentations at conferences:

- National congresses: tow oral and five poster presentations
- Local congresses: 1 oral presentation



CENTRE FOR HEALTHCARE-ASSOCIATED INFECTIONS, ANTIMICROBIAL RESISTANCE AND MYCOSES (CHARM)

CENTRE FOR HEALTHCARE-ASSOCIATED INFECTIONS, ANTIMICROBIALRESISTANCE AND MYCOSES (CHARM)

PROF. VINDANA CHIBABHAI

Centre Head

BACKGROUND

The Centre for Healthcare-Associated Infections, Antimicrobial Resistance and Mycoses (CHARM) is a specialised division within the National Institute for Communicable Diseases (NICD) that plays a critical role in protecting public health in South Africa. CHARM is responsible for national surveillance of healthcare-associated infections (HAIs), antimicrobial resistance (AMR), and fungal diseases, supporting evidence-based policy and clinical decision-making. The Centre provides strategic leadership in the detection, prevention, and control of these threats through laboratory-based surveillance, outbreak investigation, research, training, and expert consultation. By generating high-quality data and insights, CHARM informs national guidelines and response strategies, contributes to the global AMR agenda, and strengthens the country's capacity to combat communicable diseases in healthcare and community settings.

IMPACT

In the year under review, the CHARM made significant strides in strengthening surveillance, capacity building, and regional collaboration in the fight against healthcare-associated infections, antimicrobial resistance, and mycoses. A major milestone was the launch of the national Antimicrobial Resistance (AMR) dashboard in September 2024, enhancing access to real-time surveillance data for stakeholders across the country. The Centre also led several key surveillance projects, including monitoring of flucytosine-resistant Cryptococcus isolates, clinical surveillance for carbapenem-resistant Enterobacterales (CRE), started integrated surveillance with both clinical and wastewater surveillance projects, a pilot study to detect hypervirulent *Klebsiella pneumoniae*, and surveillance for *Candida auris* colonisation in the Southern Africa region.

In support of capacity development, CHARM delivered multiple training programmes aimed at enhancing laboratory and clinical capacity to detect and respond to priority pathogens. The Centre continued to run external quality assessment (EQA) programmes through EQuAfrica and WHO AFRO for laboratories across the African region, reinforcing quality and consistency in diagnostic services. The Centre hosted the first mycology training workshop for technologists in November 2024. As a designated WHO Collaborating Centre for AMR and Mycology, CHARM contributed to global technical guidance and supported regional strengthening of surveillance and response systems.

SURVEILLANCE

During the reporting period, CHARM undertook a diverse portfolio of surveillance activities aimed at improving national and regional understanding of antimicrobial resistance (AMR), healthcare-associated infections (HAIs), and fungal diseases. Notably, the Centre continued its sentinel surveillance for carbapenem-resistant Enterobacterales (CRE) and *Enterobacter cloacae* complex, generating critical data on resistance patterns and clinical outcomes. In addition, the Centre initiated pilot surveillance for hypervirulent *Klebsiella pneumoniae*, an emerging threat associated with severe community-acquired infections, laying the groundwork for future national monitoring. This year, CHARM also expanded its integrated surveillance scope with a project on wastewater surveillance for CRE, offering a novel approach to the early detection of resistant pathogens in the environment and highlighting the intersection between environmental and human health.

Further advances were made in the surveillance of fungal infections, with a focused investigation into monitoring flucytosine susceptibility in *Cryptococcus* isolates from patients with recurrent disease. Findings from this work have implications for the management of cryptococcal meningitis, a major cause of morbidity and mortality among people living with HIV in South Africa. In addition, the Centre initiated pilot surveillance for hypervirulent *Klebsiella pneumoniae*, an emerging threat associated with severe community-acquired infections, laying the groundwork for future national monitoring.

OUTBREAKS

CHARM was involved in four healthcare-associated outbreaks during the year 2024. They include:

Outbreak report of *Candida krusei (Pichia kudriavzevii)* outbreak in a Neonatal unit at Mthatha Regional Hospital, Eastern Cape, February–March 2024

On 28 March 2024, the NICD, a division of the National Health Laboratory Services (NHLS), was notified of a suspected outbreak/cluster of *C. krusei* in a neonatal unit of a public-sector hospital in Mthatha in Eastern Cape province. During the analysis period (01 Jan 2023–30 March 2024), a total of 68 cases of *Candida* colonisation (n=29) and infection (n=39) were detected at the facility. Most of the affected cases were premature infants exposed to antibiotics, which puts them at risk for candidaemia. An IPC audit reported that the ward was overcrowded and lacked isolation facilities for infected patients, posing an IPC risk. The lack of basins in the staff toilets posed a risk of poor compliance with hand hygiene by the staff. None of the environmental specimens yielded the presence of *C. krusei*. While the exact source of this outbreak remained unclear, overcrowding and inadequate infection prevention and control (IPC) practices likely played a role in the transmission of *Candida krusei*.

Candida auris outbreak investigation in the neonatal ward, Mankweng Hospital, June-October 2024

On 29 August 2024, CHARM received notification of a suspected *C. auris* outbreak in the neonatal ward at Mankweng Hospital in Limpopo province. We conducted a desktop assessment of *C. auris* bloodstream infections in the neonatal unit. We noted a clustering of cases in June and a significant rise in cases during July and August. Throughout the

outbreak period, from June 2024 to October 2024, there was an average of four cases per week, totalling 27 cases. Among these 27 cases, medical information was available for 11 individuals, all of whom had positive specimens collected >3 days after admission.

Most of the affected neonates for whom clinical data were available exhibited several risk factors for candidaemia, including prematurity, low birth weight, mechanical ventilation, the presence of a central venous catheter (CVC), parenteral nutrition, and exposure to antibiotics. Although definitive proof is lacking, the presence of CVCs in nearly all affected neonates with available data suggests this could be a source of infection. The case fatality ratio was 36% (4/11).

The IPC audit revealed several breaches and suboptimal practices that increase the risk of infection transmission in healthcare settings. Bed occupancy in the ward exceeded capacity by 11 beds, and staff shortages in the intensive care unit (ICU) and isolation cubicles resulted in a patient-to-nurse ratio of 1:3 instead of the ideal 1:1. Despite the availability of supplies in the ward, adherence to hand hygiene was inadequate, a situation exacerbated by frequent water outages experienced by the hospital.

The timing of the outbreak coincided with the NHLS cyberattack, raising the possibility that the increase in cases might be due to an unnoticed outbreak and a failure to identify patients with *C. auris* timeously, resulting in delays in isolation and cohorts. All these issues likely contributed to the transmission of *C. auris* in the ward.

The outbreak highlighted challenges with bed occupancy, staff shortages, and limited access to water, which contributed to poor IPC adherence.

Suspected *Acinetobacter baumannii* outbreak in the intensive care unit, Pietersburg Hospital.

On 28 November 2024, the CHARM within the NICD, a division of the NHLS, was requested to assist with a suspected outbreak of *A. baumannii* in the ICU of Pietersburg Hospital in Limpopo province.

Notable increases occurred in August 2024 (6%) and October 2024 (6%). In respiratory cultures alone, the *A. baumannii* positivity rate increased from an overall average of 21% to 30% in June, 32% in August, and 28% in October in 2024. During the analysis period, a total of 184 cases of *A. baumannii* were identified in the ICU, representing almost half of the cases in the hospital (47%, 184/360). There was a notable increase in the absolute number of cases in the ICU during August and October 2024. Overall, the analyses demonstrated an ongoing propagated transmission of *A. baumannii* in the ICU, particularly from respiratory specimens.

Seven isolates, including five from tracheal aspirates, one from urine, and one from the environment (ventilator), were received and processed at CHARM. Analysis of the Whole-genome sequencing (WGS) data revealed that five of the isolates were sequence type (ST) 2 and two were ST1; these STs clustered separately in the phylogenetic analysis. Single-nucleotide polymorphism (SNP) analysis showed that isolates in each sub-cluster were clonally related and essentially the same, with <20 SNP differences. The relatively few days between sample collection dates (i.e., one week or less) of these isolates suggest that the patients could potentially have been

contacts, thus demonstrating person-to-person or healthcare-associated transmission of *A. baumannii* in the ICU. The analysis suggests that there is ongoing healthcare-associated transmission of A. baumannii, characterised by intermittent clusters or outbreaks in the ICU. The source remains unknown, as isolation of *A. baumannii* from a single environmental sample collected at a single time point is insufficient to confirm ventilator(s) as an extrinsic source. Nonetheless, the increase in *A. baumannii* isolates suggests suboptimal infection prevention and control (IPC) practices, as evidenced by the pattern of transmission and closely related *A. baumannii* from patients and the environment.

POLICY CONTRIBUTIONS

- Pathologists from the CHARM attended and presented at the Joint External Evaluation meetings in September 2024 on the National Action Plan for antimicrobial resistance for the period 2020-2024.

- The planning of the National Action Plan for Health Security (NAPHS) meetings took place in December 2024, January 2025, and March 2025. Pathologists from CHARM were central to these policy framework meetings to develop the AMR NAPHS for 2025-2029.

DIAGNOSTIC SERVICES

- CHARM provides reference diagnostic services to both the public and private sectors for several bacterial and fungal pathogens.

- During the financial year, molecular testing for Histoplasma (RT-PCR) was added to the SANAS-accredited scope of tests offered in the Centre.

- As a WHO collaborating centre for AMR and Mycoses, the Centre participated in the development of AMR and fungal standard operating procedures (SOPs).

RESEARCH ACTIVITIES

Surveillance for cryptococcal meningitis
NICD investigators: NP Govender, R Mashau, R Mpembe, T Maphanga, S Naicker, E. Tsotetsi, G. Sandlheni, C. Maluleka, V Chibabhai
Collaborators: GERMS-SA network

Since 2018, the WHO has recommended a combination of amphotericin B and flucytosine (5-FC) as first-line induction treatment for patients with cryptococcal meningitis. In December 2021, the South African Health Products Regulatory Authority (SAHPRA) registered 5-FC, and the South African standard treatment guideline was updated in 2022; 5-FC is expected to be widely available from 2023 (included in the NDOH antimicrobial tender). The centre initiated isolate-based surveillance for Cryptococcus at sentinel hospitals in 2022 to screen recurrent episode isolates for 5-FC resistance. This surveillance project ended in June 2024. One hundred and eighty-five isolates from recurrent cryptococcal cases were tested for flucytosine susceptibility.

Fungal-SURV: Fungal disease surveillance and capacity in southern Africa NICD investigators: NP Govender, S Jallow, R Mashau, TM Mwamba, R Mpembe, C Maluleka, T Maphanga, S Naicker and G Greene
Collaborators: Africa CDC, National Departments of Health for Angola, Botswana, Eswatini, Lesotho, Mozambique, Namibia, Zambia and Zimbabwe

This project aims to improve the capacity to perform surveillance, identification, and genomic epidemiology of fungal pathogens in Southern Africa. During the reporting period, the Centre began work to set up a regional network for fungal

genomic surveillance, collaborating with Ministry of Health-supported national reference laboratories to ensure the sustainability of surveillance activities. Laboratory training was conducted at NICD for partner countries, and initial batches of isolates were shared for identification, antimicrobial susceptibility testing, and WGS.

TEACHING AND TRAINING

UNDERGRADUATE

Several CHARM staff are joint appointees at universities and contributed to the teaching and training of undergraduate students. This included medical, dentistry, nursing, and pharmacy students. Training was lecture-based or blended learning and related to themes applicable to CHARM as well as general microbiology. The Centre participated in the following undergraduate teaching programmes:

- MBBCh GEMP (University of the Witwatersrand).
- BDS - (University of the Witwatersrand).
- BScHons Biochemistry (vaccines) (University of Johannesburg) MBChB- University of Pretoria.

POSTGRADUATE LEVEL

Several CHARM staff are joint appointees at universities and contribute to on-site and off-site teaching and training activities, as well as online courses. These courses included the Wits DTM&H, NICD core and intensive registrar training. CHARM conducted a 2-and-a-half-day intensive advanced laboratory mycology training course for registrars in November 2024. A similar course was also offered to medical technologists in November 2024. The Centre participated in the following postgraduate teaching programmes:

- MMed (Pathology) molecular course (University of the Witwatersrand).
- DTM&H (University of the Witwatersrand).
- MSc Vaccinology (University of the Witwatersrand).
- MSc Epidemiology and Biostatistics (University of the Witwatersrand).
- Research supervision: PhD, MSc, MTech, MSc (SAFETP), and MMed.

Other training:

- CHARM contributed to the NICD's intern scientists training programme during the year.
- Intensive Mycology course for technologists.

A two-and-a-half-day training of technologists from NHLS laboratories performing diagnosis of fungal infections (specifically moulds) was hosted by the centre in November 2024. The training focused on the practical approach for the recognition and diagnosis of fungal (especially moulds) infections.

- A regional training workshop for 28 participants from the southern African region, Qualifying the Workforce for AMR Surveillance (QWArS – photo below), over two weeks in March 2025, was held at the NICD Biosafety and Biosecurity Centre, facilitated by staff at the CHARM. The training focused on standardised procedures for antimicrobial susceptibility testing and microbiology laboratory equipment maintenance.

PROFESSIONAL DEVELOPMENT

The Centre hosts several enrolled PhD and MSc students:

- MMed: 6
- MSc: 3
- BScHons Honours: 1

Three postgraduate students graduated during the year:

- BHSc Honours: 1
- MMed: 1
- PhD: 1

In addition to hosting students, the Centre also encourages its staff members to develop professionally. Staff have participated in the following developmental courses:

1. Ms Ruth Mpembe: attended EUCAST mould antifungal susceptibility testing training over two weeks in October 2024 at the Statens Serum Institut, Copenhagen, and Denmark.

2. Dr Caroline Maluleka is registered for a Master's in Medical Mycology (University of Exeter).

3. Prof. Vindana Chibabhai was selected to participate in the inaugural Southern African cohort of the WomenLift Health leadership programme 2025

RESEARCH OUTPUT

1. Shirinda, H., Smith, A.M., Prinsloo, B., Kock, M.M., Moodley, M., Said, M. and Ehlers, M.M., 2025. *Clostridioides difficile* hypervirulent strain ST1 isolated from clinical stool specimens obtained from three Provinces in South Africa. *Anaerobe*, *91*, p.102926. https://doi.org/10.1016/j.anaerobe.2024.102926

2. Prinsloo, B., Shirinda, H., Smith, A., & Ehlers, M. (2025). Toxigenic profiles of clinical *Clostridioides difficile* in public and private healthcare settings in Gauteng, South Africa. *International Journal of Infectious Diseases*. 2025 Mar 1; 152:107745. https://doi.org/10.1016/j.ijid.2024.107745

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https://doi.org/10.1016/j.ijid.2024.107745

3. Finlayson H, Chibabhai V, Jeena P, Kolman S, Lowman W, Manzini TC, Nana T, Nuttall J, Parker A, Skosana P, Ueckermann V, Wise A. The changing landscape of antimicrobial resistance and use in South Africa: The need for access to new antibiotics: A position paper. S Afr Med J. 2024 Oct 3;114(10): e2348. doi: 10.7196/SAMJ. 2024. v114i10.2348. PMID: 39508224.

4. von Gottberg A, Kleynhans J, de Gouveia L, Tempia S, Meiring S, Quan V, du Plessis M, von Mollendorf C, Crowther-Gibson P, Avenant T, du Plessis N, Kularatne R, Chibabhai V, Madhi SA, Klugman KP, Whitney CG, Cohen C; GERMS-SA. Long-term effect of pneumococcal conjugate vaccines on invasive pneumococcal disease incidence among people of all ages from national, active, laboratory-based surveillance in South Africa, 2005-19: a cohort observational study. Lancet Glob Health. 2024 Sep;12(9): e1470-e1484. doi: 10.1016/S2214-109X (24)00263-8. PMID: 39151982.

5. Meiring S, Quan V, Mashau R, Perovic O, Magobo R, Smith M, Mpembe R, von Gottberg A, de Gouveia L, Walaza S, Cohen C, Kapongo C, Mackay C, Mailula MT, Mekgoe O, Motjale L,

Phayane R, Dramowski A, Govender NP; Baby GERMS-SA. Pathogen aetiology and risk factors for death among neonates with bloodstream infections at lower-tier South African hospitals: a cross-sectional study. Lancet Microbe. 2025 Feb 17:100989. doi: 10.1016/j.lanmic.2024.100989. Epub ahead of print. PMID: 40020700.

6. Richards GA, Perovic O, Brink AJ. The challenges of difficult-to-treat *Acinetobacter* infections. Clin Microbiol Rev. 2024 Dec 10;37(4): e0009324. doi: 10.1128/cmr.00093-24. Epub 2024 Nov 18. PMID: 39555919; PMCID: PMC11629631.

7. Lowe M, Strasheim W, Chan WY, Perovic O. Bacterial and Genetic Features of Raw Retail Pork Meat: Integrative Analysis of Antibiotic Susceptibility, Whole-Genome Sequencing, and Metagenomics. Antibiotics (Basel). 2024 Jul 26;13(8):700. doi: 10.3390/antibiotics13080700. PMID: 39200000; PMCID: PMC11350697.

8. Gahimbare L, Muvunyi CM, Guessennd NAK, Rutanga JP, Gashema P, Fuller W, Mwamelo AJ, Coulibaly SO, Mosha FS, Perovic O, Tali-Maamar H, Yahaya AA. Antimicrobial Resistance in the WHO African Region: A Systematic Literature Review 2016-2020. Antibiotics (Basel). 2024 Jul 17;13(7):659. doi: 10.3390/antibiotics13070659. PMID: 39061341; PMCID: PMC11273377.

9. Strasheim W, Lowe M, Smith AM, Etter EMC, Perovic O. Whole-Genome Sequencing of Human and Porcine *Escherichia coli* Isolates on a Commercial Pig Farm in South Africa. Antibiotics (Basel). 2024 Jun 11;13(6):543. doi: 10.3390/antibiotics13060543. PMID: 38927209; PMCID: PMC11200671.

10. Ngoma N, Perovic O, de Voux A, Musekiwa A, Shuping L; for GERMS-SA. The impact of colistin-based regimens on mortality compared to other antimicrobials in patients with carbapenem-resistant Enterobacterales bacteremia in South African hospitals: a cross-sectional study. BMC Infect Dis. 2024 Jun 5;24(1):561. doi: 10.1186/s12879-024-09459-x. PMID: 38840122; PMCID: PMC11151471.

11. Amsalu G, Wen CT, Perovic O, Gebru A, Hunegnaw BM, Tadesse F, Smith M, Fikre A, Bekele D, Taddesse L, Chan GJ. Carriage of antimicrobial-resistant Enterobacterales among pregnant women and newborns in Amhara, Ethiopia. Int J Infect Dis. 2024 Jun; 143:107035. doi: 10.1016/j.ijid.2024.107035. Epub 2024 Mar 30. PMID: 38561043; PMCID: PMC11068590.

12. Mayet H, Reddy DL, Alvarez TB, Atiya Y, Govender NP, Birkhead M, Maphanga T, Pather S. Case Report of Nasal Rhinosporidiosis in South Africa. Emerg Infect Dis. 2024 Apr;30(4):766-769. doi: 10.3201/eid3004.240018. PMID: 38526207; PMCID: PMC10977841.

13. Mabena FC, Olwagen CP, Phosa M, Ngwenya IK, Van der Merwe L, Khan A, Mwamba TM, Mpembe R, Magobo RE, Govender NP, Velaphi SC, Madhi SA. Bacterial and Candida Colonization of Neonates in a Regional Hospital in South Africa. Pediatr Infect Dis J. 2024 Mar 1;43(3):263-270. doi: 10.1097/INF.0000000000004177. Epub 2023 Nov 20. PMID: 38381956.

CONFERENCES/CONGRESSES

1. International congresses: 5
2. National congresses: 5
3. Local congresses (University Research Days): 3

CHARM staff attending the Qualifying the Workforce for AMR Surveillance (QWArS) Training (17 - 20 March 2025)

World Antimicrobial Awareness Week (18 November 2024)

CENTRE FOR HIV AND STIs (CHIVSTI)

CENTRE FOR HIV AND STI (CHIVSTI)

PROF. ADRIAN PUREN

Centre Head

BACKGROUND

Sexually transmitted infections (STIs), including those caused by the human immunodeficiency virus (HIV), types 1 and 2, remain a major public health problem in Africa. Published estimates from the Joint United Nations Programme on HIV/AIDS show that South Africa has the highest burden of HIV infections, with recent estimates of 7.8 million people living with HIV.

The National Institute for Communicable Diseases (NICD) Centre for HIV and STIs (CHIVSTI) has a strong track record in the research disciplines of HIV virology, HIV immunology, HIV/STI epidemiology, HIV/STI diagnostics, and HIV-STI interactions.

The CHIVSTI addresses the challenges of HIV and STI diseases through various programmes:

1. Surveillance of disease burden and antimicrobial resistance.
2. Measurement of endpoint infections and detection.
3. Broadly neutralising antibodies as part of prophylactic HIV vaccine and antibody-mediated protection clinical trials.
4. Exploring an HIV "cure" strategy, and
5. Development and implementation of reference diagnostics and implementation science.

The CHIVSTI consists of the following four sections:

1. HIV Virology.
2. Cell Biology.
3. HIV Molecular and Serology, and
4. Sexually Transmitted Infections.

The centre also provides a suitable academic environment for successfully supervising undergraduate and postgraduate students and postdoctoral fellows. The centre has well-established links and collaborations with key national and international organisations in HIV and STIs.

SURVEILLANCE

HIV SURVEILLANCE IN PREGNANT WOMEN

The Antenatal Clinic (ANC) HIV survey is a biannual survey aimed at monitoring trends in HIV prevalence, incidence, coverage of HIV testing, viral load suppression, and the syphilis cascade among pregnant women attending antenatal care at 1589 public sector primary care facilities (sentinel sites). The year started with detailed and in-depth analyses of the 2022 ANC survey data, as well as plans for the 2024/25 edition of the ANC survey. SARS-CoV-2 serological testing of a subset of stored plasma samples from the 2022 ANC survey was conducted. The objective of this sub-study was to determine the prevalence of immunity (both natural and vaccine-derived) among pregnant women attending antenatal care in 2022. The analysis of samples from 9810 participants in the survey found high levels of natural and vaccine-derived immunity, which were similar across all the provinces but were lowest among pregnant women living with HIV who were not virally suppressed at a threshold of 1000 copies per millilitre. Dissemination of this report and triangulation with other SARS-CoV-2 serological surveys will continue in the next year.

HIV CASE SURVEILLANCE

The HIV Case Surveillance (CS) project aims to develop and implement a data linkage system for Persons Living with HIV (PLHIV), including a matching algorithm that helps link an individual's data and prevents duplication, using the existing NICD SDW data source (two years of retrospective data). Secondly, the CS aims to develop and implement an HIV case surveillance system to prospectively monitor the HIV care continuum of newly diagnosed and existing PLHIV. During this financial year, for the HIV CS project, we have 1) successfully added technical enhancements to the case surveillance dashboard, 2) started the pilot phase at the three beta-testing facilities located in KZN, and 3) finalised the addition of cervical cancer screening as a sentinel event to the case surveillance system. However, the pilot phase was interrupted by the cyberattack, which started in July 2024 and continued until November 2024. Overall, CS was well received and will play a crucial role in improving patient management for PLHIV. The next phase for the CS will be the pilot phase, which will be implemented in more facilities in the eThekwini and uMgungundlovu districts.

RECENCY OF HIV INFECTION SURVEILLANCE

The goal of the recency of HIV infection surveillance project is to utilise a laboratory-based recency assay to identify recent HIV infections in South Africa to assess its role in HIV epidemic control. The amended aims of the project are to: 1) assess the acceptability and feasibility of integrating LAg Avidity EIA into routine HIV Testing Services (HTS) in public sector health facilities; 2) estimate the proportion of recent infections among newly diagnosed PLHIV using the Recent Infection Testing Algorithm (RITA); and 3) describe, among patients presenting for HIV testing, demographic and health service-related factors associated with previous HIV testing/diagnosis history and recent and long-term testing on the RITA.

PAEDIATRIC SURVEILLANCE

The Centre supports the Department of Health through the analysis and reporting of HIV-related NHLS data from the NICD Data Warehouse. This includes secure online distribution via the NICD's Self Service Portal of Results for Action (RfA) reports as per National HIV Guidelines, maintenance of the NHLS HIV M&E Dashboard, and monthly aggregated

reporting on early infant diagnosis and paediatric, adolescent, and maternal HIV viral load monitoring. The Centre provides aggregated monthly and ad hoc reporting for early infant diagnosis (both testing coverage and positivity), paediatric, adolescent and adult HIV VL (monthly and rolling annual test-level and patient-level numbers of HIV viral load done and suppression rates), uptake of maternal HIV VL electronic gatekeeping codes (including antenatal, delivery and postnatal suppression rates), and HIV PCR, VL, and CD4 test rejection numbers and rates. Reporting is provided at national, provincial, district, and facility levels to the National and Provincial Departments of Health and other stakeholders, including the South Africa National AIDS Council (SANAC), as part of reporting for the Global Alliance to End AIDS in Children. These reports highlight programmatic achievements and trends, support the HIV treatment programme by identifying areas that require targeted interventions, and assist with effective monitoring thereof. As at the end of the financial year 2024/5, the number of RfA users was >1200, having more than doubled over the last 6 months of the year, with >7000 reports downloaded or distributed in the previous quarter alone.

SURVEILLANCE OF HIV DRUG RESISTANCE IN ADULT AND PAEDIATRIC PATIENTS THROUGH ROUTINE ANTIRETROVIRAL TREATMENT (ART) PROGRAMME MONITORING IN SOUTH AFRICA, 2024

In 2024, the National HIV Drug Resistance (HIVDR) surveillance study in South Africa expanded its scope to include people living with HIV (PLWH) under the age of 18 years while continuing to focus on patients with viral loads exceeding 1,000 copies/mL, indicative of treatment failure. A total of 5,713 residual plasma specimens were collected from both adult and paediatric HIV patients with viral loads exceeding 1,000 copies/mL. Of these, 742 adult and 539 paediatric samples were selected for genotypic resistance testing using next-generation sequencing (NGS) technologies. The sequencing data were analysed using the Calibrated Population Resistance (CPR) tool on Stanford HIVdb version 8.1, which enabled the detection of critical resistance patterns that inform treatment protocols. HIVDR Profile in the Adult Cohort – 2024 Surveillance Data. PRRT Resistance: Of the 686 adult PRRT sequences analysed, 35.4% had at least one Surveillance Drug Resistance Mutation (SDRM), with 1.8% having SDRMs in the protease (PI) region, 14.4% in the NRTI region, and 31.4% in the NNRTI region. Dual resistance to NRTIs and NNRTIs was observed in 10.4%, and 0.4% exhibited triple-class resistance. Integrase Resistance: Of the 693 adult integrase sequences, 2.0% carried at least one INSTI SDRM, with mutations such as G118R, R263K, and E138K. HIVDR Profile in Paediatric Cohort – 2024 Surveillance Data PRRT Resistance: Among the 450 paediatric PRRT sequences analysed, 54.7% contained at least one SDRM. Resistance was detected in the PI (1.6%), NRTI (25.6%), and NNRTI (42.4%) regions. Dual-class resistance to NRTIs and NNRTIs was observed in 14.2%, and 0.2% showed triple-class resistance. Integrase Resistance: Among 458 paediatric integrase sequences, 2.0% had at least one INSTI SDRM, with key mutations including G118R and R263K, indicating low but notable INSTI resistance. Key Trends in HIVDR in the Adult Cohort 2024 vs. Previous Years (2019-2023): A significant decline was observed from 72.1% in 2019 to 53.7% in 2023, with a further reduction to 35.4% in 2024. NNRTI Resistance: Resistance decreased from 70.5% in 2019 to 50.7% in 2023 and further declined to 31.4% in 2024. PI Resistance: Resistance rose from 2.2% in 2019 to 4.3% in 2022, then decreased to 2.2% in 2023, remaining stable at 1.8% in 2024. INSTI Resistance: INSTI resistance increased from 0.2% in 2021 to 2.3% in 2023, with a slight rise to 2.0% in 2024.

SEXUALLY TRANSMITTED INFECTIONS (STIs) SURVEILLANCE

The aetiological STI surveillance was undertaken at three primary healthcare facilities in Gauteng, KwaZulu-Natal, and the Western Cape. The data continue to validate the current STI syndromic management guidelines, with evidence of the low specificity of the vaginal syndrome algorithm. *Neisseria gonorrhoeae* (82%) remained the most typical cause of male urethritis discharge syndrome, while bacterial vaginosis (54%) was more prevalent in vaginal discharge syndrome. The relative prevalence of *Treponema pallidum* among patients presenting with genital ulcers was 28%, and 41% of ulcers were due to herpes simplex virus type 2. The section continues to monitor antimicrobial susceptibility patterns to detect the emergence of extensively drug-resistant *Neisseria gonorrhoeae*. All isolates were susceptible to the cephalosporins Cefixime and Ceftriaxone. Azithromycin-resistant isolates are circulating in the surveillance communities. Critical alerts have been reported in the country and within the EGASP network for action. As a WHO Enhanced Gonococcal Surveillance Programme (eGASP) site, the isolates' demographic, behavioural, and clinical data collected in 2023 have been published in the 2023 WHO EGASP Report. The report was launched during the World Antimicrobial Awareness Week in September 2024. The early warning surveillance site in an at-risk priority population (MSM) relocated to Rosebank from Melville. The extragenital sampling protocol aims to monitor for evolving resistance to extended-spectrum cephalosporins in *Neisseria gonorrhoeae* and emerging STIs such as lymphogranuloma venereum. Rectal *Neisseria gonorrhoeae* infection was detected in 23% of the participants, with a 20% syphilis seropositivity rate.

CONGENITAL SYPHILIS SURVEILLANCE

Congenital syphilis is a category 2 notifiable medical condition (NMC). The year saw i) continued receipt and monitoring of congenital syphilis notifications, ii) support to districts and provinces with training on congenital syphilis and the notification process, and iii) analysis and publication of the case notification and case investigation data from 2023 in a public health surveillance bulletin article. The highlights of the training were training sessions with clinicians from Northern Cape in May 2024, obstetricians and gynaecologists on the University of the Witwatersrand training circuit, and clinicians from the Western Cape in January 2025. The CS surveillance team also took part in a syphilis webinar hosted by the Southern African HIV Clinicians Society. The analysis of the case investigation form CS notification data from 2023 showed that there were 1739 congenital syphilis cases that were reported to the NICD, equivalent to 198 cases per 100 000 – higher than the global elimination target of 50 per 100 000. Most notifications (89.9%) came from four provinces – Eastern Cape, Gauteng, KwaZulu-Natal, and Western Cape, with KwaZulu-Natal alone accounting for 46% of cases. It showed there were gaps at all steps of the maternal syphilis treatment cascade – 16% of mothers who gave birth to infants with CS were unbooked, 13% were not tested during pregnancy, 28% were tested , and 56% did not receive adequate treatment for syphilis. The NDoH rolled out rapid dual HIV/syphilis testing to improve the frequency of syphilis testing, the coverage of testing, and reduce the time to treatment among pregnant women.

OUTBREAKS

The Centre continues to play a pivotal role in assessing viral escape and humoral immune responses in SARS-CoV-2-infected individuals and vaccines, and in defining correlates of protection, which have global implications for the design of second-generation vaccines.

POLICY CONTRIBUTIONS

Prof. Penny Moore continues to serve as the Director of the Global Virus Network (GVN) in South Africa and as a Taskforce Member of the Coronavirus Vaccines R&D Roadmap (CVR) – research and development (R&D) roadmap for coronavirus vaccines. Prof. Moore also serves on the Scientific Advisory Boards of multiple scientific and capacity-strengthening initiatives.

CHIVSTI was represented in the Global Alliance to End AIDS in Children by 2030 – The South African Country Plan (contributing member of the Global Alliance Technical Working Group).

CHIVSTI continues to contribute to the National Department of Health STI Technical Working Group and supports the introduction of diagnostic tests for STIs in the country. The Centre worked with the NDoH to revise guidelines for dual HIV/syphilis testing. The previous guidelines had health providers collect blood for rapid plasma regain (RPR) testing if a syphilis result was positive on a rapid test. The NHLS, on the other hand, would repeat the full testing using the traditional or reverse testing algorithm as directed by the individual laboratories. The unit took part in a meeting that recommended a change to laboratory SOPs that would allow clinicians to request RPR only.

The Centre also took part in meetings and discussions on various STI point-of-care assays in the market to understand specifications and performance. This will aid the National Department of Health in finalising a policy on STI point-of-care diagnostics.

The STI Section participated in the WHO's technical consultation on STI drug resistance to develop the WHO's integrated global action plan (i-GAP) to prevent, monitor, and respond to HIV, viral hepatitis, and STI drug resistance on the 9th and 10th of May 2024.

DIAGNOSTIC SERVICES

SURVEILLANCE IN KEY POPULATIONS

The Sero-Molecular Unit collaborated on the following surveys: PWID IBBS Survey (HIV Biobehavioural Survey among People Who Inject Drugs in South Africa using Respondent-driven Sampling). The BBS estimates the burden of HIV and other sexually transmitted infections (STIs), related risk behaviours, service utilisation, and population size, and informs progress towards reaching UNAIDS 95-95-95 targets.

ASSESSING HIV AND STI PREVALENCE AND RECENCY (AHSPIRE) IN MINING COMMUNITIES

This study focuses on individuals living in peri-mining communities in the Bojanala district of South Africa, aiming to address the increased risk of HIV infection among this population. The increased risk is attributed to their proximity to mineworkers and the surrounding active sex industry, which facilitates risky sexual behaviours. The study objectives include estimating HIV prevalence in mining communities selected for this study, assessing the recency of HIV infections among these communities using laboratory tests, and evaluating progress towards the UNAIDS 95-95-95 targets among individuals aged 18 and older residing in these communities.

HERSTORY 3 STUDY (IMPACT EVALUATION OF THE MY JOURNEY PROGRAMME IN 12 SOUTH AFRICAN SUBDISTRICTS)

The HERStory 3 Study aims to evaluate the impact of the My Journey Programme. This programme was implemented to alleviate the HIV burden among Adolescent Girls and Young Women (AGYW). The Global Fund to Fight AIDS, TB, and Malaria invested in a combination HIV prevention intervention called the My Journey Programme for AGYW in South Africa, from 2016 through to 2022. The combination intervention and primary objectives aimed to reduce HIV incidence, teenage pregnancy, and gender-based violence, and to increase retention in school and access to economic opportunities.

NATIONAL REFERENCE LABORATORY FUNCTIONS

HIV Rapid Tender (RT-41 National Tender) and Post Market Surveillance (PMS).

The HIV Sero-Molecular laboratory serves as the national Centre for HIV and Syphilis rapid test device (RTD) kit evaluation testing in its capacity as the national reference laboratory of the National Department of Health (NDoH). Evaluate HIV and syphilis rapid test devices for NDoH and provides technical reports detailing the performance of each test kit. The RT41 government tender was awarded in November 2024. The new tender catered for the introduction of the 3-test strategy as recommended by WHO where HIV test prevalence is ≤5% at the facility level. In addition, dual HIV and syphilis kits were selected. A total of seven WHO prequalified (WHO PQ) kits were approved.

Post-marketing surveillance of HIV rapid test kits and syphilis and dual HIV/syphilis rapid kits testing is conducted on test kits that have been selected as an outcome of the NDoH/National Treasury tender. The PMS programme is a key contribution to ensuring the quality of HIV and syphilis rapid testing in South Africa. The goal of this activity is to perform PMS on test devices used in public health facilities to verify that the test devices perform accurately. On completion of the batch testing by the NICD, a report on the performance of the batch is generated and submitted to the supplier and NDoH. The NICD laboratory tested 120 new batches prior to final production. Of these 120, 30 kits were from pre-production (prior to manufacture), and 90 were from the same batches post their production for distribution. This equates to 14,640 tests that were completed for the PMS programme in this reporting period. Since the new tender was awarded, the laboratory has received 22 post-production rapid kits.

HIV VACCINES TRIALS END POINT TESTING

The Centre supported endpoint testing for the following HIV trials: HVTN305, 142, 139, 135, and 705. A total of 376 samples were received in this reporting period compared to 427 specimens in the previous period, 2024-2025.

HIV TEST VALIDATIONS

- Validation on the use of Whole Blood Specimens for the HIV-1 Qualitative assay on the cobas® 8800 System (serial number WSIM005249).

- Verification of Dried Blood Spot (DBS) samples using the cobas® HIV-1/HIV-2 Qualitative kit on the cobas® 8800 System.

- Both in-house validations were assessed by the South African National Accreditation Schemes (SANAS) in February 2025 and were approved for accreditation.

DIFFICULT-TO-DIAGNOSE CASES

The Centre offers individualised diagnostic support, including a range of serological and nucleic acid tests, for infants, children, and adults for whom the HIV diagnosis is in doubt. The need for such a service has arisen on account of the decreased positive predictive value of both rapid diagnostic tests and early infant diagnostic assays, a consequence of a reduced positivity yield in the tested population, within the context of potent antiretroviral agents that have the potential to cause loss of detection. Furthermore, alternative testing platforms and diagnostic algorithms are evaluated to assist diagnostic accuracy in the field.

SPECIALISED STI TESTING

- Specialised STI reference testing (in-house and commercial PCR assays) for non-resolving STI syndromes, child abuse cases and complicated STI cases. A total of 386 cases were referred for specialised STI reference testing in the review period.

- Verification of *Neisseria gonorrhoeae* culture identification and antimicrobial susceptibility testing, referred from peripheral NHLS laboratories.

- Herpes simplex virus type 2 genotypic acyclovir resistance testing for patients with unresolved herpetic ulcers from Groote Schuur Hospital, Helen Joseph Hospital and Charlotte Maxeke Johannesburg Academic Hospital.

RESEARCH ACTIVITIES

Safety and immunogenicity of booster vaccination and fractional dosing with Ad26.COV2.S or BNT162b2 in Ad26.COV2.S-vaccinated participants

NICD Investigators: Bhiman JN, Ayres F, Balla SR, Crowther C, Hermanus T, Kaldine H, Kgagudi P, Madzivhandila M, Motlou TP, Mzindle NB, Makhado Z, Manamela NP, Mkhize Q, van Graan S, Venter EM, Moyo-Gwete T, Richardson SI, Moore PL.

Collaborators: Riou C, Ganga Y, Sawry S, Baguma R, Benede N, Bernstein M, Besethi AS, Cele S, Dhar M, Geyer S, Gill K, Grifori A, Keeton RS, Khad K, Lazarus E, Le Roux J, Lustig F, Magugu SFJ, Mosala P, Mutavhatsindi H, Nana A, Nesamari R, Mgomti A, Nkayi AA, Nkosi TP, Omondi MA, Pachia R, Patel D, Sette A, Singh U, Walters A, Garrett N, Rees H, Bekker L, Gray G, Burgers WA, Sigal A, Fairlie L.

We report the safety and immunogenicity of fractional and full doses of Ad26.COV2.S and BNT162b2 in a phase 2 trial of participants previously vaccinated with a single dose of the Ad26.COV2.S, with 1.4% showing evidence of previous SARS-CoV-2 infection. A total of 286 adults (with or without HIV) were enrolled >4 months after an Ad26.COV2.S prime and randomised 1:1:1:1 to receive either a full or half-dose booster of the Ad26.COV2.S or BNT162b2 vaccine. B cell responses and spike-specific T-cell responses were evaluated at baseline and 2-, 12- and 24-weeks post-boost. The full- and half-dose BNT162b2 boosted anti-SARS-CoV-2 binding antibody levels (3.9- and 4.5-fold, respectively) and neutralising antibody levels (4.4- and 10-fold). Binding and neutralising antibodies following half-dose Ad26.COV2.S were not significantly boosted. A full dose of Ad26.COV2.S did not boost binding antibodies but slightly enhanced neutralising antibodies (2.1-fold). Six months post-boost, antibody and T-cell responses had waned to baseline levels. Overall, in the context of hybrid immunity, boosting with the heterologous full- or half-dose BNT162b2 mRNA vaccine demonstrated superior immunogenicity 2 weeks post-vaccination compared to homologous Ad26.COV2.S.

SARS-CoV-2 correlates of protection from infection against variants of concern

NICD Collaborators: Bhiman JN, Tempia S, Kleynhans J, Madzorera VS, Mkhize Q, Kaldine H, Wolter N, Moyes J, Carrim M, Mkhencele T, von Gottberg A, Moore PL, Cohen C.

Collaborators: Sun K, McMorrow ML, Martinson NA, Kahn K, Lebina L, du Toit JD, Viboud C.

Serum neutralising antibodies induced by vaccination have been linked to protection against symptomatic and severe COVID-19. However, less is known about the efficacy of neutralising antibodies in preventing the acquisition of infection. Here, we assessed serum neutralising antibodies induced by prior SARS-CoV-2 infections as potential correlates of protection against Delta and Omicron infections. We find that, in the Delta wave, D614G neutralising antibodies mediate 37% of the total protection against infection conferred by prior exposure to SARS-CoV-2, and that protection decreases with waning immunity. In contrast, Omicron BA.1 neutralising antibodies mediate 11% of the total protection against Omicron BA.1 or BA.2 infections, due to Omicron's neutralisation escape. These findings underscore that correlates of protection are variant-specific and that boosting of nAbs against circulating variants might restore or confer immune protection lost due to nAb waning and/or immune escape. However, most immune protection against SARS-CoV-2 conferred by natural infection cannot be fully explained by serum antibodies alone. Measuring these and other immune markers, including T-cell responses, both in the serum and in other compartments such as the nasal mucosa, may be required to comprehensively understand and predict immune protection against SARS-CoV-2.

Safety, effectiveness and immunogenicity of heterologous mRNA-1273 boost after prime with ad26.cov2.s among healthcare workers in South Africa: the single-arm, open-label, phase 3 SHERPA study

NICD Collaborators: Richardson SI, Moyo-Gwete T, Moore PL.

Collaborators: Garrett N, Reddy T, Yende-Zuma N, Takalani A, Woeber K, Bodenstein A, Jonas P, Engelbrecht I, Jassat W, Moultrie H, Bradshaw D, Seocharan I, Odhiambo J, Khuto K,, Omondi MA, Nesamari R, Keeton RS, Riou C,, Innes C, Zwane Z, Barnabas S, Lombaard J, Gill K, Nchabeleng M, Snyman E, Petrick F, Spooner E, Naidoo L, Kalonji D, Naicker V, Singh N, Maboa R, Mda P, Malan D, Nana A, Malahlena M, Kotze P, Allagappen JJ, Diacon AH, Kruger GM, Patel D,, Burgers WA, Anteyi K, Leav B, Bekker L, Gray GE, Goga A.

Limited studies have been conducted on the safety and effectiveness of heterologous COVID-19 vaccine boosting in lower-income settings, especially those with high HIV prevalence. The Sisonke Heterologous mRNA-1273 boost after priming with the Ad26.COV2.S (SHERPA) trial evaluated an mRNA-1273 boost after Ad26.COV2.S priming in South Africa. SHERPA was a single-arm, open-label, phase 3 study nested in the Sisonke implementation trial of 500000 healthcare workers (HCWs). Of 11248 SHERPA participants in the rVE analysis cohort, 45.4% had received one and 54.6% two Ad26.COV2.S doses. Self-reported comorbidities included HIV (18.7%), hypertension (12.9%) and diabetes (4.6%). In multivariable analysis including 413161 unboosted Sisonke participants, the rVE of the booster was 59% (95%CI 29-76%) against SARS-CoV-2 infection: 77% (95%CI 9–94%) in the one-Ad26.COV2.S dose group and 52% (95%CI 13–73%) in the two-dose group. Of 11,798 participants in the safety analysis, 228 (1.9%) participants reported 575 reactogenicity

events within 7 days of the booster. There were 115 unsolicited adverse events (AEs) within 28 days of vaccination. No related serious AEs were reported. In an immunogenicity sub-study, mRNA-1273 increased binding and neutralising antibody titres and spike-specific T-cell responses 4 weeks after boosting, regardless of the number of prior Ad26.COV2.S doses or HIV status and generated Omicron spike-specific cross-reactive responses. mRNA-1273 boosters after one or two Ad26.COV2.S doses were well-tolerated, safe, and effective against Omicron SARS-CoV-2 infections among HCWs and PLWH.

Resistance mutations that distinguish HIV-1 envelopes with discordant VRC01 phenotypes from multi-lineage infections in the HVTN703/ HPRN081 trial: implications for cross resistance

NICD Collaborators: Cohen P, Lambson BE, Mkhize NN, Moyo-Gwete T, Morris L, MoorePL.

Collaborators: Moodley C, Yssel AEJ, York T, Gwashu-Nyangiwe A, Ndabambi N, Thebus R, Juraska M, deCamp AC, Williamson BD, Magaret CA, Gilbert PB, Westfall D, Deng W, Mullins JI, Williamson C.

The Antibody Mediated Prevention (AMP) trials showed that passively infused VRC01, a broadly neutralising antibody (bNAb) targeting the CD4 binding site (CD4bs) on the HIV-1 envelope protein (Env), protected against neutralisation-sensitive viruses. We identified six individuals from the VRC01 treatment arm with multi-lineage breakthrough HIV-1 infections from HVTN703, where one variant was sensitive to VRC01 (IC50 < 25 ug/mL), but another was resistant. We identified sites predicted to affect VRC01 neutralisation and assessed the effect of their reversion in the VRC01-resistant clone on neutralisation sensitivity. In four pairs, a single mutation restored partial or full sensitivity to VRC01, whereas in the fifth participant, transfer of the entire β23-V5 loop was required. Analysis of deep sequencing env data showed that VRC01 resistance was likely the property of the acquired virus. Although VRC01-resistant clones generally retained sensitivity to other CD4-binding site bNAbs, they were less potently neutralised than the VRC01-sensitive clones. In conclusion, VRC01 resistance mutations occurred through multiple mutational pathways, but sensitivity to second-generation CD4bs bNAbs was retained even in VRC01-resistant transmitted viruses, confirming the potential of these bNAbs for HIV-1 prevention studies.

Early antiretroviral treated children and adolescents with perinatally-acquired HIV-1 infection: understanding viral control and reservoir size on treatment

NICD investigators: M Paximadis, S Shalekoff, S Loubser, M Tshabalala, S Mncube, S Reddy, C Herbert, C T Tiemessen.

Collaborators: L Kuhn (Columbia University, USA), R Strehlau R (Rahima Moosa Mother and Child Hospital, Johannesburg), GM Aldrovandi (University of California, USA), AC Ka'e and J Fokam (Chantal BIYA International Reference Centre for Research on HIV/ AIDS Prevention and Management (CIRCB), Yaounde, Cameroon).

Perinatal HIV infection favours the effective decay of the HIV-1 reservoir (as measured by cellular HIV DNA, which is the sum of both intact and defective provirus) with suppressive antiretroviral therapy (ART) initiated very early (within the first week of birth). Higher pre-ART viral load and female sex are associated with greater deficits in growth trajectories through 48 weeks in the LEOPARD trial of very early ART initiation. Higher CCR5 cell surface density on CD4+ T cells in mothers and infants was associated with an increased risk of in utero HIV-1 transmission,

and a combined mother-infant low CCR5 density phenotype was protective against transmission/acquisition. In Cameroonian adolescents, starting ART in the first year of life and suppressive ART for more than 9 years were associated with low HIV-1 proviral DNA levels. Finding biomarkers predictive of low HIV-1 reservoir and understanding immunological mechanisms that underlie effective restriction of the reservoir in the presence of ART are crucial for informing interventions to test in analytical treatment interruption trials, essential in the quest to achieve ART-free remission for people living with HIV.

Implementation of the research study "Sexually transmitted infections and associated consequences in a South African private sector medical insurance scheme: cohort study"

NICD collaborators: Tendesayi Kufa-Chakezha.

Other collaborators: Nicola Low, Yann Ruffieux, Naomi Folb, Nanina Anderegg, Ayesha Kriel, Eliane Rohner, Nathalie V Fernandez-Villalobos, Andreas Haas, Chido Chinogurei, Gary Maartens, Katayoun Taghavi.

This research project uses private medical scheme data to analyse sexually transmitted syndrome diagnoses and treatment using ICD-10 codes and pharmacy scripts. It aims to evaluate the adherence to syndromic management guidelines in South Africa.

Opportunities to optimise outcomes of diagnosis and treatment of HIV and syphilis in pregnancy: the quest to eliminate maternal and vertical transmission

NICD collaborators: Kufa-Chakezha T.

Collaborators: Davey DJ, de Voux A, Shaetonhodi N, Marks M, Frigati L, Kufa-Chakezha T.

This review discusses maternal or gestational HIV infection and syphilis – causes, epidemiology, outcomes, and opportunities for integrated prevention of both HIV and syphilis, drawing lessons from the success of the prevention of vertical transmission of HIV.

Evaluating the accuracy of multiple rapid diagnostic tests for HIV detection in serum samples analysed during point-of-care proficiency testing assessments

NICD collaborators: Kufa-Chakezha T.

Collaborators: Nozuko P. Blasich, Jerom Okot, Artur Ramos, Mduduzi Buthelezi, Dumisani Shabangu, Mahlatse Maleka, Sarvashni Moodliar, Nqobile Ngoma.

This project analysed data from the NHLS national HIV point-of-care proficiency testing programme and assessed the rapid diagnostic test performance of sites enrolled in the proficiency testing scheme. The analysis found that compared to known panels, the sensitivity and specificity of Rapid Test Device (RTD) kits used from April to June 2023 were both 98.7%, with good agreement between site results and panel results. Sites in the Northern Cape have lower sensitivity, highlighting the need to strengthen training.

Ecological analysis of syphilis and HIV seroprevalence at district level using the 2022 ANC survey data.

NICD collaborators: Kufa-Chakezha T, Shangase N, Puren A.

Collaborators: Kenyon C.

This project is a secondary analysis of data collected in the 2022 edition of the ANC survey and seeks to correlate district-level maternal HIV prevalence with maternal syphilis seroprevalence.

Predictors of asymptomatic Sexually Transmitted Infections in AGYW attending family planning clinics in South Africa

NICD Investigators: Etienne Muller, Duduzile Valashiya, Bianca Da Costa Dias, Thabitha Mathega, Tendesayi Kufa.

Collaborators: Ranmini Kularatne.

In South Africa, STIs are managed syndromically, which does not detect or treat asymptomatic infections, leading to ongoing infection, transmission, and complications in persons without symptoms. We assessed STI prevalence in asymptomatic AGYW attending family planning services in selected provinces of South Africa between 2014 and 2018 and explored associations with demographic, clinical, and behavioural characteristics. A total of 37.4% of participants tested positive for an STI, with *C. trachomatis* being the most common (25.0%). Younger age at first sex was associated with a lower STI risk. HIV-positive women were significantly more likely to have an STI, while those with a history of STI treatment were at higher risk, though not statistically significant. HIV status was the strongest predictor of having an STI in this population, highlighting the need for continued sexual health education and STI prevention efforts among AGYW.

Phylo-Plex: A phylogenetically informed, low-cost amplicon sequencing platform for deployable high-resolution genomic epidemiology

NICD Investigators: Etienne Muller, Precious Mahlangu, Johanna Venter, Bianca Da Costa Dias.

Collaborators: Mathew A Beale, Vignesh Shetty, Kirsty E Ambridge, George Lacey, Sam Dougan, William Roberts-Sengier, Beth Sampher, Florent Lassalle, Matthew J Dorman, Martha Chipinduro, Tendai M. Washaya, Luanne Rodgers, Beauty Makamure, Ethel Dauya, Michael Marks, Rashida A Ferrand, Nicholas R Thomson.

Genomic pathogen surveillance is a powerful tool for public health and research, but is costly and unachievable in low-resource settings. Most sub-genomic typing methods sacrifice resolution while remaining costly. "Phylo-Plex", a novel approach that identifies information-rich genomic regions, was developed to maximise phylogenetic information while minimising the number of regions. Applied to *Treponema pallidum*, a high-resolution multiplex PCR sequencing scheme was developed for lineage tracking. Variant calls from MinION amplicon sequencing were highly correlated with Illumina whole-genome sequencing. The method was successfully deployed in a low-resource laboratory in Zimbabwe and enabled low-cost tracking of priority pathogenic lineages.

Antimicrobial resistance determinants associated with azithromycin resistance in South African Neisseria gonorrhoeae, 2017- 2021

NICD Investigators: Precious Mahlangu, Lindy Gumede, Bianca Da Costa Dias, Dumisile Maseko, Etienne Muller.

Collaborators: Odile. B Harrison, Anastasia. F Unitt.

Azithromycin (AZM) resistance among gonococci has recently been reported in South Africa. Genetic determinants associated with AZM resistance and reduced susceptibility to AZM in South African *N. gonorrhoeae* isolates were determined for isolates collected between 2017 and 2021. Four isolates resistant to AZM (minimum inhibitory concentration (MIC) > 8.0 µg/mL) contained mutations in 23S rRNA

(A2143G or C2599T) and the *mtrR* repressor gene (G45D or A39T). None of the isolates that showed reduced susceptibility to AZM (MIC = 0.25 - 1 µg/mL) had mutations in 23S rRNA, but 72% had an A39T mutation in *mtrR*. AZM-susceptible isolates (MIC = 0.016 – 0.128 µg/mL) only had a -35A deletion in the promoter region of *mtrR*. Resistant isolates belonged to LINcode lineages 0_2_21 and 1_1_17 and were the only isolates in PubMLST in these lineages to be resistant to AZM, indicative of putative spontaneous mutations conferring resistance. Enhanced genetic characterisation using whole genome sequencing and comprehensive gonococcal typing is essential to understanding local pathogen epidemiology and AMR transmission.

Neisseria gonorrhoeae antimicrobial resistance in South Africa, 2007 – 2023: implications for national sentinel surveillance

NICD Investigators: Etienne Muller, Dumisile Maseko, Tendesayi Kufa.

Collaborators: Dennis K Partl, Nanina T Anderegg, Nicola Low, Kirstin Oliveira-Roster, Yonatan H Grad, Pia Abel zur Wiesch, Roger D Kouyos.

South Africa has among the highest levels of gonorrhoea worldwide. *Neisseria gonorrhoeae* resistance develops readily, and recommended first-line gonorrhoea treatments in South Africa have changed accordingly: in 2008, from ciprofloxacin to cefixime, and in 2014, to ceftriaxone. Azithromycin has been in the regimen for genital discharge syndrome since 2014. Sentinel surveillance minimum inhibitory concentration (MIC) data collected by the NICD from 2007 to 2023 were analysed. MIC distributions were stable for ceftriaxone and cefixime, with one cefixime-resistant isolate in 2019 and no ceftriaxone resistance. Ciprofloxacin resistance increased from 27% in 2007 to 75% in 2016 and was predicted at 91% in 2023. Azithromycin resistance increased from 0.2% in 2020 to 3.3% in 2023. *N. gonorrhoeae* MICs to ceftriaxone are not increasing in South Africa. Azithromycin resistance is increasing, thereby reducing the potential effectiveness of combination regimens. Nearly all *N. gonorrhoeae* isolates were predicted to be resistant to ciprofloxacin by 2023. This finding is consistent with reports of ongoing prescribing, despite its longstanding absence from guidelines. Routine enhancement of sentinel surveillance with prescription data and interventions for South African physicians could improve antimicrobial stewardship.

Microbiological sentinel surveillance of sexually transmitted infection syndromes in South Africa, 2021- 2024

NICD Investigators: Tendesayi Kufa, Lindy Gumede, Duduzile Nhlapo, Ilze Venter, Mahlape Mahlangu, Bianca Da Costa Dias, Matamela Mabugana, Shabashini Reddy, Thabitha Mathega, Portia Baloyi, Valentia Kekana, Alex Vezi, Nokuthula Nzuza, Zukiswa Mithani, Frans Radebe, Adrian Puren, Venessa Maseko, Etienne Müller.

Syndromic management remains the mainstay of STI management in South Africa. Surveillance of pathogens or aetiologies associated with the main STI syndromes – male urethritis syndrome, vaginal discharge syndrome, and genital ulcer syndrome – is recommended. A sentinel-site-based surveillance study was conducted to monitor trends in the aetiological causes of the main STI syndromes, validate the recommended treatment algorithms, and monitor *Neisseria gonorrhoeae* antimicrobial resistance (AMR) from 2021 to 2024. Across all syndromes, there was no change in the relative prevalences of the aetiologies/pathogens over the surveillance period. Strengthening STI prevention,

diagnosis, and treatment through better information, education, and communication on STIs, partner management, and the implementation of point-of-care diagnostics and asymptomatic screening is recommended.

Sexually Transmitted Infections in Men Who Have Sex with Men in Johannesburg, South Africa: A 2024 Analysis of Symptomatic and Asymptomatic Cases

NICD Investigators: Etienne E Müller, Mpumelelo Sibanda, Mahlape P Mahlangu, Johanna ME Venter, Lindy Gumede, Duduzile Valashiya, Dumisile V Maseko, Thabitha Mathega, Nelisiwe Swana, Tendesayi Kufa, Bianca Da Costa Dias.
Collaborators: Maurice Greeves, Joseph Adams.

Men who have sex with men (MSM) face a high risk for acquiring and transmitting sexually transmitted infections (STIs), due to high-risk sexual behaviours and limited access to tailored sexual health services. Asymptomatic infections in the oropharynx and rectum contribute to the overall STI burden when left undiagnosed and untreated. The public healthcare system in South Africa uses a syndromic STI management approach to treat STIs and may miss asymptomatic infections. The study was conducted in Johannesburg in 2024 to assess STI prevalence rates among MSM (symptomatic and asymptomatic individuals). *Neisseria gonorrhoeae* was prevalent in participants with urethral symptoms, with 80.3% testing positive in the urethra, 41.7% in the rectum, and 18.0% in the pharynx. A total of 3.1% and 13.5% of asymptomatic participants tested positive for *N. gonorrhoeae* in the pharynx and rectum, respectively. *Chlamydia trachomatis* prevalence was similar across both groups, with no significant differences at any anatomical site. *Trichomonas vaginalis* and *Mycoplasma genitalium* infections were rare, and lymphogranuloma venereum was only found in rectal samples from asymptomatic participants. All *Neisseria gonorrhoeae* isolates were 100% susceptible to ceftriaxone, cefixime, gentamicin, and azithromycin. The study highlights the significant prevalence of *N. gonorrhoeae* among symptomatic MSM while also revealing the importance of addressing asymptomatic infections and improving STI screening, particularly for extragenital infections.

TEACHING AND TRAINING

- Kayla Delaney, a PhD student at Stellenbosch University, visited the lab for two months (April–May 2024) to be trained on the HIV-1 neutralisation assay.

- Dr Jinal Bhiman presented two lectures as part of the University of the Witwatersrand, Faculty of Health Sciences, Department of Virology Honours Course on 14 May 2024.

- Prof. Penny Moore lectured Wits students on HIV Immunology on 25 July 2024.

- Dr Jinal Bhiman lectured the Wits Faculty of Health Sciences, Virology PHIII class on "Emerging and current viral threats: Pandemic/avian influenza and coronaviruses" on 6 August 2024.

- Prof. Penny Moore gave a lecture to Wits MSc Vaccinology students on Applied Immunology entitled "What is immunogenicity, what is efficacy, and how to measure them" on 30 August 2024.

- Prof. Penny Moore and Dr Nono Mkhize gave a lecture to MSc Vax students at Wits on Applied Vaccinology on 25 September 2024.

- Jinal Bhiman presented a lecture titled "Adaptive

Immunity (B and T cells)" for the GEMP I students, Faculty of Health Sciences, Wits Medical Campus, on 27 January 2025.

- Wits Immunology/Virology Hons students visited AIRU on 6 March 2025 for practical training on protein purification.
- Prof. Penny Moore gave a lecture on HIV immunology to Hons students at Wits University on 20 March 2025.
- The HIV Virology Section hosted Ané Kotzé from the University of Cape Town (UCT) for 3 weeks for training on the HIV neutralisation assay.
- The HIV Virology Section hosted Miné van der Walt, Lekita Singh and Elsje Rabie from Wits University for 2 weeks of training on the VSV-SARS-CoV-2 neutralisation assay.
- Trained seven intern scientists in June–July 2024 for 2 weeks.
- One intern scientist under contract for 2 years submitted a portfolio to the Health Professions Council of South Africa (HPCSA) at the end of September 2024. Portfolio submission was successful, and the intern had registered as a Medical Scientist.
- Postgraduate training and lectures on infant diagnosis and paediatric HIV surveillance for registrars.
- Training for the Department of Health and District partner staff on the use of HIV surveillance data for clinical action.
- STI/HIV Epidemiology lecture in the Infectious Disease Epidemiology module (CDT870 Module) facilitated by the South Africa Field Epidemiology Training Programme (SAFETP), May 2024.
- HIV/AIDS surveillance lecture in the Surveillance Epidemiology and Outbreak Investigation and Disease Surveillance (COMH7070/EPM874) at the University of Wits School of Public Health, March 2025.

POSTGRADUATE RESEARCH SUPERVISION

- MPH
- MSc
- 1 PhD

The STI Section participated in a three-week training course for registrars covering STI management and laboratory methodologies. During the reporting period, the STI Section participated in the training of six intern medical scientists during their internship at the NICD. The STI Section participated in the Africa Centre for Disease Control (CDC)-funded AMR training organised by CHARM for the delegates from Zimbabwe on 10 April 2024.

The STI Section provided training to two visiting scientists from the University of Limpopo (3-month training duration, July–September 2024). Training involved all laboratory procedures performed at the STI Section, including specialised STI testing (NG-STAR, TV metronidazole resistance testing, and WGS).

PROFESSIONAL DEVELOPMENT

POSTGRADUATE STUDENTS

Forty-one students were enrolled in postgraduate studies. These comprised the following:

1. PhD: 7
2. MSc: 22
3. BSc (Hons): 9
4. MHSC: 1
5. MPH: 1
6. MMED: 1

Ten students graduated during the period under review. These comprised the following:

1. PhD: 2
2. MSc: 3
3. BSc (Hons): 3
4. Project Management Diplomas: 2

RESEARCH OUTPUT

CONFERENCES AND PRESENTATIONS

1. International congresses: 32
2. National congresses and local congresses: 29
3. Local congresses: 2

PUBLICATIONS

1. Barrios AT, Strehlau R, Patel F, Burke M, Shiau S, Yanhan Shen Y, Arpadi SM, Abrams EJ, Tiemessen CT, Kuhn L. Growth trajectories over the first year of life among early-treated infants with HIV and infants who are HIV-exposed uninfected. The Journal of Pediatrics 2024; 270: 114018.

2. Batohi N, Shalekoff S, Martinson NA, Ebrahim O, Tiemessen CT, Thobakgale CF. HIV-1 Elite Controllers are characterised by elevated frequencies of CD69-expressing Natural Killer cells. JAIDS 2024; 97: 522-532.

3. Bhiman JN, Madzorera VS, Mkhize Q, Scheepers C, Hermanus T, Ayres F, Makhado, Moyo-Gwete T, Crowther C, Singh B, Fortuin M, Marinda E, Jooste S, Zuma Khangelani, Zungu N, Morris L, Puren A, Simbayi L, Moyo S, Moore PL. (2025) Population shift in antibody immunity following the emergence of a SARS-CoV-2 variant of concern. Scientific Reports, 15(1):5549.

4. Blasich NP, Okot J, Ramos A, Buthelezi MB, Shabangu DF, Maleka MM, Moodliar S, Ngoma N, Kufa T. Evaluating the Accuracy of Multiple Rapid Diagnostic Tests for HIV Detection in Serum Samples Analysed during Point-of-Care Proficiency Testing Assessments. *Diagnostic Microbiology and Infectious Disease* 111, no. 3 (March 1, 2025): 116706.

Click Here »»

https://doi.org/10.1016/j.diagmicrobio.2025.116706.

5. Brangel P, Tureli S, Liechti N, Zysset D, Engler O, Hunger-Glaser I, Mattiuzzo G, Eckerle I, Bekliz M, Rossler A, Schmitt M, Knabl L, Kimpel J, Tort LFL, de Araujo MF, de Oliveira ACA, Caetano BC, Siqueira MM, Budt M, Gensch J, Wolff T, Hassan T, Selvaraj A, Hermanus T, Kgagudi P, Crowther C, Richardson SI, Bhiman JN, Moore PL, Cheng SMS, Li JKC, Poon LLM, Peiris M, Corman VM, Muhlemann B, Drosten C, Suthar MS, Hunsawong T, Rungrojcharoenkit K, Lohachanakul J, Sigal A, Khan K, Thiel V, Haagmans B, Mykytyn A, Donkor IO, Aboagye J, van Kerkhove M, Cunningham J,

Smith D, Subissi L. (2024) A global collaborative comparison of SARS-CoV-2 antigenicity across 15 laboratories. Viruses, 16(12):1936.

6. Chege GK, Chapman RE, Keyser AT, Adams CH, van Diepen MT, Douglass N, Lambson B, Hermanus T, Moore PL, Williamson A. (2025) Heterologous immunization with improved HIV-1 subtype C vaccines elicit Tier 2 neutralizing antibodies with rapid viral replication control after SHIV challenge. Viruses, 17(2), 277.

7. Christie M, Haeri Mazanderani A, Sherman G, Feucht U. How paediatric HIV services weathered the COVID-19 storm in Tshwane District, South Africa. S Afr J HIV Med. 2024;25(1), a1557.

Click Here »»»

https://doi.org/10.4102/sajhivmed.v25i1.1557.

8. Cohen P, Lambson BE, Mkhize NN, Moodley C, Yssel AEJ, Moyo-Gwete T, York T, Gwashu-Nyangiwe A, Ndabambi N, Thebus R, Juraska M, deCamp AC, Williamson BD, Magaret CA, Gilbert PB, Westfall D, Deng W, Mullins JI, Morris L, Williamson C, Moore PL. (2025) Resistance mutations that distinguish HIV-1 envelopes with discordant VRC01 phenotypes from multi-lineage infections in the HVTN703/HPRN081 trial: implications for cross resistance. Journal of Virology, 99(2): e0173024.

9. Cordioli M, Gios L, Mirandola M, Zorzi A, Barbara C, Padovese V, Hancali A, Oumzi H, Kularatne R, Jiang TT, Caceres CF, Vargas S, Alvarez CS, Camey E, Peeling RW, Unemo M, Ballard R, Blondeel K, Kiarie J, Thwin SS, Toskin I; ProSPeRo Network. Standardised protocol for a prospective international multicentre clinical-based evaluation of point-of-care tests for the screening of genital and extragenital chlamydial and gonococcal infections in men who have sex with men and for the screening of genital chlamydial, gonococcal and *Trichomonas vaginalis* infections in at risk women. BMJ Open. 2024 Jun 16;14(6): e073565. doi: 10.1136/bmjopen-2023-073565. PMID: 38885995; PMCID: PMC11184175.

10. Cottrell CA, Pratap PP, Cirelli KM, Carnathan DG, Enemuo CA, Antanasijevic A, Ozorowski G, Sewall LM, Gao H, Allen JD, Nogal B, Silva M, Bhiman J, Pauthner M, Irvine DJ, Montefiori D, Crispin M, Burton DR, Silvestri G, Crotty S, Ward AB. (2024) Priming antibody responses to the fusion peptide in rhesus macaques. NPJ Vaccines, 9:126.

11. Da Costa Dias, B, Sibanda M, Mahlangu MP, Venter JME, Gumede L, Valashiya D, Greeves M, Müller EE, Maseko DV, Mathega T, Baloyi P, Kufa T, Radebe F (2024) Sexually Transmitted Infections surveillance among high-risk men who have sex with men (MSM) cohort in Johannesburg, South Africa, 2023. Pub Health Bull SA. DOI: 10.13140/RG.2.2.21997.40167.

12. Dassaye E, Chetty T, Daniels B, Gaffoor Z, Spooner E, Ramraj T, Mthethwa N, Nsibande D, Pillay S, Bhana A, Magasana V, Reddy T, Mohlabi K, Moore PL, Burgers WA, de Oliveira T, Goga A. (2024) SARS-CoV-2 infections in a triad of primary school learners (grades 1-7), their parents and teachers in KwaZulu-Natal, South Africa: A pilot study protocol. Journal of Medical Internet Research Protocols, 13e52713.

13. de Voux A, Maruma W, Morifi M, Maduma M, Ebonwu J, Sheikh K, Dlamini-Nqeketo S, Kufa T. Gaps in the prevention of mother-to-child

transmission of syphilis: a review of reported cases, South Africa, January 2020-June 2022. J Trop Pediatr. 2024 Apr 5;70(3): fmae010. doi: 10.1093/tropej/fmae010. PMID: 38733096; PMCID: PMC11087667.

14. Dias BD, Sekgele W, Nhlapo D, Mahlangu MP, Venter JM, Maseko DV, Müller EE, Greeves M, Botha P, Radebe F, Kufa T, Kularatne R.S. Extragenital Sexually Transmitted Infections Among High-Risk Men Who Have Sex with Men in Johannesburg, South Africa. Sexually Transmitted Diseases. 2024 Apr 1;51(4):245-50. DOI: 10.1097/OLQ.0000000000001927.

15. Enhanced Gonococcal Antimicrobial Surveillance Programme (EGASP): surveillance report 2023. Geneva: World Health Organization; 2024. Licence: CC BY-NC-SA 3.0 IGO.

Click Here »»»

https://www.who.int/publications/i/item/9789240102927

16. Fortuin TL, Nkone P, Glass A, Viana R, Moeng K, Loubser S, Tiemessen CT, Mayaphi SH. Performance of an in-house multiplex PCR assay for HIV-1 drug resistance testing – a cheaper alternative. J Virol Methods 2024; 330; 115034.

17. Garrett N, Reddy T, Yende-Zuma N, Takalani A, Woeber K, Bodenstein A, Jonas P, Engelbrecht I, Jassat W, Moultrie H, Bradshaw D, Seocharan I, Odhiambo J, Khuto K, Richardson SI, Omondi MA, Nesamari R, Keeton RS, Riou C, Moyo-Gwete T, Innes C, Zwane Z, Barnabas S, Lombaard J, Gill K, Nchabeleng M, Snyman E, Petrick F, Spooner E, Naidoo L, Kalonji D, Naicker V, Singh N, Maboa R, Mda P, Malan D, Nana A, Malahlena M, Kotze P, Allagappen JJ, Diacon AH, Kruger GM, Patel D, Moore PL, Burgers WA, Anteyi K, Leav B, Bekker L, Gray GE, Goga A, the SHERPA study team (2024) Safety, effectiveness and immunogenicity of heterologous mRNA-1273 boost after prime with ad26.cov2.s among healthcare workers in South Africa: the single-arm, open-label, phase 3 SHERPA study. PLOS Global Public Health, 4(12): e0003260.

18. Goga A, Ramraj T, Naidoo L, Daniels B, Matlou M, Chetty T, Dassaye R, Ngandu N, Galli L, Reddy T, Seocharan I, Ndlangamandla Q, September Q, Ngcobo N, Reddy M, Cafun-Naidoo T, Woeber K, Jeenarain N, Imamdin R, Maharajh K, Ramjeth A, Bhengu T, Clarence E, van de Perre P, Tylleskar T, Nagot N, Moles J, Moore PL, Mkhize NN, Gama L, Dispinseri S, Biswas P, Scarlatti G on behalf of the PedMAb1 clinical trial team. (2024) Safety and pharmacokinetics of subcutaneous administration of broadly neutralizing anti-HIV-1 monoclonal antibodies (bNAbs), given to HIV-1 exposed, uninfected neonates and infants: study protocol for a phase I trial Acronym: PedMAb1. BMC Infectious Diseases, 24(1):712.

19. Goya S, Ruis C, Neher RA, Meijer A, Aziz A, Hinrichs AS, von Gottberg A, Roemer C, Amoako DG, Acuña D, McBroome J, Otieno JR, Bhiman JN, Everatt J, Muñoz-Escalante JC, Ramaekers K, Duggan K, Presser LD, Urbanska L, Venter M, Wolter N, Peret TCT, Salimi V, Potdar V, Borges V, Viegas M. (2024) Standardized Phylogenetic Classification of Human Respiratory Syncytial Virus below the Subgroup Level. Emerging Infectious Diseases, 30(8):1631-1641.

20. Gyamerahb AO, Marr A, Maleke K, Manyuchi AE, Mirzazadeh A, Radebe O, Lane T, Puren A, Steward WT, Struthers H, Lippman SA. Correlates

of viral suppression among sexual minority men and transgender women living with HIV in Mpumalanga, South Africa. Plos global Public Health.

Click Here

https://datadryad.org/stash/share/zaBRm2oB8uq0m1JFIxelpDiEDzOQ4QjBg6mBpOmWe4s.

21. Haeri Mazanderani A, Radebe L, Sherman GG. Attrition Rates in HIV Viral Load Monitoring and Factors Associated with Overdue Testing Among Children Within South Africa's Antiretroviral Treatment Program: Retrospective Descriptive Analysis. JMIR Public Health Surveill 2024;10: e40796 doi: 10.2196/40796

22. Hesselman MC, Zeeb M, Rusert P, Pasin C, Mamrosh J, Karikuki S, Sickmann M, Kaufmann M, Schmidt D, Friedrich N, Metzner K, Huber M, Yerly S, Leuzinger K, Perreau M, Koller R, Dollenmeier G, Frigerio S, Murell B, Murrell H, Garrett N, Wagh K, Mullins JI, Williamson C, Moore PL, Gunthard HF, Kouyos R, Trkola A. (2025) Rare twin cysteine residues in the HIV-1 envelope variable region 1 link to neutralization escape and breadth development. Cell Host & Microbe, 2:12, 279-293.

23. Jacob N, Rice B, Heekes A, Johnson L.F, Brinkmann S, Kufa T, Boulle A. Can routine antenatal data be used to assess HIV antiretroviral therapy coverage among pregnant women? Evaluating the validity of different data sources in the Western Cape, South Africa. PLoS One https://doi.org/10.1371/journal.pone.0291844

24. Jacob N, Rice B, Heekes A, Johnson L.F, Brinkmann S, Kufa T, Puren A, Boulle A. Exploring the Validity of Routine Individuated Service Data for Antenatal HIV Surveillance in the Western Cape. BMC Infectious Diseases 25, no. 1 (March 4, 2025): 309.

Click Here

https://doi.org/10.1186/s12879-025-10639-6

25. Jacobsson S, Cherdtrakulkiat T, Golparian D, Heng LS, Hoffman I, Jamoralin MC, Kakooza F, Kittiyaowamarn R, Kyambadde P, Lan PT, Maseko V, Matoga M, Müller E, Nguyen TTP, Ouk V, Schröder D, Setiawaty V, Sia SB, Sulaiman V, Virak M, Van NTT, Maatouk I, Wi T, Unemo M, on behalf of the WHO EGASP zoliflodacin study group. High susceptibility to the novel antimicrobial zoliflodacin among Neisseria gonorrhoeae isolates in eight WHO Enhanced Gonococcal Antimicrobial Surveillance Programme countries in three WHO regions, 2021-2024. IJID Regions, Volume 15, 2025,100624, ISSN 2772-7076,

Click Here

https://doi.org/10.1016/j.ijregi.2025.100624

26. Johnson VJ, Wall SC, Kramer KJ, Holt CM, Periasamy S, Richardson SI, Manamela NP, Suryadevara N, Andreano E, Paciello I, Pierleoni G, Piccini G, Huang Y, Ge P, Allen JD, Uno N, Shiakolas AR, Pilweski KA, Nargi RS, Sutton RE, Abu-Shmais AA, Parks R, Haynes BF, Carnahan RH, Crowe JE, Montomoli E, Rappuoli R, Bukreyev A, Ross TD, Sautto GA, McLellan JS, Georgiev IS. (2024) Discovery and characterization of a pan-betacoronavirus S2-binding antibody. Structure, 32, 1-17.

27. Ka'e AC, Santoro MM, Duca N, Chenwi A, Semengue ENJ, Nka AD, Etame N-K, Pabo WLT, Beloumou G, Mpouel M-L, Djupsa S, Takou D, Sosso SM, Tchidjou K, Colizzi V, Halle-Ekane GE, Perno CF, Lewin S, Jones B, Tiemessen CT, Ceccherini-Silberstein F, Fokam J. Evaluation of HIV-1 DNA levels among perinatally infected adolescents in Yaounde, Cameroon: A contribution to paediatric HIV cure research in sub-Saharan Africa. J Virus Eradication 2024; 10: 100367.

28. Ko SH, Radecki P, Bhiman JN, Meiring S, Kleynhans J, Amoako D, Caneda VG, Lucas M, Kekana D, Martinso N, Lebina L, Everett J, Tempia S, Bylund T, Rawi R, Kwong P, Wolter N, von Gottberg A, Cohen C, Belinky F, Boritz E. (2024) Rapid Intra-host Diversification and Evolution of SARS-CoV-2 in Advanced HIV Infection. Nature Communications, 15: 7240.

29. Kufa T, Thabane E, Leshaba D, Makhubele M, Puren A. Congenital Syphilis Annual Surveillance Report, South Africa 2023.Public Health Surveillance Bulletin South Africa: National Institute for Communicable Diseases, 2025.

Click Here »»»

https://www.phbsa.ac.za/wp-content/uploads/2025/01/Congenital-syphilis-annual-surveillance-report-South-Africa-2023.pdf.

30. Kufa T, Tobaiwa O, Cutler E, Singh B, Brukwe Z, Maseko V, Pillay E, Dorrell P, Moyo K, Zondi L, Pillay Y, Patrick S, Puren A. 2024. Acceptability and performance of dual HIV/syphilis testing in male circumcision clients, 2021. Southern African journal of HIV medicine, 25(1), 1571.

Click Here »»»

https://doi.org/10.4102/sajhivmed.v25i1.1571

31. Kuhn L, Barnabas S, Cotugno N, Peay H, Goulder P, Cotton M, Violari A, Pahwa S, Reddy, K Tagarro A, Otwombe K, Fry S, Vaz P, Lain MG, Nhampossa T, Archary M, Maiga A, e Puthanakit T, Kityo C, Foster C, Rojo P, Klein N, Nastouli E, Tiemessen CT, de Rossi A, Ndung'u T, Persaud D, Lichterfeld M, Gianquinto C, Palma P, Rossi R on behalf of the EPIICAL consortium. Analytic Treatment Interruption (ATI) in children living with HIV: Consensus Statement from the Early-treated Perinatally HIV-infected individuals Improving Children's Actual Life (EPIICAL) consortium. Lancet HIV 2024; 11(10): e700-e710.

32. Kularatne R, Blondeel K, Kasaro M, Maseko V, Bosomprah S, Silva R, Laverty M, Kurbonov F, Mirandola M, Peeling RW. Clinic-based evaluation of point-of-care dual HIV/syphilis rapid diagnostic tests at primary healthcare antenatal facilities in South Africa and Zambia. BMC Infect Dis. 2024 Jun 19;24(Suppl 1):600. doi: 10.1186/s12879-024-09463-1. PMID: 38898466; PMCID: PMC11186134.

33. Malebo K, Woodward J, Ximba P, Mkhize Q, Cingo S, Moyo-Gwete T, Moore PL, Williamson A, Chapman R. (2024) Development of a two-component nanoparticle vaccine displaying an HIV-1 envelope glycoprotein that elicits Tier 2 neutralising antibodies. Vaccines, 12 (9): 1063.

34. Marsden AA, Corcoran M, Karlsson Hedestam G, Garrett N, Abdool Karim SS, Moore PL, Kitchin D, Morris L, Scheepers C. (2024) Novel Polymorphic and Copy Number Diversity in the Antibody IGH Locus of South African Individuals. Immunogenetics, 77, 6.

35. McMahon WC, Kwatra G, Izu A, Jones SA, Mbele NJ, Jafta N, Lala R, Shalekoff S, Tiemessen CT, Madhi SA, Nunes MC. T-cell responses to ancestral SARS-CoV-2 and Omicron variant among unvaccinated pregnant and postpartum women living with

and without HIV in South Africa. Sci Rep 2024; 14(1): 20348.

36. Michalow J, Walters MK, Edun O, Wybrant M, Davies B, Kufa T, Mathega T, Chabata ST, Cowan FM, Cori A, Boily MC, Imai-Eaton JW. Aetiology of vaginal discharge, urethral discharge, and genital ulcer in sub-Saharan Africa: A systematic review and meta-regression. PLoS Med. 2024 May 20;21(5): e1004385. doi: 10.1371/journal.pmed.1004385.

37. Moonsamy S, Pillay P, Singh BA, Puren A, Ward JW, Prabdial-Sing N. 2025. Hepatitis B infection (HBsAg and HBeAg) status among women attending antenatal care at public healthcare facilities of South Africa, 2017. PLOS global public health, 5(1), e0003567.

Click Here »»»

https://doi.org/10.1371/journal.pgph.0003567

38. Morbioli GG, Baillargeon KR, Kalimashe MN, Kana V, Zwane H, van der Walt C, Tierney A J, Mora AC, Goosen M, Jagaroo R, Brooks JC, Cutler E, Hunt G, Jordan MR, Tang A, Mace C R. 2025. Clinical evaluation of patterned dried plasma spot cards to support quantification of HIV viral load and reflexive genotyping. Proceedings of the National Academy of Sciences of the United States of America, 122(7), e2419160122.

Click Here »»»

https://doi.org/10.1073/pnas.2419160122

39. Motsoeneng BM, Dhar N, Nunes MC, Krammer F, Madhi SA, Moore PL, Richardson SI. (2024) Hemagglutinin stalk-specific Fc-mediated functions are associated with protection against influenza-illness after seasonal influenza vaccination in pregnant women. Journal of Infectious Diseases. Journal of Infectious Diseases, 230(6):1329-1336.

40. Motsoeneng BT, Bhiman JN, Richardson SI, Moore PL. (2024) SARS-CoV-2 humoral immunity in people living with HIV. Trends in Immunology, 45(7):511-522.

41. Moyo-Gwete T, Ayres F, Mzindle NB, Makhado Z, Manamela NP, Richardson SI, Kitchin D, van Graan S, van Heerden J, Parbhoo N, Chege GK, Moore PL. (2024) Evaluating the antibody response elicited by diverse HIV envelope immunogens in the African green monkey (Vervet) model. Scientific Reports, 14, 13311

42. Murray TY, Sherman GG, Mlotshwa D, Mazanderani AF. High paediatric HIV viral load rejection rate in South Africa, a retrospective review. Southern African Journal of HIV Medicine. 2025;26(1):1687.

43. Naicker V, Laher F, Bekker L, Seaton KE, Allen M, de Rosa S, Yates NL, Mkhize NN, Saunders K, Heptinstall J, Malahleha M, Mngadi K, Daniels B, Innes C, Yu C, Modise T, Bekker V, Grunenberg N, Furch B, Miner MD, Phogat S, Diazgranados CA, Gurunathan S, Koutsoukos M, van der Meeren O, Roxby AC, Ferrari G, Morris L, Montefiori D, McElrath MJ, Tomaras GD, Moodie Z. Safety and immunogenicity after a 30-month boost of a subtype C ALVAC-HIV (vCP2438) vaccine prime plus bivalent subtype C gp120/ MF59 vaccine boost (HVTN 100): A phase 1–2 randomized double-blind placebo-controlled trial. PLoS Global Public Health, 4(9):e0003319.

44. Pascual F, Au C, Chikwari CD, Daram P, Deal C, Miranda AE, Grad YH, Hook EW, Kittiyaowamarn R, Luckey A, Low N, Maseko V, Peters RPH, Roberts T, Unemo M, Srinivasan S. Recommendations for the optimal introduction of novel antibiotics to

treat uncomplicated gonorrhoea in the face of increasing antimicrobial resistance: a case study with zoliflodacin. BMC Glob Public Health. 2024 Sep 3;2(1):58. doi: 10.1186/s44263-024-00087-w. PMID: 39681965; PMCID: PMC11622883.

45. Peters RPH, Nel JS, Sadiq E, Kufa T, Smit DP, Sorour G, Garrett N, Gill K, Makhakhe L, Chandiwana NC, Moran NF, Cohen K, Wattrus C, Moosa MY. Southern African HIV Clinicians Society Guideline for the clinical management of syphilis. South Afr J HIV Med. 2024 Apr 30;25(1):1577. doi: 10.4102/sajhivmed. v25i1.1577. PMID: 38725703; PMCID: PMC11079416.

46. Richardson SI, Mzindle N, Motlou T, Manamela NP, van der Mescht MA, Lambson BE, Everatt J, Amoako DG, Balla S, von Gottberg A, Wolter N, de Beer Z, de Villiers TR, Bodenstein A, van den Berg G, Abdullah F, Rossouw TM, Boswell MT, Uekcermann V, Bhiman JN, Moore PL. (2024) SARS-CoV-2 BA.4/5 infection triggers more cross-reactive FcγRIIIa signalling and neutralization than BA.1, in the context of hybrid immunity. Journal of Virology, 98(7): e0067824.

47. Riou C, Bhiman JN, Ganga Y, Sawry S, Ayres F, Baguma R, Balla SR, Benede N, Bernstein M, Besethi AS, Cele S, Crowther C, Dhar M, Geyer S, Gill K, Grifori A, Hermanus T, Kaldine H, Keeton RS, Kgagudi P, Khad K, Lazarus E, Le Roux J, Lustig F, Madzivhandila M, Magugu SFJ, Makhado Z, Manamela NP, Mkhize Q, Mosala P, Motlou TP, Mutavhatsindi H, Mzindle NB, Nana A, Nesamari R, Mgomti A, Nkayi AA, Nkosi TP, Omondi MA, Pachia R, Patel D, Sette A, Singh U, van Graan S, Venter EM, Walters A, Moyo-Gwete T, Richardson SI, Garrett N, Rees H, Bekker L, Gray G, Burgers WA, Sigal A, Moore PL, Fairlie L. Safety and immunogenicity of booster vaccination and fractional dosing with Ad26.COV2.S or BNT162b2 in Ad26.COV2.S-vaccinated participants. PLoS Global Health (Published online, 11 April 2024).

48. Schröder D, Cherdtrakulkiat T, Doanh LH, Golparian D, Heng LS, Hoffman I, Jacobsson S, Jamoralin MC Jr, Kakooza F, Kittiyaowamarn R, Kyambadde P, Maseko V, Matoga M, Müller E, Nguyen TTP, Ouk V, Setiawaty V, Sia SB, Sulaiman V, Virak M, Thuy Van NT, Wi T, Maatouk I, Unemo M. WHO EGASP tetracycline study group. Exceedingly high levels of tetracycline resistance in Neisseria gonorrhoeae in eight WHO Enhanced Gonococcal Antimicrobial Surveillance Programme countries in three WHO regions, 2021-2024-doxycycline post-exposure prophylaxis will unlikely impact gonorrhoea burdens. J Antimicrob Chemother. 2025 Mar 18: dkaf066. doi: 10.1093/jac/dkaf066. Epub ahead of print. PMID: 40099718.

49. halekoff S, Da Costa Dias B, Loubser S, Strehlau R, Kuhn L, Tiemessen CT. Higher CCR5 density on CD4+ T-cells in mothers and infants is associated with increased risk of in utero HIV-1 transmission. AIDS 2024; 38(7): 945-954.

50. Shangase N, Edwards J, Pence B, Aiello A, Gómez-Olivé X, Kahn K, Stoner M, Pettifor A. Quality of Caregiver-Adolescent Relationship on HIV, Herpes Simplex Virus Type-2, and on Pregnancy Among Young Women in South Africa Enrolled in HIV Prevention Trials Network 068. Journal of Adolescent Health, October 2, 2024.

Click Here »»»

https://doi.org/10.1016/j.jadohealth.2024.08.015

51. Shangase N, Kufa T, Cheyip M, Puren A. PrEP Awareness and Coverage: Results from the 2022

South Africa Antenatal HIV Sentinel Survey. AIDS and Behavior, 2025, 1–12.

Click Here

https://doi.org/10.1007/s10461-024-04609-3

52. Sun K, Bhiman JN, Tempia S, Kleynhans J, Madzorera VS, Mkhize Q, Kaldine H, McMorrow ML, Wolter N, Moyes J, Carrim M, Martinson NA, Kahn K, Lebina L, du Toit JD, Mkhencele T, von Gottberg A, Viboud C, Moore PL (joint last), Cohen C for the PHIRST-C group. (2024) SARS-CoV-2 correlates of protection from infection against variants of concern. Nature Medicine, 30(10):2805-2812.

53. Van der Mescht M, de Beer Z, Steel HC, Anderson R, Moore PL, Bastard P, Casanova J, Abdullah F, Ueckermann V, Rossouw TM. (2024) Aberrant innate immune profile associated with COVID-19 mortality in Pretoria, South Africa. Clinical Immunology, 266, 110323.

54. Vukovich MJ, Shiakolas AR, Lindenberger J, Richardson RA, Bass LE, Barr M, Liu Y, Go EP, Park CS, May A, Sammour S, Kambarami C, Huang X, Janowska K, Edwards RJ, Mansouri K, Spence TN, Aba-Shmais AA, Manamela NP, Richardson SI, Leonard SEW, Gripenstraw KR, Setliff I, Saunders KO, Bonami RH, Ross TM, Desaire H, Moore PL, Parks R, Haynes BF, Sheward DJ, Acharya P, Sautto, Gerogiev IS. (2024) Isolation and Characterization Glycan-Targeting IgG3 Antibodies with Exceptional Cross-Reactivity for Diverse Viral Families. PLoS Pathogens, 20(9): e1012499.

ARTICLES IN BOOKS:

1. Dove E, Ed. Staunton C, Haeri Mazanderani A, Murray T, Sherman G. Balancing the right to data protection with managing the care of HIV patients: experiences from the National Institute for Communicable Diseases, South Africa in Confidentiality, Privacy, and Data Protection in Biomedicine. Taylor and Francis. 2024.

CENTRE FOR RESPIRATORY DISEASES AND MENINGITIS (CRDM)

CENTRE FOR RESPIRATORY DISEASES AND MENINGITIS (CRDM)

PROF. CHERYL COHEN

Centre Head

OVERVIEW

The Centre for Respiratory Diseases and Meningitis (CRDM) conducts surveillance, diagnostic testing, outbreak support, and research in the field of communicable respiratory diseases and meningitis for South Africa and the African continent. The Centre provides data and expertise to the National Department of Health (NDoH) and healthcare providers, as well as regional and international collaborators, to assist with the planning of public health policies and programmes and to respond to respiratory and meningitis disease outbreaks. CRDM is a source of capacity building within South Africa and the African region. The Centre is responsible for six 'category one' notifiable medical conditions (NMCs): acute rheumatic fever, COVID-19 , diphtheria, meningococcal disease, pertussis, and respiratory disease caused by a novel respiratory pathogen, as well as two 'category two' NMCs: *Haemophilus influenzae* type b (Hib) disease and legionellosis. These diseases, in addition to other important diseases such as influenza, respiratory syncytial virus (RSV), and pneumococcus, are monitored through ongoing syndromic and laboratory-based surveillance programmes, as well as the NMC programme.

SURVEILLANCE

GERMS-SA

This programme conducts national, laboratory, and population-based active surveillance for invasive pneumococcal disease (IPD), meningococcal disease, and Hib disease to evaluate the ongoing impact of the pneumococcal conjugate vaccine and the Hib conjugate vaccine. It also provides strategic information regarding trends in pathogens of public health importance. Microbiology laboratories throughout South Africa submit reports of cases meeting the laboratory-based case definitions together with isolates and/or specimens. In addition, surveillance for Group A and Group B *Streptococcus* continued, aiming to generate evidence to contribute to vaccine development and decision-making for the introduction of future vaccines or other control interventions. Genomic surveillance is used to characterise and track lineages and better assist in outbreak detection.

SYNDROMIC SURVEILLANCE FOR RESPIRATORY ILLNESS (SEVERE RESPIRATORY ILLNESS (SRI)/ INFLUENZA-LIKE ILLNESS (ILI)/VIRAL WATCH)

National pneumonia surveillance continued to operate in five provinces. The programmes aim to describe the burden, risk groups, seasonality, and characteristics of SARS-CoV-2, influenza, RSV, and *Bordetella pertussis*. Systematic surveillance for outpatient influenza-like illness (ILI) and suspected pertussis is ongoing at outpatient public sector clinics in four provinces. The Viral Watch surveillance network of general practitioners continues to operate in eight provinces. All syndromic programmes provide information on the timing of influenza and RSV seasons and SARS-CoV-2 waves and provide data on influenza virus circulation and strains for decision-making around annual influenza vaccine composition, as well as annual estimates of influenza vaccine effectiveness. Data were also published describing vaccine effectiveness estimates for COVID-19 vaccines. The surveillance provides a platform for SARS-CoV-2 genomic surveillance to monitor circulating strains and emerging variants of concern. Through these programmes, circulating respiratory viruses are genetically characterised in real time through whole genome sequencing to monitor virus evolution and identify emerging variants.

OUTBREAKS

NATIONAL

The Centre assisted with outbreak response to an ongoing diphtheria outbreak in the Western Cape and more broadly within the country (Gauteng, Limpopo, and Mpumalanga), providing alerts for clinicians and responses to media queries regarding the increase in cases, as well as producing regular situation reports. The CRDM also conducted ad *hoc* testing for suspected avian influenza cases.

INTERNATIONAL

CRDM provided laboratory support for African partners in response to outbreaks of meningitis, respiratory illness (including pertussis), and diphtheria. As a World Health Organization (WHO) COVID-19 international regional reference laboratory, the CRDM continued to provide technical support and training to many African countries. The CRDM staff consult on numerous expert committees and working groups for the WHO, Africa Centres for Disease Control and Prevention (Africa CDC), and the WHO African Region (AFRO).

CRDM is exploring multi-pathogen, target-enrichment-based, and metagenomics-based sequencing methods to enable the detection of novel and emerging pathogens. In addition, the Centre is working with animal health and environmental health colleagues to be able to rapidly detect and respond to zoonotic infections and outbreaks, such as avian influenza.

POLICY CONTRIBUTIONS

Influenza vaccination guidelines were updated to include updated guidance on influenza vaccination. Prof. Anne von Gottberg continued to act as chairperson of the National Advisory Group on Immunisation (NAGI). In addition, CRDM staff contributed data and expertise to the NAGI RSV working group, which has developed an advisory to the NDoH on the introduction of newly available prevention approaches for RSV in infants. The CRDM contributed data to promote increased uptake of the diphtheria, tetanus, and pertussis vaccine in the expanded programme on immunisation. Prof. Anne von Gottberg became the chairperson of the WHO Technical Advisory Group on SARS-CoV-2 Virus Evolution (TAG-VE), which advises the WHO and monitors and evaluates the evolution of SARS-CoV-2. Prof. Cheryl Cohen was appointed vice chair of the WHO Technical Advisory Group on

COVID-19 Vaccine Composition (TAG-CO-VAC), which periodically reviews the evidence and analyses the implications of emerging variants of concern (VOCs) on the performance of COVID-19 vaccines and makes recommendations for which strains should be included in the vaccine.

DIAGNOSTIC SERVICES

CRDM routinely offers advanced molecular testing for several respiratory and meningitis-causing pathogens using a variety of in-house and commercial platforms, including meningitis/encephalitis, respiratory, and pneumonia multi-pathogen panels. The Centre also offers serotyping/grouping of vaccine-preventable bacterial pathogens and subtyping for influenza and RSV, and is the only laboratory in the country doing toxin detection for *C. diphtheriae*. The Centre is currently exploring culture-free sequencing methods to assist in pathogen detection and characterisation directly from clinical specimens.

NATIONAL INFLUENZA CENTRE (NIC) AND WHO CORONAVIRUS NETWORK (COVINET)

The CRDM houses the NIC for South Africa, which forms part of the expanded WHO Global Influenza Surveillance and Response System (e-GISRS). The NIC continued to support WHO by serologic and genetic characterisation of respiratory viruses to guide the composition of the annual seasonal influenza vaccines, RSV, and SARS-CoV-2. The NIC provided technical assistance and capacity building to other countries in the region to strengthen the diagnosis and characterisation of respiratory viruses, including training on virus isolation, the haemagglutination inhibition assay, whole genome sequencing, and bioinformatics analysis. NIC activities play an important role in improving the detection, prevention, and control of influenza and other respiratory viruses for pandemic preparedness. The CRDM is also a WHO-designated Coronavirus Network (CoViNet) laboratory and RSV reference laboratory.

RESEARCH ACTIVITIES

Chiwandire N, Walaza S, von Gottberg A, et al. Estimation of vaccine effectiveness against SARS-CoV-2-associated hospitalization using sentinel surveillance in South Africa. International Journal of Epidemiology 2024 Aug 14;53(5).

Using a longstanding syndromic sentinel surveillance platform, test-negative case-control study showed that the BNT162b2 mRNA (Pfizer) vaccine was effective against SARS-CoV-2-associated hospitalization during the Delta wave period for adults aged ≥18 years, ≥60 years and those that are HIV uninfected.

von Gottberg A, Kleynhans J, de Gouveia L, et al. Long-term effect of pneumococcal conjugate vaccines on invasive pneumococcal disease incidence among people of all ages from national, active, laboratory-based surveillance in South Africa, 2005–19: a cohort observational study. Lancet Global Health 2024 Sep 1;12(9):e1470-1484.

The 7-valent pneumococcal conjugate vaccine (PCV7) was introduced in 2009 and replaced by PCV13 in 2011, both in a 2+1 schedule. We evaluated the ongoing effects of PCV on the prevention of invasive pneumococcal disease (IPD) over 15 years of sustained surveillance in South Africa before the COVID-19 pandemic. The data show sustained direct and indirect benefits of PCV across age groups, and non-vaccine serotype (NVT) disease increases in adults >24 years. Higher valency PCVs would have the added benefit of preventing residual disease.

Moyes J, Tempia S, Walaza S, et al. Risk factors for severe respiratory syncytial virus-associated respiratory tract infection in a high HIV prevalence setting, South Africa, 2012-2018. *BMC Infectious Diseases* 2024 Oct 9; 24(1):1128.

These data contribute to a portfolio of evidence to support the introduction of a respiratory syncytial virus (RSV) maternal vaccine and monoclonal antibodies. Identifying groups at risk of hospitalisation

with severe RSV-associated respiratory illness will assist with the targeted design and implementation of programmes for RSV prevention strategies. Among children, factors associated with increased odds of severe RSV-associated illness include children <23 months of age (and specifically infants <2 months of age), prematurity (<37 weeks' gestation), malnutrition, and HIV infection. In adults, factors associated with severe infection include older age (≥ 65 years), HIV infection, and comorbidities.

Sun K, Bhiman JN, Tempia S, et al. SARS-CoV-2 correlates of protection from infection against variants of concern. *Nature Medicine* 2024 Oct 1;30(10).

This study provided evidence on the immune markers that correlate with protection against SARS-CoV-2 infection, including during waves driven by emerging variants of concern. Drawing on detailed household transmission data from South Africa, the study provided real-world insight into how both infection- and vaccine-induced immunity function in high-exposure settings. By linking immune responses to actual protection, the work informed vaccine policy, immunobridging, and the development of next-generation vaccines. The study also demonstrated the value of longitudinal, community-based cohort studies for understanding population-level immunity. It stands as a major contribution to global efforts to define meaningful immune correlates in the context of evolving viral threats.

du Plessis M, Mikhari R, de Gouveia L, et al. *Corynebacterium diphtheriae* infections, South Africa, 2015-2023. *Emerging Infectious Diseases* 2025 Mar 31(3):417-426.

The reemergence of respiratory diphtheria in 2015 created increased awareness amongst clinicians and laboratory personnel regarding a previously forgotten disease. Almost a decade later, *C. diphtheriae* continues to cause sporadic outbreaks of toxigenic respiratory diphtheria. Other manifestations, such as cutaneous diphtheria and infective endocarditis, also occur. These data highlight the need for ongoing surveillance and prompt public health action to curb transmission and death. Improved diphtheria-tetanus-pertussis vaccine coverage and booster doses are urgently needed.

TEACHING AND TRAINING

- Training at various sites in South Africa for surveillance programmes.
- Laboratory training workshops for SARS-CoV-2, influenza and RSV detection, as well as virus characterisation and sequencing (Africa).
- Advisory, technical, and epidemiological support in-country and on the continent for SARS-CoV-2, influenza, RSV, diphtheria, pertussis, and bacterial meningitis.
- Training and MSc and PhD supervising efforts as part of an international research training grant (D43) from the United States National Institutes of Health (NIH) and Fogarty International Center (FIC) sub-award through the University of Pittsburgh. The grant provides young South African public health and academic investigators from historically disadvantaged backgrounds with the multidisciplinary tools needed to conduct cutting-edge research in public health genomic and metagenomic epidemiology of respiratory and invasive bacterial and fungal diseases. As the 5-year programme draws to a close, three PhD students are still enrolled in the programme as of 2024, with planned submission in 2025.

- Wits University joint staff contributions included lectures, course coordination, and postgraduate supervision of MSc and PhD students.

POSTGRADUATE STUDENTS

Currently enrolled: Masters 4; PhD 7
Students graduated/passed: Masters 2; PhD 1

RESEARCH OUTPUTS

1. Cohen C, Zar HJ. Early life respiratory syncytial virus disease—a preventable burden. Lancet Infect Dis. 2024 Apr 30:S1473-3099(24)00261-5. Available from:

Click Here >>>

https://pubmed.ncbi.nlm.nih.gov/38701821/

2. Cong B, Koç U, Bandeira T, Bassat Q, Bont L, Chakhunashvili G, Cohen C, Desnoyers C, Hammitt LL, Heikkinen T, Huang QS, Markić J, Mira-Iglesias A, Moyes J, Nokes DJ, Ploin D, Seo E, Singleton R, Wolter N, Fu Yung C, Zar HJ, Feikin DR, Sparrow EG, Mrčela D, Milić P, Veljačić Visković D, Torres-Fernandez D, Urchueguía A, Díez-Domingo J, Orrico-Sánchez A, Walaza S, Gottberg A von, Reubenson G, Dawood H, Mekgoe O, Plessis M du, Baute N, Naby F, Keck JW, Dobson J, Hartman R, Sandoval M, Bressler SS, Bruden D, Karseladze I, Shchomak Z, Barreto R, Murunga N, Mutunga M, Casalegno JS, Horvat C, Nair H, Li Y. Changes in the global hospitalisation burden of respiratory syncytial virus in young children during the COVID-19 pandemic: a systematic analysis. Lancet Infect Dis [Internet]. 2024 Apr 1 [cited 2024 Apr 4];24(4):361-374. Available from:

Click Here >>>

https://pubmed.ncbi.nlm.nih.gov/38141633/

3. Bishop K, Meiring S, Tempia S, von Gottberg A, Wolter N, Kleynhans J, Moosa F, du Plessis M, Moyes J, Makhasi M, Chuene B, Samuels AM, Dawood H, Reubenson G, Zar HJ, Quan V, Cohen C, Walaza S. Risk Factors for Severe COVID-19 Among Children and Adolescents Enrolled in Acute Respiratory Infection Sentinel Surveillance in South Africa, 2020-2022. Influenza Other Respi Viruses [Internet]. 2024 May 1 [cited 2024 Jun 26];18(5). Available from:

Click Here >>>

https://pubmed.ncbi.nlm.nih.gov/38666359/

4. Caini S, Casalegno JS, Rodrigues AP, Lee V, Cohen C, Huang QS, Bruno Caicedo A, Teirlinck A, Guiomar R, Ang LW, Moyes J, Wood T, de Mora D, Bangert M, Kramer R, Staadegaard L, Heemskerk S, van Summeren J, Meijer A, Paget J. Change in Age profile of Respiratory Syncytial Virus disease over the course of annual epidemics: a multi-national study. J Infect [Internet]. 2024 May 1 [cited 2024 Jun 26];88(5). Available from:

Click Here >>>

https://pubmed.ncbi.nlm.nih.gov/38583722/

5. Kassanjee R, Davies MA, Heekes A, Mahomed H, Hawkridge A, Morden E, Jacobs T, Cohen C, Moultrie H, Lessells R, Van Der Walt N, Arendse J, Wolter N, Walaza S, Jassat W, von Gottberg A, Hannan P, Feikin D, Cloete K, Boulle A. COVID-19 Vaccine Uptake and Effectiveness by Time since Vaccination in the Western Cape Province, South Africa: An Observational Cohort Study during 2020-2022. Vaccines 2024 Jun 5 12(6):628. Available from:

Click Here >>>

https://pubmed.ncbi.nlm.nih.gov/38932357/

6. Strasheim W, Lowe M, Smith AM, Etter EMC, Perovic O. Whole-Genome Sequencing of Human and Porcine *Escherichia coli* Isolates on a Commercial Pig Farm in South Africa. Antibiot

(Basel, Switzerland) [Internet]. 2024 Jun 1 [cited 2024 Oct 1];13(6). Available from:

Click Here »»»

https://pubmed.ncbi.nlm.nih.gov/38927209/

7. Belman S, Lefrancq N, Nzenze S, Downs S, du Plessis M, Lo SW, McGee L, Madhi SA, von Gottberg A, Bentley SD, Salje H. Geographical migration and fitness dynamics of *Streptococcus pneumoniae*. Nature. 2024 Jul 11;631(8020):386–92.

Click Here »»»

https://www.nature.com/articles/s41586-024-07626-3

8. Richardson SI, Mzindle N, Motlou T, Manamela NP, van der Mescht MA, Lambson BE, Everatt J, Amoako DG, Balla S, von Gottberg A, Wolter N, de Beer Z, de Villiers TR, Bodenstein A, van den Berg G, Abdullah F, Rossouw TM, Boswell MT, Ueckermann V, Bhiman JN, Moore PL. SARS-CoV-2 BA.4/5 infection triggers more cross-reactive FcγRIIIa signaling and neutralization than BA.1, in the context of hybrid immunity. J Virol. 2024 Jul 23;98(7).

Click Here »»»

https://pmc.ncbi.nlm.nih.gov/articles/PMC11265454/

9. Els F, Kleynhans J, Wolter N, du Plessis M, Moosa F, Tempia S, Makhasi M, Nel J, Dawood H, Meiring S, von Gottberg A, Cohen C, Walaza S. Comparing adults with severe SARS-CoV-2 or influenza infection: South Africa, 2016-2021. South African J Infect Dis [Internet]. 2024 July 26 [cited 2024 Oct 1];39(1):574. Available from:

Click Here »»»

http://www.ncbi.nlm.nih.gov/pubmed/39114258

10. Goya S, Ruis C, Neher RA, Meijer A, Aziz A, Hinrichs AS, von Gottberg A, Roemer C, Amoako DG, Acuña D, McBroome J, Otieno JR, Bhiman JN, Everatt J, Muñoz-Escalante JC, Ramaekers K, Duggan K, Presser LD, Urbanska L, Venter M, Wolter N, Peret TCT, Salimi V, Potdar V, Borges V, Viegas M. Standardized Phylogenetic Classification of Human Respiratory Syncytial Virus below the Subgroup Level. Emerg Infect Dis. 2024 Aug 1;30(8):1631-41.

Click Here »»»

https://pubmed.ncbi.nlm.nih.gov/39043393/

11. Lowe M, Strasheim W, Chan WY, Perovic O. Bacterial and Genetic Features of Raw Retail Pork Meat: Integrative Analysis of Antibiotic Susceptibility, Whole-Genome Sequencing, and Metagenomics. Antibiot (Basel, Switzerland) [Internet]. 2024 Aug 1 [cited 2024 Oct 1];13(8). Available from:

Click Here »»»

https://pubmed.ncbi.nlm.nih.gov/39200000/

12. Chiwandire N, Walaza S, von Gottberg A, Wolter N, Du Plessis M, Moosa F, Groome MJ, Nel J, Variava E, Dawood H, Makhasi M, Feldstein LR, Marcenac P, Lafond KE, Samuels AM, Cohen C. Estimation of vaccine effectiveness against SARS-CoV-2-associated hospitalization using sentinel surveillance in South Africa. Int J Epidemiol [Internet]. 2024 Aug 14 [cited 2024 Oct 1];53(5). Available from:

Click Here »»»

http://www.ncbi.nlm.nih.gov/pubmed/39305220

13. Ko SH, Radecki P, Belinky F, Bhiman JN, Meiring S, Kleynhans J, Amoako D, Guerra Canedo V, Lucas

M, Kekana D, Martinson N, Lebina L, Everatt J, Tempia S, Bylund T, Rawi R, Kwong PD, Wolter N, von Gottberg A, Cohen C, Boritz EA. Rapid intra-host diversification and evolution of SARS-CoV-2 in advanced HIV infection. Nat Commun. 2024 Aug 22;15(1).

Click Here »»»

https://pmc.ncbi.nlm.nih.gov/articles/PMC10836083/

14. Subissi L, Otieno JR, Worp N, Attar Cohen H, Oude Munnink BB, Abu-Raddad LJ, Alm E, Barakat A, Barclay WS, Bhiman JN, Caly L, Chand M, Chen M, Cullinane A, de Oliveira T, Drosten C, Druce J, Effler P, El Masry I, Faye A, Ghedin E, Grant R, Haagmans BL, Happi C, Herring BL, Hodcroft EB, Ikejezie J, Katawera V, Kassamali ZA, Leo YS, Leung GM, Kondor RJ, Marklewitz M, Mendez-Rico J, Melhem NM, Munster V, Nahapetyan K, Naindoo D, Oh DY, Peacock TP, Peiris M, Peng Z, Poon LLM, Rambaut A, Saha S, Shen Y, Siqueira MM, Volz E, Tessema SK, Thiel V, Triki H, van der Werf S, von Eije K, Cunningham J, Koopmans MPG, von Gottberg A, Agrawal A, Van Kerkhove MD. An updated framework for SARS-CoV-2 variants reflects the unpredictability of viral evolution. Nat Med [Internet]. 2024 Sep 1 [cited 2024 Oct 1];30(9). Available from:

Click Here »»»

https://pubmed.ncbi.nlm.nih.gov/38720002/

15. von Gottberg A, Kleynhans J, de Gouveia L, Tempia S, Meiring S, Quan V, du Plessis M, von Mollendorf C, Crowther-Gibson P, Avenant T, du Plessis N, Kularatne R, Chibabhai V, Madhi SA, Klugman KP, Whitney CG, Cohen C. Long-term effect of pneumococcal conjugate vaccines on invasive pneumococcal disease incidence among people of all ages from national, active, laboratory-based surveillance in South Africa, 2005-19: a cohort observational study. Lancet Glob Health. 2024 Sep 1;12(9):e1470-84.

Click Here »»

https://pubmed.ncbi.nlm.nih.gov/39151982/

16. Kiakuvue YN, Mall S, Govender N, von Gottberg A, Mashau R, Meiring S, Cohen C. Demographic and pathogen characteristics of incident bacterial meningitis in infants in South Africa: A cohort study. PLoS One [Internet]. 2024 Sep 1 [cited 2024 Oct 1];19(9). Available from:

Click Here »»»

https://pubmed.ncbi.nlm.nih.gov/39321191/

17. Nyiro JU, Nyawanda BO, Mutunga M, Murunga N, Nokes DJ, Bigogo G, Otieno NA, Lidechi S, Mazoya B, Jit M, Cohen C, Moyes J, Pecenka C, Baral R, Onyango C, Munywoki PK, Vodicka E. The cost of care for children hospitalized with respiratory syncytial virus (RSV) associated lower respiratory infection in Kenya. BMC Public Health [Internet]. 2024 Sep 4 [cited 2024 Oct 1];24(1). Available from:

Click Here »»»

https://pubmed.ncbi.nlm.nih.gov/39232690/

18. Lekhuleni C, Ndlangisa K, Gladstone RA, Chochua S, Metcalf BJ, Li Y, Kleynhans J, de Gouveia L, Hazelhurst S, Ferreira ADS, Skosana H, Walaza S, Quan V, Meiring S, Hawkins PA, McGee L, Bentley SD, Cohen C, Lo SW, von Gottberg A, du Plessis M. Impact of pneumococcal conjugate vaccines on invasive pneumococcal disease-causing lineages among South African children. Nat Commun [Internet]. 2024 Sep 27 [cited 2024 Oct 1];15(1):8401. Available from:

Click Here >>>

http://www.ncbi.nlm.nih.gov/pubmed/39333488

19. Carcelen AC, Kong AC, Takahashi S, Hegde S, Jaenisch T, Chu M, Rochford R, Kostandova N, Gurley ES, Wesolowski A, Azman AS, van der Klis FRM, den Hartog G, Drakeley C, Heaney C, Winter AK, Salje H, Rodriguez-Barraquer I, Leung DT, Njenga SM, Kagucia EW, Jambo KC, Wolter N, Charles RC, Saboyá-Díaz MI, Martin DL, Moss WJ. Challenges and Approaches to Establishing Multi-Pathogen Serosurveillance: Findings from the 2023 Serosurveillance Summit. Am J Trop Med Hyg [Internet]. 2024 Sep 3 [cited 2025 Jan 2];111(5). Available from:

Click Here >>>

https://pubmed.ncbi.nlm.nih.gov/39226906/

20. Sun K, Bhiman JN, Tempia S, Kleynhans J, Madzorera VS, Mkhize Q, Kaldine H, McMorrow ML, Wolter N, Moyes J, Carrim M, Martinson NA, Kahn K, Lebina L, du Toit JD, Mkhencele T, von Gottberg A, Viboud C, Moore PL, Cohen C, Buys A, Carrim M, de Gouveia L, du Plessis M, du Toit J, Gómez-Olivé FX, Kgasago KP, Kotane R, McMorrow ML, Moloantoa T, Tollman S, von Gottberg A, Wafawanaka F, Wolter N. SARS-CoV-2 correlates of protection from infection against variants of concern. Nat Med [Internet]. 2024 Oct 1 [cited 2025 Jan 2];30(10). Available from:

Click Here >>>

https://pubmed.ncbi.nlm.nih.gov/39060660/

21. Brown L, Bingham J, Pulliam J, Mthombothi Z, Sereo T, Kamupira M, Botha S, Molema K, Maseti E, Schönfeldt M, Mabhena N, Prabdial-Sing N, von Gottberg A, McCarthy K, van Schalkwyk C. Estimation of the poliovirus type 2 immunity gap in South Africa. Vaccine. 2024 Oct 3;42(23).

Click Here >>>

https://pubmed.ncbi.nlm.nih.gov/38969540/

22. Moyes J, Tempia S, Walaza S, Cohen AL, Treurnicht F, Hellferscee O, Wolter N, von Gottberg A, Dawood H, Variava E, Kahn K, Madhi SA, Cohen C. Risk factors for severe respiratory syncytial virus-associated respiratory tract infection in a high HIV prevalence setting, South Africa, 2012 - 2018. BMC Infect Dis [Internet]. 2024 Oct 9 [cited 2025 Jan 2];24(1):1128. Available from:

Click Here >>>

http://www.ncbi.nlm.nih.gov/pubmed/39385077

23. Moyes J, Makhazi M, Walaza S, Ntombela P, Moosa F, von Gottberg A, Wolter N, du Plessis M, Hunt G, Cawood C, Dueger E, Cohen C. Home-Based Testing as an Approach to Estimate Influenza Vaccine Effectiveness in South Africa, 2021-2022-A Pilot Study. Influenza Other Respi Viruses [Internet]. 2024 Dec 1 [cited 2025 Jan 2];18(12). Available from:

Click Here >>>

https://pubmed.ncbi.nlm.nih.gov/39648401/

24. Terstappen J, Hak SF, Bhan A, Bogaert D, Bont LJ, Buchholz UJ, Clark AD, Cohen C, Dagan R, Feikin DR, Graham BS, Gupta A, Haldar P, Jalang'o R, Karron RA, Kragten L, Li Y, Löwensteyn YN, Munywoki PK, Njogu R, Osterhaus A, Pollard AJ, Nazario LR, Sande C, Satav AR, Srikantiah P, Stein RT, Thacker N, Thomas R, Bayona MT, Mazur NI. The respiratory syncytial virus vaccine and monoclonal antibody landscape: the road to

global access. Lancet Infect Dis [Internet]. 2024 Dec 1 [cited 2025 Jan 2];24(12). Available from:

Click Here »»»

https://pubmed.ncbi.nlm.nih.gov/39326422/

25. Mikhari RL, Meiring S, de Gouveia L, Chan WY, Jolley KA, Van Tyne D, Harrison LH, Marjuki H, Ismail A, Quan V, Cohen C, Walaza S, von Gottberg A, du Plessis M. Genomic Diversity and Antimicrobial Susceptibility of Invasive Neisseria meningitidis in South Africa, 2016-2021. J Infect Dis [Internet]. 2024 Dec 16 [cited 2025 Jan 2];230(6). Available from: https://pubmed.ncbi.nlm.nih.gov/38687883/Moleleki M, Nel P, Matukane SR, Cloete S, Abrahams Z, Wolter N, Whitelaw AC. Enhanced pathogen identification among patients with clinically suspected meningitis. South African J Infect Dis [Internet]. 2024 Dec 10 [cited 2025 Apr 3];39(1). Available from:

Click Here »»»

https://academic.oup.com/jid/article/230/6/e1311/7660491

26. Moleleki M, Nel P, Matukane SR, Cloete S, Abrahams Z, Wolter N, Whitelaw AC. Enhanced pathogen identification among patients with clinically suspected meningitis. South African J Infect Dis [Internet]. 2024 Dec 10 [cited 2025 Apr 3];39(1). Available from:

Click Here »»»

https://pubmed.ncbi.nlm.nih.gov/39822283/

27. Nabeemeeah F, Sabet N, Otwombe K, Hlongwane K, Mlambo LM, Moloantoa T, Wong M, Mangena P, Abraham P, Swanepoel F, Moosa F, Von Gottberg A, Cohen C, Southern J, Fletcher M, Dunne E, Ndungane-Tlakula B, Begier E, Gray S, Gessner BD, Naidoo J, Milovanovic M, Variava E, Martinson N. Cohort profile: the potentially preventable burden of community-acquired pneumonia in South African adults in the era of widespread PCV13 immunisation and antiretroviral therapy roll-out, before and during the COVID-19 pandemic - the multicentre, multimethod PotPrev Study. BMJ Open [Internet]. 2024 Dec 20 [cited 2025 Apr 3];14(12). Available from:

Click Here »»»

https://pubmed.ncbi.nlm.nih.gov/39806691/

28. Wodniak N, Gharpure R, Feng L, Lai X, Fang H, Tian J, Zhang T, Zhao G, Salcedo-Mejía F, Alvis-Zakzuk NJ, Jara J, Dawood F, Emukule GO, Ndegwa LK, Sam IC, Mend T, Jantsansengee B, Tempia S, Cohen C, Walaza S, Kittikraisak W, Riewpaiboon A, Lafond KE, Mejia N, Davis WW. Costs of Influenza Illness and Acute Respiratory Infections by Household Income Level: Catastrophic Health Expenditures and Implications for Health Equity. Influenza Other Respi Viruses [Internet]. 2025 Jan 1 [cited 2025 Apr 3];19(1). Available from:

Click Here »»»

https://pubmed.ncbi.nlm.nih.gov/39789855/

29. Lombard B, Cohen C, von Gottberg A, Dushoff J, Pulliam JRC, van Schalkwyk C. A generalised catalytic model to assess changes in risk for multiple reinfections with SARS-CoV-2. Ndeffo-Mbah ML, editor. PLoS One [Internet]. 2025 Jan 2 [cited 2025 Apr 3];20(1):e0315476. Available from:

Click Here »»»

https://pubmed.ncbi.nlm.nih.gov/39746096/

30. Cohen C, du Plessis M, Martinson N, Moyes J, Walaza S, Wolter N, Makhasi M, Moosa F, Charles M, Samuels AM, Tempia S, Moloantoa T, Ncwana B, Phalatse L, Buys A, Fry A, Baumgartner EA, von Gottberg A, Kleynhans J. A Potential Platform for Future Vaccine Trials Identifies a High Incidence of Symptomatic and Asymptomatic Influenza Infection Among Children Aged 6 to 23 Months in South Africa. J Infect Dis [Internet]. 2025 Feb 15 [cited 2025 Apr 3];231(2):e328-36. Available from:

Click Here »»»

https://pubmed.ncbi.nlm.nih.gov/39542652/

31. du Plessis M, Mikhari R, de Gouveia L, Duma N, Lovelock T, Lawrence C, Mahabeer P, Mahabeer Y, Govender N, Nzenze S, Featherston J, Moodley M, Moyes J, Walaza S, Cohen C, von Gottberg A. *Corynebacterium diphtheriae* Infections, South Africa, 2015-2023. Emerg Infect Dis [Internet]. 2025 Mar 1 [cited 2025 Apr 3];31(3):417-26. Available from:

Click Here »»»

https://pubmed.ncbi.nlm.nih.gov/40023798/

32. Yang Y, Knoll MD, Herbert C, Bennett JC, Feikin DR, Garcia Quesada M, Hetrich MK, Zeger SL, Kagucia EW, Xiao M, Cohen AL, van der Linden M, du Plessis M, Yildirim I, Winje BA, Varon E, Valenzuela MT, Valentiner-Branth P, Steens A, Scott JA, Savrasova L, Sanz JC, Khan AS, Oishi K, Nzoyikorera N, Nuorti JP, Mereckiene J, McMahon K, McGeer A, Mackenzie GA, MacDonald L, Ladhani SN, Kristinsson KG, Kleynhans J, Kellner JD, Jayasinghe S, Ho PL, Hilty M, Hammitt LL, Guevara M, Gilkison C, Gierke R, Desmet S, De Wals P, Dagan R, Colzani E, Ciruela P, Chuluunbat U, Chan G, Camilli R, Bruce MG, Brandileone MCC, Ampofo K, O'Brien KL, Hayford K. Global impact of 10- and 13-valent pneumococcal conjugate vaccines on pneumococcal meningitis in all ages: The PSERENADE project. J Infect [Internet]. 2025 Mar 1 [cited 2025 Apr 3];90(3). Available from:

Click Here »»»

https://pubmed.ncbi.nlm.nih.gov/39864526/

33. Crawley AW, Murphy K, Plumb ID, Ocansey GA, Baffoe-Nyarko I, Nyazema N, Walaza S, Leidman E. Challenges and enablers to establishing COVID-19 vaccine effectiveness studies in the World Health Organization Africa region: A mixed-methods evaluation of the African region monitoring vaccine effectiveness (AFRO-MoVE) network. Vaccine [Internet]. 2025 Mar 20 [cited 2025 Apr 3]; Available from:

Click Here »»»

https://pubmed.ncbi.nlm.nih.gov/40118700/

CONFERENCES:

- 27 presentations

CENTRE FOR TUBERCULOSIS (CTB)

CENTRE FOR TUBERCULOSIS (CTB)

DR SHAHEED VALLY OMAR

Centre Head

BACKGROUND

The Centre for Tuberculosis (CTB) core functions are to execute TB surveys and population research, conduct laboratory-based public health surveillance of TB, and contribute to the advancement of TB epidemiology, diagnostics, and treatment, thereby guiding South African policy. In addition, the Centre houses the National TB Reference Laboratory and is a member of the World Health Organization (WHO) TB Supranational Reference Laboratory network for the sub-Saharan region. The Centre has made significant contributions towards both National and Global TB policies and guidelines in collaboration with the National Department of Health (NDoH) and WHO. For the year under review, CTB provided critical support for the National TB Programme, including supporting the development of the National Strategic Plan for HIV, TB, and STIs 2023–2028, the National TB Programme's TB Strategic Plan 2023–2028, the TB Recovery Plan, and the revision of the National TB diagnostic algorithms. The Centre is further designated as a WHO Prequalification Unit for performance evaluation of TB-Nucleic Acid Amplification in vitro diagnostics.

During the year under review, the CTB continued to support the National Tuberculosis Programme (NTP) through the provision of advanced diagnostic services, laboratory-based surveillance, and policy-orientated technical support. The Centre also made substantial contributions to regional and global TB control efforts, particularly in the areas of diagnostic innovation and strengthening laboratory systems.

STRENGTHENING LABORATORY-BASED TB SURVEILLANCE AND DIAGNOSTICS

The CTB refined and expanded its laboratory-based surveillance programme to reflect the evolving diagnostic landscape in South Africa. In alignment with the NHLS diagnostic expansion, automated quarterly surveillance reports were updated to incorporate data from newly introduced molecular assays, including GeneXpert MTB/XDR, BD MAX™ MDR-TB, and Roche cobas® MTB-RIF/INH. These updates allowed for a more granular understanding of diagnostic yield and drug resistance trends across the country.

In support of the National TB Programme's digital health initiatives, the CTB also reinstated monthly monitoring and evaluation reports for the SMS-based TB Nucleic Acid Amplification Tests (TB-NAAT) result notification system, which plays a crucial role in timely case management. The enhancement of this system has strengthened the programmatic use of laboratory data to guide patient care and improve diagnostic turnaround time.

Furthermore, with funding from the Global Fund, the CTB developed enhanced surveillance reports for 12 high-priority districts, which include detailed facility-level epidemiological data, geospatial distribution maps, and longitudinal trajectory analyses. These reports have been instrumental in guiding targeted interventions by district-level TB programmes and are now earmarked for expansion across all 52 districts of South Africa.

The Centre further participated in the Data-2-Policy Brief to address a major gap in the diagnostic work-up of drug-resistant TB patients titled: *Boost Drug-Resistant TB Testing: Optimising the Drug-Resistant TB Reflex Testing Algorithm in South Africa*. In South Africa, the diagnosis and management of drug-resistant TB (DR-TB) face significant challenges, including missed or delayed follow-up testing for additional drug susceptibility tests. Despite the implementation of TB-NAAT, it is estimated that only 65% of diagnosed RR-TB patients underwent further testing. To address these challenges, the introduction of a two-sample sputum collection approach in the Western Cape has shown improved testing coverage but has not been implemented nationally. Findings from this evaluation recommended that collecting two sputum samples during initial TB screening visits would enhance drug-resistance detection and improve early resistance profiling, thus reducing treatment delays and improving patient outcomes. Implementing this policy could increase DR-TB case detection by 54% annually, leading to a significant rise in drug resistance testing coverage. To support this, we further recommend the formation of a national steering committee to oversee policy implementation, along with the development of standardised guidelines, training for healthcare workers, strengthening of laboratory infrastructure, and improving stakeholder collaboration to ensure seamless execution and monitoring.

IMPLEMENTATION OF TARGETED NEXT-GENERATION SEQUENCING (TNGS) FOR DRUG-RESISTANT TB

One of the most significant developments during this period was the launch of targeted Next-Generation Sequencing implementation for the diagnosis and management of DR-TB. This represents a major step forward in the country's molecular diagnostic capability. The tNGS platform enables high-resolution identification of resistance-conferring mutations to support treatment decisions for DR-TB earlier.

The implementation strategy was formally presented at the National Clinical Advisory Committee (NCAC) meeting in Cape Town in August 2024 and several subsequent meetings, where it was endorsed as a valuable tool to support improved clinical management of DR-TB and surveillance of resistance trends. This initiative places South Africa among the first countries in the region to operationalise tNGS as part of routine public health laboratory services for TB.

OPERATIONALISING MOBILE TB DIAGNOSTIC SERVICES

The CTB was tasked with operationalising mobile TB-NAAT laboratories to support Active Case Finding

(ACF) in high-risk populations. This was done in collaboration with the NHLS, Global Fund, and National TB Programme as part of a national pilot project aimed at expanding access to TB diagnostic services in underserved communities.

During this period, four mobile laboratory units were delivered – two to the Eastern Cape and two to Gauteng. These mobile labs are paired with vehicles equipped to perform digital chest X-rays and provide on-site molecular testing using TB NAATs, significantly improving the speed and reach of diagnostic services in remote and high-burden areas.

ENGAGEMENT IN NATIONAL TB POLICY AND PROGRAMME DEVELOPMENT

The CTB contributed technical expertise to key national forums:

- At the National TB Programme Quarterly Meeting, Dr Moultrie presented hospital-based surveillance data that will support updates to the national TB testing policy.
- Dr Omar engaged with civil society and provincial programme managers at a national meeting, presenting on targeted universal TB testing as part of a broader diagnostic access strategy.
- At the Global Fund NFM3 Programme Performance Review Meeting, Dr Omar shared detailed plans for the ACF mobile laboratory initiative, including rollout timelines, operational models, and monitoring frameworks.

The CTB also hosted the Chief Director of the National TB Programme for a strategic planning visit, where 2025 priorities were discussed, and alignment across national and laboratory efforts was reinforced.

REGIONAL AND GLOBAL LEADERSHIP AND COLLABORATION

The CTB maintained its international leadership role through active participation in global technical and policy forums:

- Dr Omar and Dr Ismail were appointed to the WHO Advisory Group on TB Diagnostics and Laboratory Strengthening (2024–2026), recognising their expertise in diagnostic strategy development and laboratory systems strengthening. They participated in the WHO Diagnostics Technical Advisory Group meeting convened on the 20–24th of January 2025 in Geneva, Switzerland, contributing to policy discussions on tNGS, digital radiography, and latent TB infection testing.
- At the Union World Conference on Lung Health (November 2024, Bali), CTB staff presented accepted abstracts and participated in key sessions. Dr Omar was invited to speak at a symposium on NGS implementation for DR-TB and at a workshop on advancing molecular diagnostics.
- CTB's participation extended to the Stop TB Partnership Global Laboratory Initiative (GLI) Partner Meeting, where Dr Omar contributed to a roundtable on innovative approaches to increase access to TB testing.

CAPACITY BUILDING AND REGIONAL TRAINING

To further support regional capacity, the CTB co-led the development and delivery of a 5-day African TB Diagnostics Workshop in Johannesburg. This initiative, funded by the Bill & Melinda Gates Foundation and co-hosted with Wits University, McGill University, and the National TB Programme, attracted

over 700 applications. A total of 136 participants from 28 countries (including 21 African nations) attended, alongside developers and academic partners.

The CTB coordinated programme design, speaker and delegate logistics, clinical site visits, and practical laboratory visits – including the NHLS and the National TB Reference Laboratory – offering participants hands-on exposure to South Africa's TB diagnostic infrastructure.

PROVINCIAL AND COMMUNITY-LEVEL ENGAGEMENT

The CTB team engaged with provincial TB managers during the Provincial TB Programme Meeting held from 26–28 February 2025, where diagnostic priorities and rollout plans for new tools were discussed. Additionally, Dr Ismail presented on innovations in TB diagnostics at the Rural East Ecosystem TB Conference in George (13 March 2025), reinforcing the Centre's commitment to expanding access in rural and hard-to-reach areas.

POLICY CONTRIBUTIONS

NATIONAL POLICY

Management of Tuberculosis in children and adolescents: A Clinical Guideline for the Diagnosis and Treatment of Drug-Susceptible TB in Children and Adolescents in South Africa (September 2024).

INTERNATIONAL POLICY

- CTB was requested by WHO to write the GLI Xpert XDR implementation guide.

- Drs Omar and Ismail were invited to the WHO for the first in-person WHO Advisory Group meeting on Tuberculosis Diagnostics and Laboratory Strengthening, 20-24th January 2025, where data for alternative interferon-gamma release assays for the detection of TB infection, targeted next-generation sequencing solutions for the detection of drug-resistant TB, and Computer Aided Detection (CAD) solutions for chest X-ray screening were evaluated. Draft policy statements were circulated to all members for comment. The final policy statement is to follow.

- Drs Omar and Ismail contributed to the update of the WHO TB prevalence survey guidance document. The final publication is to follow.

Impact of US Government Funding Cuts on Programmes

In early 2025, the Centre experienced significant disruptions to several programme areas following the reduction in funding from key United States government sources. These budget cuts affected support for select operational research activities and laboratory systems strengthening initiatives previously funded through international partnerships.

Despite these constraints, the Centre has taken proactive steps to reallocate available resources to sustain core diagnostic and surveillance functions. Engagements are ongoing with both national and global partners to identify alternative funding mechanisms and ensure continuity of essential services. The Centre remains committed to maintaining high-impact outputs and is actively adapting programme strategies to mitigate the effects of these financial challenges.

DIAGNOSTIC SERVICES

SPECIALISED REFERENCE MYCOBACTERIOLOGY – NATIONAL AND WHO SUPRANATIONAL REFERENCE LABORATORY ACTIVITIES

Proficiency testing panels for second-line drug susceptibility testing (including BDQ and Linezolid (LZD)) were prepared by the Centre and sent to the NHLS laboratories performing DR-TB Reflex testing. Extended drug susceptibility testing is provided for all patients not responding to their drug-resistant TB regimen. Phenotypic drug susceptibility testing for BDQ, LZD, and Pretomanid is provided for the private laboratories. We completed the verification of Pretomanid as per the WHO-recommended critical concentrations, and testing of clinical samples was originally initiated for FLQ-resistant samples only, which was then expanded to all RIF-R in January 2025. Verification of the Becton Dickinson BDQ drug kit was also completed, and a report was shared with the NHLS laboratories, enabling the NHLS labs to order the drug kit. There is a Global shortage of LZD drug powder, as Sigma is not able to provide the product. In order to sustain National testing as per the DR-TB reflex testing algorithm, CTB prepared LZD drug vials and shipped them to the NHLS labs in need.

Drug susceptibility testing for non-tuberculous mycobacteria is also provided on request from clinicians and/or pathologists. On the regional front, we have provided support to Namibia in terms of performing drug susceptibility testing for patients who have a poor response to a drug-resistant TB regimen, and discussions were initiated with the NIP to support second-line drug susceptibility testing for all RIF-R patients in Namibia.

The laboratory has been designated as the central laboratory for genomics, supporting the Bill and Melinda Gates Medical Research Institute for the PAN-TB clinical trial as well as the Otsuka Pharmaceutical Development & Commercialisation OPC-167832 clinical trial.

ADVANCING DIAGNOSTICS, EPIDEMIOLOGY, AND TREATMENT

As part of the Advancing Diagnostics, Epidemiology, and Treatment function of the CTB, several new cutting-edge diagnostic technologies were evaluated during this period, which include targeted next-generation sequencing technologies for predicting drug resistance. The CTB has been instrumental in the implementation of the tNGS assay, which aims to significantly improve turnaround time for the detection of drug-resistant tuberculosis, thereby providing comprehensive information for the adequate clinical management of patients. As a WHO Performance Evaluation Laboratory (PEL) for the evaluation of TB-NAAT for in vitro diagnostics by the WHO Prequalification Unit, three technologies were evaluated, of which one technology was granted the first WHO prequalification for a TB-NAAT; the remaining two are currently under evaluation.

RESEARCH ACTIVITIES

Microbiological and Epidemiological Surveillance of Tuberculosis in South Africa: Application of Whole Genome Sequencing to Enhance Microbiological and Epidemiological Surveillance of Drug Resistant Tuberculosis in South Africa

NICD Investigators: Farzana Ismail, Shaheed V. Omar, Halima Said, Lavania Joseph,
Ayanda Shabalala, Carrol Tshabane
Collaborator: Centre for Disease Control, South Africa/USA

This research activity aims to assess Whole Genome Sequencing (WGS) as the primary phylogenetic investigation tool for longitudinal surveillance of

transmission in selected regions with relatively high burdens of MDR-TB, improving the detection of high-risk cluster transmissions with outbreak potential and demonstrating the effective use of WGS to improve surveillance by comprehensive detection of drug resistance to guide national policy. Furthermore, the study aims to validate the diagnostic performance of targeted next-generation sequencing (tNGS) assays in predicting drug resistance to first-line, second-line, and new anti-TB drugs and diagnostic performance among smear-positive and -negative samples. The study is currently in year 6, and a total of 1,202 Rifampicin-resistant samples were collected between April 2023 and March 2024; 996 (83%) from the City of Cape Town and 206 (17%) from the City of Johannesburg. The primary findings of the proportion of BDQ resistance prompted investigation for national data, provided a basis for the national BDQ testing, and prompted the implementation of targeted next-generation sequencing for rapid detection of BDQ resistance.

Laboratory evaluation of next-generation sequencing for routine genotypic Drug Susceptibility Testing in South Africa for Drug Resistant Tuberculosis

NICD Investigators: *Shaheed Vally Omar, Lavania Joseph, Farzana Ismail*
Collaborators: TB Control & Management (National Department of Health)

Targeted next-generation sequencing (tNGS) assays can be applied directly to clinical specimens without the need for a pure cultured isolate and incorporate targeted amplification of genes associated with *M. tuberculosis* identification, typing and resistance, as well as a cloud-based automated pipeline for resistance prediction. This study aims to evaluate the diagnostic accuracy of tNGS compared to the current standard of care for patient management to predict drug resistance at a centralised laboratory. The study is the first step in a longer-term vision for the role of tNGS in the fight against DR-TB, with an important public health impact by changing the management of patients with DR-TB. A total of 116 samples have been included in the study since March 2025, of which 113 have been processed for tNGS.

Bedaquiline, Pretomanid, and linezolid Resistance Emergence in Drug-resistant TB treatment in South Africa (B-Prepared study)

NICD Investigators: *Shaheed Vally Omar, Lavania Joseph, Farzana Ismail*
Collaborators: *Columbia University, Emory University, Albert Einstein College of Medicine*

Bedaquiline (BDQ) and pretomanid (Pa) are medications from the first novel TB drug classes created since 1968. Combined with a repurposed medication, linezolid (LZD), these new drugs have provided substantial improvements in survival and cure rates. The emergence of widespread BDQ, Pa, or LZD resistance could undermine these drugs' potential. In the study, we will examine the emergence of BDQ, Pa, and LZD resistance in South Africa as treatment with these new drugs is expanded to all drug-resistant TB cases. Samples will be processed for MICs for each of the three drugs and whole genome sequencing. Six hundred and nine samples have been enrolled in the study.

Pan-Africa Network for Genomic Surveillance of Poverty Related Disease and Emerging Pathogens

NICD Investigators: *Shaheed V Omar, Harry Moultrie, Lavania Joseph, Halima Said, Farzana Ismail, Thabisile Gwala*
Collaborators: *PanGens Consortium*

The main purpose of this project is to increase Africa's capacity in genomic epidemiology and to conduct genomic epidemiology of drug-resistant tuberculosis and malaria across 12 African countries. The capacity-building strategy will include engagement of Post-docs, conducting on-site workshops, and

development of free virtual training materials. The initiative will expand south-south research collaborations, train the next generation of African scientists with cutting-edge techniques, and develop advances in disease surveillance, contributing to the African Union Agenda. The Pan-Africa Network for Genomic Surveillance of Poverty-Related Diseases and Emerging Pathogens is part of the EDCTP3 Programme and is supported by the European Union. The project was initiated in this reporting period. DR-TB isolates from across the country have been collected and stored for processing since the inception of the study. To date over 1000 isolates eligible for this study have been stored in the repository. Currently, routine staff are supporting the activity, and once reagents are received, laboratory processing will be initiated to complete the activity. During this period, two staff members participated in the Biobanking and Data Management training held at the MRC in The Gambia from October 20 to 25, 2024.

DriveDx4TB: accelerating the introduction of novel TB diagnostics

NICD Investigators: *Shaheed Vally Omar, Thabisile Gwala, Lavania Joseph, Dumisani Ngcamu and Mamello Motsei*
Collaborators: *Foundation for Innovative New Diagnostics (FIND), Geneva, Switzerland*

FIND, the global alliance for diagnostics, and Unitaid recently signed a new US$15.9 million grant to accelerate the introduction of new TB diagnostics, address access barriers, and improve case detection at primary healthcare and community levels. The Drive Diagnostics for Tuberculosis (DriveDx4TB) project is harnessing the power of collaboration to increase TB testing options in primary care clinics and community settings. By working with local communities, as well as manufacturers, in-country partners, and the global health organisation Unitaid, DriveDx4TB aims to accelerate the development and implementation of next-generation TB diagnostics. During this financial year, three technologies were assessed, which include a Point-of-Care TB-NAAT, a near-patient TB-NAAT, as well as a next-generation Urine LAM assay.

Pretomanid Resistance Surveillance Programme

NICD Investigators: *Shaheed V. Omar & Farzana Ismail*
Collaborators: *TB Alliance*

Pretomanid is a new nitroimidazooxazine antimycobacterial drug. One of the United States (US) Food and Drug Administration (FDA) post-marketing requirements (PMRs) specifies that a 5-year resistance surveillance study should be conducted after the introduction of pretomanid to the market to monitor changes in *Mycobacterium tuberculosis* complex susceptibility to pretomanid. The primary goal is to conduct a study over a 5 years to determine pretomanid minimum inhibitory concentrations (MICs) of a sample of multidrug-resistant (MDR) and extensively drug-resistant (XDR) *Mycobacterium tuberculosis* complex (MTBC) isolates. The CTB has successfully submitted year four data during this reporting period. Testing of year five samples is in progress.

Calibration of Antimicrobial Susceptibility Testing Methods and Breakpoints Against EUCAST Reference Standards for Bedaquiline, Clofazimine, Levofloxacin, and Linezolid

NICD Investigators: *Shaheed Vally Omar, Dumisani Ngcamu, Mamello Motsei & Lavania Joseph*
Collaborators: *The European Committee on Antimicrobial Susceptibility Testing*

The purpose of the calibration portion of this study

is to propose quality control (QC) ranges/targets and epidemiological cut-offs (ECOFFs) for the European Committee on Antimicrobial Susceptibility Testing (EUCAST) Middlebrook 7H9 broth (7H9) microdilution (BMD) reference method and to calibrate surrogate methods. Testing has been completed, and the results have been shared with the EUCAST Subcommittee on Antimycobacterial Susceptibility Testing (EUCAST-AMST) for review and recommendation.

Molecular, Clinical, and Phenotypic Monitoring of Bedaquiline Resistance in Drug-resistant Tuberculosis in South Africa

NICD Investigators: Shaheed Vally Omar & Lavania Joseph
Collaborator: Janssen Pharmaceuticals

Bedaquiline (BDQ) is a key component in the shortened regimen for drug-resistant tuberculosis. This study aims to investigate the changes in prevalence of BDQ resistance following the increased uptake of the drug in the high-burden districts in South Africa.

A total of 2 315 people with MDR/RR-TB who had an isolate submitted to the NICD from a sample collected between 1 January 2019 and 31 December 2021 were included in the analysis. This included patients from seven districts (five provinces), including those with the highest burden of DR-TB, and, for representation, districts from provinces with a lower burden. Of these, four of the provinces account for 77% of the DR-TB burden nationally, and the districts included account for ~50% of the national burden.

Comprehensive resistance profiling of these samples was performed, which included both phenotypic and genotypic diagnostic methods. In addition, WGS was performed on these isolates to provide genomic insights into resistance determinants for BDQ, full genotypic characterisation of the isolate, as well as strain relatedness. Post WGS samples harbouring mutations in any of the genes associated with resistance were then subjected to minimum inhibitory concentration (MIC) testing to determine the association with mutations and MIC. The dataset was then further merged with the electronic drug resistance register (EDRweb) to determine patient outcomes using probabilistic linkages (due to the lack of use of a unique identifier in South Africa within and between data systems). The findings suggest that transmission of BDQ resistance is occurring within these districts (supported by genomic analysis), and patients with BDQ resistance had a significantly lower clinical success rate when compared to those without BDQ resistance.

TEACHING AND TRAINING

The CTB was involved in the coordination of the first African Advanced TB Diagnostics Workshop in December 2024. In addition, training was provided on both reference mycobacteriology testing and public health aspects of TB to rotating registrars and intern medical scientists from university-based medical microbiology and public health departments in South Africa. CTB staff provided formal lectures to undergraduate medical students, medical microbiology registrars, and epidemiology and biostatistics master's students at the University of Pretoria and postgraduate students at the University of the Witwatersrand. Several postgraduate students were hosted and trained at the CTB to perform advanced testing, which supported their research. The CTB has taken responsibility for the coordination of the NICD three-week Communicable Diseases Rotation for medical microbiology, virology, public health registrars, and infectious disease fellows. Regional training support was provided for Namibia, Zambia, Somalia, and Ethiopia. The CTB supported the National and Provincial departments of health

for training on drug-resistant TB. Training was also provided for PhD students from the Medical Research Council/University of Pretoria.

PROFESSIONAL DEVELOPMENT

POST-GRADUATE SUPERVISION

Two PhD, six MSc, and two Honours students.

INTERN MEDICAL SCIENTIST TRAINING

Three Intern Medical Scientists graduated and one submitted.

RESEARCH OUTPUT

1. Bertagnolio S, Dobreva Z, Centner CM, Olaru ID, Donà D, Burzo S, Huttner BD, Chaillon A, Gebreselassie N, Wi T, Hasso-Agopsowicz M, Allegranzi B, Sati H, Ivanovska V, Kothari KU, Balkhy HH, Cassini A, Hamers RL, Weezenbeek KV; **WHO Research Agenda for AMR in Human Health Collaborators (Shaheed Vally Omar)**. WHO global research priorities for antimicrobial resistance in human health. Lancet Microbe. 2024 Aug 12:100902. doi: 10.1016/S2666-5247(24)00134-4. Epub ahead of print. PMID: 39146948.

2. Cassim N, **Omar SV**, Masuku SD, **Moultrie H**, Stevens WS, **Ismail F**, da Silva P. Xpert MTB/XDR implementation in South Africa: cost outcomes of centralised vs. decentralised approaches. IJTLD Open. 2024 May 1(5): 215-222. doi: 10.5588/ijtldopen.23.0501. PMID: 39022776; PMCID: PMC11249600.

3. Colman RE, Seifert M, De la Rossa A, Georghiou SB, Hoogland C, Uplekar S, Laurent S, Rodrigues C, Kambli P, Tukvadze N, Maghradze N, **Omar SV**, Joseph L, Suresh A, Rodwell TC. Evaluating culture-free targeted next-generation sequencing for diagnosing drug-resistant tuberculosis: a multicentre clinical study of two end-to-end commercial workflows. Lancet Infect Dis. 2025 Mar;25(3):325-334. doi: 10.1016/S1473-3099(24)00586-3. Epub 2024 Oct 29. PMID: 39486428; PMCID: PMC11871994.

4. Du DH, Geskus RB, Zhao Y, Codecasa LR, Cirillo DM, van Crevel R, Pascapurnama DN, Chaidir L, Niemann S, Diel R, **Omar SV**, Grandjean L, Rokadiya S, Ortitz AT, Lân NH, Hà ĐTM, Smith EG, Robinson E, Dedicoat M, Nhat LTH, Thwaites GE, Van LH, Thuong NTT, Walker TM. The effect of M. tuberculosis lineage on clinical phenotype. PLOS Glob Public Health. 2023 Dec 20;3(12):e0001788. doi: 10.1371/journal.pgph.0001788. Erratum in: PLOS Glob Public Health. 2024 Aug 23;4(8): e0003674. doi: 10.1371/journal.pgph.0003674. PMID: 38117783; PMCID: PMC10732390.

5. Ismail N, **Moultrie H**, Mwansa-Kambafwile J, Copas A, Izu A, Moyo S, Skinner D, Ismail F, Gosce L, **Omar SV**, Abubakar I, Madhi SA. Effects of conditional cash transfers and pre-test and post-test tuberculosis counselling on patient outcomes and loss to follow-up across the continuum of care in South Africa: a randomised controlled trial. Lancet Infect Dis. 2025 Feb 6: S1473-3099(24)00816-8. doi: 10.1016/S1473-3099(24)00816-8. Epub ahead of print. PMID: 39923785.

6. Kassanjee R, Davies MA, Heekes A, Mahomed H, Hawkridge AJ, Morden E, Jacobs T, Cohen C, **Moultrie H**, Lessells RJ, Van der Walt N, Arendse JO, Wolter N, Walaza S, Jassat W, von Gottberg A, Hannan PL, Feikin DR, Cloete K, Boulle A. COVID-19 Vaccine Uptake and Effectiveness by Time since Vaccination in the Western Cape

Province, South Africa: An Observational Cohort Study during 2020-2022. Vaccines (Basel). 2024 Jun 5;12(6):628. doi: 10.3390/vaccines12060628. PMID: 38932357; PMCID: PMC11209070.

7. Köser CU, Miotto P, Ismail N, Anthony RM, Utpatel C, Merker M, Niemann S, Tahseen S, Rigouts L, Rodrigues C, **Omar SV**, Farhat MR, Antonenka U, Hoffmann H, Cirillo DM, Schön T. A composite reference standard is needed for bedaquiline antimicrobial susceptibility testing for Mycobacterium tuberculosis complex. Eur Respir J. 2024 Jul 11; 64(1): 2400391. doi: 10.1183/13993003.00391-2024. PMID: 38991722; PMCID: PMC11237371.

8. Naidoo K, Perumal R, Cox H, Mathema B, Loveday M, Ismail N, **Omar SV,** Georghiou SB, Daftary A, O'Donnell M, Ndjeka N. The epidemiology, transmission, diagnosis, and management of drug-resistant tuberculosis-lessons from the South African experience. Lancet Infect Dis. 2024 Sep;24(9):e559-e575. doi: 10.1016/S1473-3099(24)00144-0. Epub 2024 Mar 22. PMID: 38527475.

9. **Omar SV**, Louw G, **Ismail F**, Liu X, **Ngcamu D, Gwala T, van der Meulen M, Joseph L**. Performance evaluation of the Xpert MTB/XDR test for the detection of drug resistance to Mycobacterium tuberculosis among people diagnosed with tuberculosis in South Africa. J Clin Microbiol. 2024 Aug 14;62(8):e0022924. doi: 10.1128/jcm.00229-24. Epub 2024 Jul 26. PMID: 39058018; PMCID: PMC11323472.

10. Qumbelo Y, Kachingwe E, **Omar SV**. Extended clinical sample incubation in the cepheid Xpert MTB/XDR test sample reagent: enhancing flexibility and workflows in high-volume laboratories. Diagn Microbiol Infect Dis. 2024 Aug 24;110(4):116504. doi: 10.1016/j.diagmicrobio.2024.116504. Epub ahead of print. PMID: 39216193.

11. Reta MA, **Said HM**, Maningi NE, Wubetu GY, Agonafir M, Fourie PB. Genetic diversity of Mycobacterium tuberculosis strains isolated from spiritual holy water site attendees in Northwest Ethiopia: a cross-sectional study. New Microbes New Infect. 2024 Mar 8; 59:101235. doi: 10.1016/j.nmni.2024.101235. PMID: 38590765; PMCID: PMC11000200.

12. Richards L, Ismail F, Nel J, **Omar SV**. Missed rifampicin and isoniazid resistance by commercial molecular assays. S Afr Med J. 2024 Jul 1;114(7): e1779. doi: 10.7196/SAMJ. 2024.v114i17.1779. PMID: 39041520.

13. Roberts LW, Malone KM, Hunt M, **Joseph L**, Wintringer P, Knaggs J, Crook D, Farhat MR, Iqbal Z, **Omar SV**. MmpR5 protein truncation and bedaquiline resistance in Mycobacterium tuberculosis isolates from South Africa: a genomic analysis. Lancet Microbe. 2024 Aug;5(8):100847. doi: 10.1016/S2666-5247(24)00053-3. Epub 2024 Jun 5. PMID: 38851206.

14. Schwab TC, **Joseph L**, Moono A, Göller PC, **Motsei M**, Muula G, Evans D, Neuenschwander S, Günther G, Bolton C, Keller PM, Ramette A, Egger M, **Omar SV**, Fenner L; IeDEA Southern Africa (IeDEA-SA). Field evaluation of nanopore targeted next-generation sequencing to predict drug-resistant tuberculosis from native sputum in South Africa and Zambia. J Clin Microbiol. 2025 Feb 12: e0139024. doi: 10.1128/jcm.01390-24. Epub ahead of print. PMID: 39936893.

15. Schwab TC, Perrig L, Göller PC, Guebely De la Hoz FF, Lahousse AP, Minder B, Günther G, Efthimiou O, Omar SV, Egger M, Fenner L. Targeted next-generation sequencing to diagnose drug-resistant tuberculosis: a systematic review and meta-analysis. Lancet Infect Dis. 2024 Oct;24(10):1162-1176. doi: 10.1016/S1473-3099(24)00263-9. Epub 2024 May 22. PMID: 38795712; PMCID: PMC11881551.

Women's Day at the Centre for Tuberculosis 2024

CENTRE FOR VACCINES AND IMMUNOLOGY (CVI)

CENTRE FOR VACCINES AND IMMUNOLOGY (CVI)

DR NISHI PRABDIAL-SING

Centre Head

"From clinical case investigation to integrated laboratory and environmental surveillance, the Centre remains at the forefront of disease detection and surveillance."

BACKGROUND

The CVI provides expert knowledge, scientific laboratory-based evidence, and expertise in the epidemiology and virology of vaccine-preventable viral diseases to the NDoH and other stakeholders. CVI testing, surveillance, and research are aligned to meet WHO targets, NICD and NHLS action plans, and the NDoH strategic targets.

Our environmental surveillance has grown from testing for poliovirus to many more pathogens, using advanced PCR and genomic technologies. New innovative methods using direct detection of poliovirus, whole genome sequencing, and amplicon targeted sequencing for poliovirus, SARS-CoV-2, measles, rubella, and viral hepatitis have seen great improvement in the year, with increased efforts on technicalities and bioinformatics pipelines.

The CVI has also launched the informative dashboard for measles and rubella that allows the tracking of positive cases nationwide, in real time, both at clinical and wastewater sources. The Centre continues its support to countries in the South and East African region as a regional reference laboratory for polio, measles, and rubella, providing sequencing, quality assurance and training to countries requiring this.

The number of rubella cases reached its peak from epi-week 32 to 50 of 2024, with >1000 cases reported weekly across several provinces in South Africa. The number of measles cases fluctuated over time. Primary healthcare clinics (PHCs) reported fewer measles cases on the Notifiable Medical Conditions Surveillance System (NMCSS) than the cases that were clinically seen. Hospitals with infection prevention and control (IPC) and expanded programme on immunisation (EPI) managers had better data compared to PHCs. The presence of a focal person in the facility substantially improved measles case reporting and case investigation form (CIF) availability. From our support to sub-Saharan African countries with the detection and sequencing of polioviruses in acute flaccid paralysis (AFP) cases and environmental surveillance samples, vaccine-derived polioviruses were detected in the region.

SURVEILLANCE

MEASLES/RUBELLA CLINICAL SURVEILLANCE

As a national and WHO regional reference laboratory, we strive to perform molecular analyses on measles and rubella positive samples, with assistance to other countries, especially during outbreak situations.

The measles and rubella dashboard provides measles test positivity rates per province down to the sub-district level and includes population demographics and geographically mapped locations of the cases. To aid in case classification of measles results, laboratory tests, including avidity of anti-measles IgG antibodies and real-time (RT)-PCR in conjunction with epidemiological case investigations, are used in diagnosing acute measles infections.

Approximately 29,842 South African febrile rash samples were tested during the period under review, with 913 confirmed measles cases (3.1% positivity rate). Overall, for the period under review, 48.1% (14,344/29,842) of the cases were positive for rubella. The increase in rubella cases was reported primarily in the City of Johannesburg in the Gauteng province; Harry Gwala and eThekwini in KwaZulu-Natal; and the Dr Kenneth Kaunda and Ngaka Modiri Molema districts in the North West province. Although cases in other provinces were not considered low, reporting >1200 rubella cases in each province, except for Free State and Limpopo (<700 rubella cases). South Africa has approved the use of measles-rubella-containing vaccines, which will be available at public healthcare facilities. Rubella infections were primarily detected in children aged 0–14 years, with 13,968 children reported to be infected.

Of the samples that were genotyped, genotypes B3 and D8 were detected for measles (Fig. 1A). Genotype B3 was predominant in Gauteng in several districts (The City of Johannesburg, Ekurhuleni, and Sedibeng), whilst D8 was primarily detected in Gauteng (The City of Johannesburg Metropolitan Municipality), Free State (Lejweleputswa District Municipality), and Mpumalanga (Nkangala District Municipality). The implementation of a nested-PCR approach has allowed for the successful sequencing of rubella samples. Fifteen rubella samples were successfully genotyped in 2024 and classified as 2B (Fig. 1B), the majority (6/15) of which were detected in the North West province in the Dr Ruth Segomotsi Mompati and Ngaka Modiri Molema districts.

As part of the WHO regional quality assurance programme, the Centre retests approximately 10% of serum samples from 11 Southern and Eastern African countries, namely Botswana, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, Seychelles, Eswatini, Zambia, and Zimbabwe. In the past year, 578 samples were tested, and there was good concordance between the inter-laboratory measles IgM and rubella IgM results. Eleven samples were received from Namibia and four from Seychelles for genotyping.

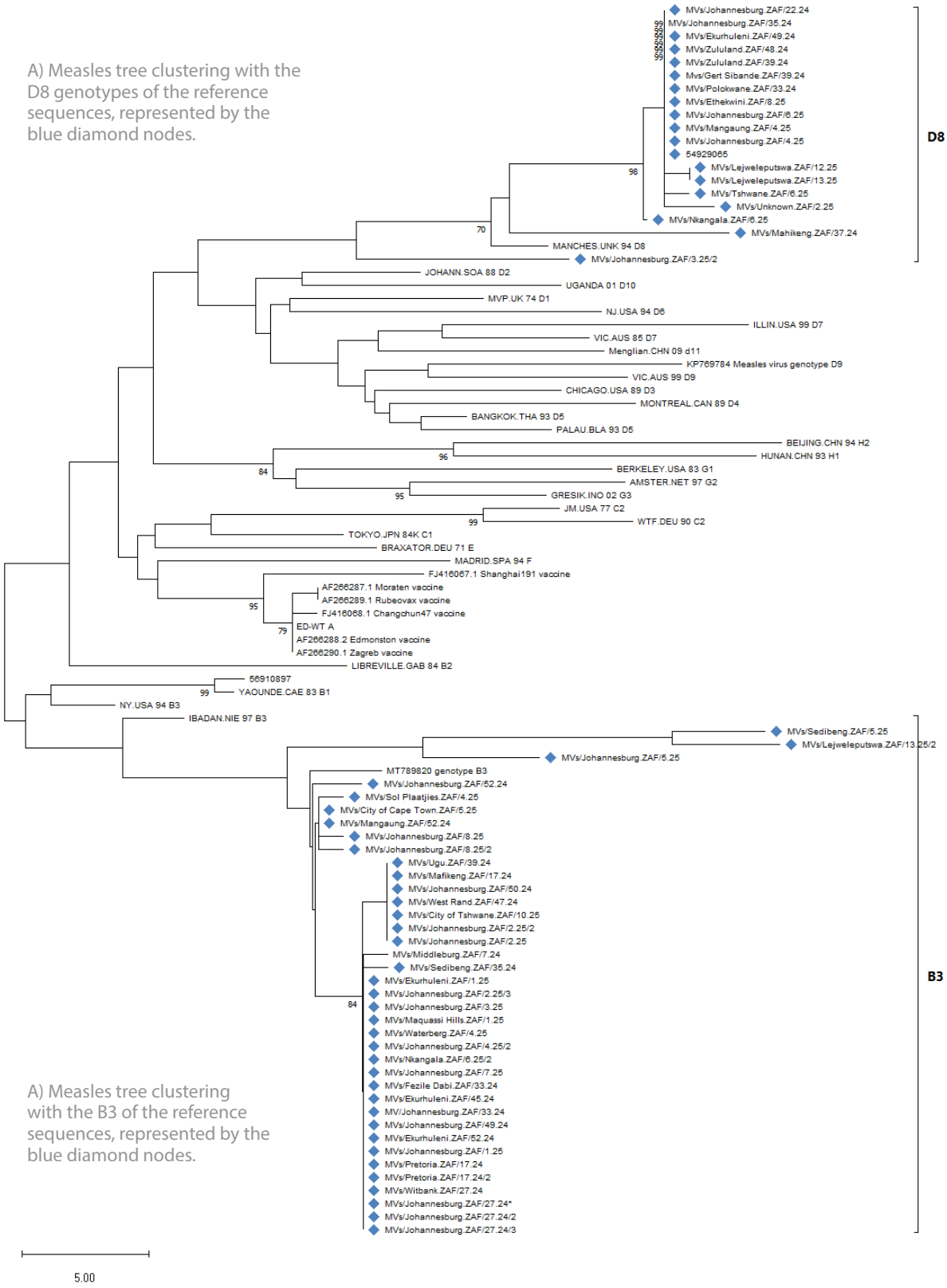
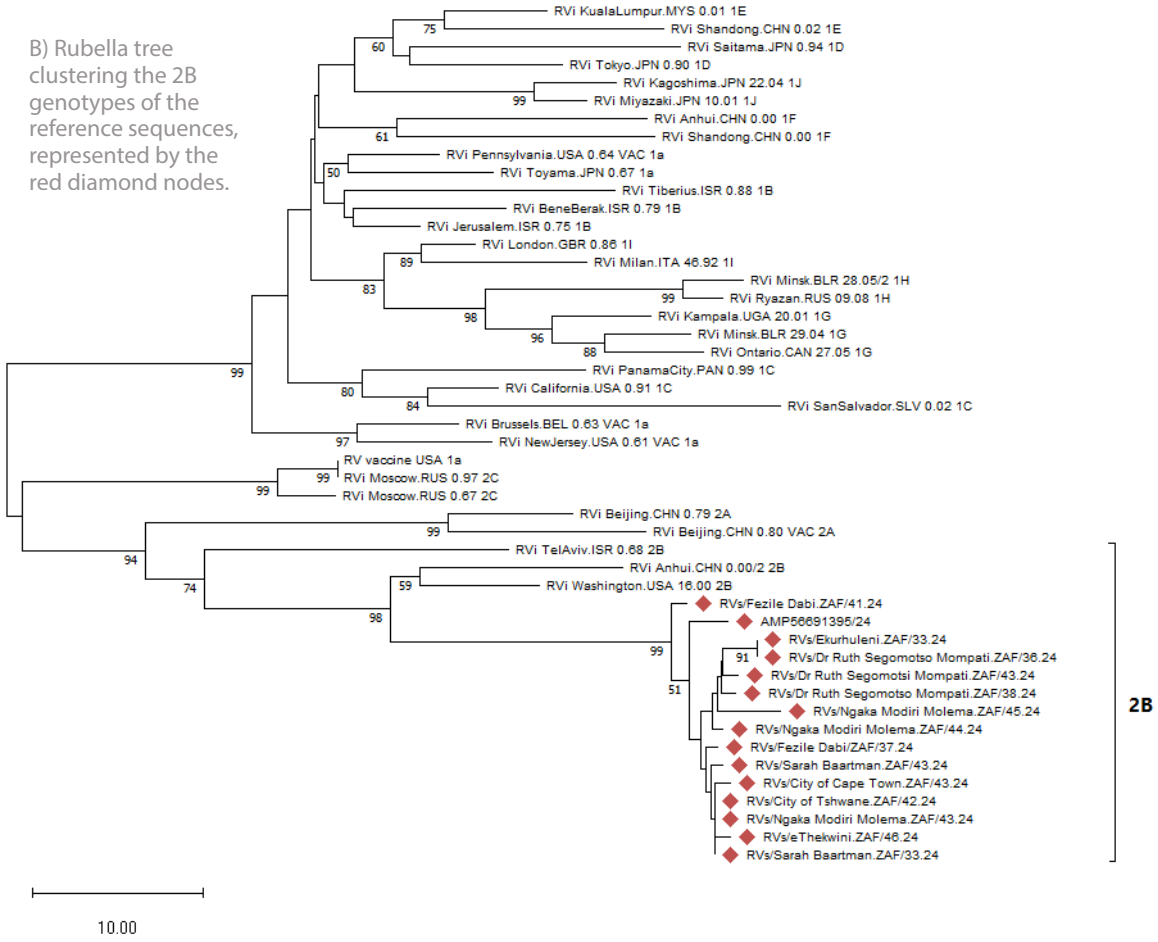


Fig. 1: Phylogenetic trees displaying the measles and rubella clusters. A) Measles tree clustering with the B3 and D8 genotypes of the reference sequences, represented by the blue diamond nodes. B) Rubella tree clustering the 2B genotypes of the reference sequences, represented by the red diamond nodes.



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POLIO SURVEILLANCE

The poliovirus national laboratory serves nine countries in the region for AFP surveillance: Angola, Botswana, Lesotho, Malawi, Mozambique, Namibia, Eswatini, Seychelles, and South Africa, and ten countries for environmental surveillance, nine as above and Zimbabwe. Up until February 2025, the NICD Poliovirus Regional Reference Laboratory was only one of two in Africa providing sequence analysis of polioviruses, supporting additional African countries in the region.

ACUTE FLACCID PARALYSIS SURVEILLANCE

During the period under review, 4,593 samples were processed for poliovirus isolation; 924 were from South Africa and 3,669 from the other eight countries. For the period January to March 2025, the non-polio AFP detection rate in children under the age of 15 years in the country was 2.9/100,000 population, above the WHO target of 2/100,000 but below the national target of 4/100,000. Of the nine provinces,

the Eastern Cape did not reach the WHO target of 2/100,000 population, while Free State, Gauteng, KwaZulu-Natal, Limpopo, North West, Northern Cape, and Western Cape have reached this target. Mpumalanga was the only province that exceeded the South African target of 4/100,000 population. The stool adequacy rate for South Africa was 74.2%, below the WHO target of 80%.

No polioviruses of programmatic importance were identified in South Africa, although a mixture of Sabin 1 and Sabin 3 was detected in one case from the Eastern Cape, and Sabin 3 in one case from Gauteng between September and November 2024.

Between May 2024 and March 2025, vaccine-derived poliovirus type 1 (VDPV1) was identified in one case (2 samples) from Mozambique, and vaccine-derived poliovirus type 2 (VDPV2) was identified in 12 cases, one contact, and three community contacts from Angola (26 samples in total). The date of onset for the VDPV1 case in Mozambique was 17 May 2024, while the onset date for the VDPV2 case in Angola was 07 February 2025. For those countries that refer isolates for sequencing only, VDPV1 was identified in 18 samples: DRC (11), Madagascar (6), and Uganda (1). VDPV2 was identified in 79 samples: Ethiopia (20), Liberia (14), DRC (25), and the Republic of South Sudan (20).

POLIOVIRUS ENVIRONMENTAL SURVEILLANCE

During the period under review, 1,407 samples were processed for poliovirus isolation: 252 from South Africa and 1,155 from the other nine countries. Sabin viruses of types 1 or 3 were identified in 10 sites in seven provinces of South Africa, and no polioviruses of programmatic importance were identified.

For countries we serve as a National Laboratory, VDPV2 was detected in five sites from Angola (18 samples), one site from Mozambique (1 sample), and eight sites from Zimbabwe (25 samples). From other countries or polio laboratories that we support for sequencing, VDPV1 was confirmed in two sites from Madagascar (4 samples), and VDPV2 in 14 sites in Côte d'Ivoire (80 samples), one site in Ethiopia (1 sample), two sites in Liberia (80 samples), four sites in the Republic of South Sudan (33 samples), five sites in Sierra Leone (50 samples), one site in Tanzania (6 samples), one site in Uganda (1 sample), and two sites in Zambia (2 samples).

ENVIRONMENTAL SURVEILLANCE FOR SARS-COV-2 AND OTHER PATHOGENS

CVI maintains the National Wastewater Surveillance network, which comprises 28 collection sites from wastewater treatment plants in nine provinces and 21 collection sites from sewers in communities located within catchment areas in communities across Gauteng province. Samples are collected from WWTP in towns nearest all land borders, including Botswana, Zimbabwe and Mozambique. A programme of aviation wastewater surveillance also supports weekly collection and testing of wastewater from OR Tambo International Airport, and aircraft from West, East Africa, South East Asia and Europe. Grab samples of one litre are collected and transported on ice within 24 hours to CVI for testing. During the period under review, testing of all wastewater samples for measles, rubella, influenza, hepatitis E, mpox (formerly called monkeypox), and *Mycobacterium tuberculosis* (MTB) were performed. The data has contributed to emerging insights regarding the interpretation of wastewater surveillance data (funded through Gates INV 050051).

Wastewater surveillance for SARS-CoV-2 continued in the period under review. A total of 2,053 wastewater samples were processed for SARS-CoV-2 surveillance from sites in all provinces. SARS-CoV-2 was identified

in 1,137 samples (55%) using optimised sensitive digital PCR assays. From the samples that tested positive and were sequenced, 837 sequences were generated. Sequence analyses were performed using in-house methods developed by the team in collaboration with Scripps Research in the United States. Briefly, quality checks, read mapping, variant identification, and single-nucleotide polymorphism (SNP) analyses were conducted using several open-source tools[3]. Over the period under review, there has been increasing dependence on WES SARS-CoV-2 data to determine circulating variants because of low numbers of clinical samples available for sequencing. The BA.2.87.1 lineage of SARS-CoV-2, a highly diverged BA.2-related lineage, was detected in clinical and wastewater samples. WES data contributed significantly to understanding the geographic and temporal distribution of this variant. The NB.1.8.1 variant, a WHO Variant Under Monitoring (VUM), was first detected in wastewater, as clinical cases had decreased in the year.

Reports are compiled and shared with stakeholders every week on the NICD SARS-CoV-2 wastewater dashboard at www.wastewater.nicd.ac.za.

Click Here »»

To complement fever-rash surveillance, CVI has integrated measles testing of wastewater samples with clinical samples for the whole of South Africa. During the period under review, measles was detected in 268 out of 2,859 (9.95%) samples tested. Mpox virus (MPXV) was also detected in wastewater during the period under surveillance, and three ad hoc reports were generated following the detection of the virus from wastewater samples collected in Gauteng, Limpopo, and Northern Cape provinces.

In collaboration with the CEZPD, CVI was able to publish and share these with the NDoH and WHO. The reports integrated data from both clinical and wastewater samples and were utilised by the Mpox IMT.

In addition, a new pilot programme for aircraft surveillance was established in September 2024. Wastewater samples from aeroplane lavatories were collected weekly from four flights. Testing was conducted for all assays available in the laboratory. Reports were shared with interested stakeholders.

TETANUS

The Centre collates tetanus cases reported through the NMC system. In the reporting period, 30 suspected tetanus cases were reported, with nine in KwaZulu-Natal, eight in Gauteng, four in Limpopo, three in the Western Cape, two in the Eastern Cape and North West, and one in Mpumalanga and the Northern Cape. Twenty-five cases of tetanus were reported in adults, five in neonates, and one case with an unknown age. Five deaths were reported in the adult cases. Of the five neonatal cases, two were in KwaZulu-Natal and Limpopo, and one was in Mpumalanga. There was one neonatal death.

The WHO declared that South Africa had eliminated maternal and neonatal tetanus in 2002, with the country's rate of neonatal tetanus below the threshold of less than one case per 1,000 live births in every district annually.

VIRAL HEPATITIS

The Centre remains committed to achieving the viral hepatitis elimination goals by 2030. CVI performs passive laboratory-based surveillance for hepatitis A, B, and C data from the Surveillance Data Warehouse (SDW).

HEPATITIS A

During the period under review, 01 April 2024 to 31 March 2025, 5,552 (2.7%) hepatitis A cases tested hepatitis A IgM antibody positive from a total of 208,196 tests done throughout NHLS laboratories nationally. The hepatitis A IgM positivity rate was high in the Western Cape province at 6.4% (859), with the most cases (68.2%) reported in the City of Cape Town Metro (586). Overall, most of the sub-districts in the Western Cape province reported above the provincial hepatitis A positivity rate of 6.4%, showing that there might be clusters of hepatitis A occurring, as shown previously by the molecular genotyping of some of the samples that detected hepatitis A sub-genotype 1B clusters. The surveillance of hepatitis A needs to be strengthened, with the investigation of hepatitis A risk factors, including environmental factors such as clean water supply disruption that might have an impact on hepatitis A transmission.

HEPATITIS B

Between 01 April 2024 and 31 March 2025, national NHLS laboratories tested 1,142,372 cases for hepatitis B surface antigen (HBsAg), of which 35,483 (3.1%) tested positive. Of these, the majority (25,919, 73.0%) were among the age group of 25 to 49 years, with the test positivity rate highest among the age group of 45 to 49 years (Fig. 2). Provincially, most HBsAg-positive cases were from Gauteng province, with test positivity rates highest in KwaZulu-Natal, Western Cape, Eastern Cape, and North West provinces (Fig. 2). Among children under one year old, there were 77 HBsAg-positive cases, with a test positivity rate of 2.11%. Hepatitis B data were shared with the NDoH (in joint reporting format).

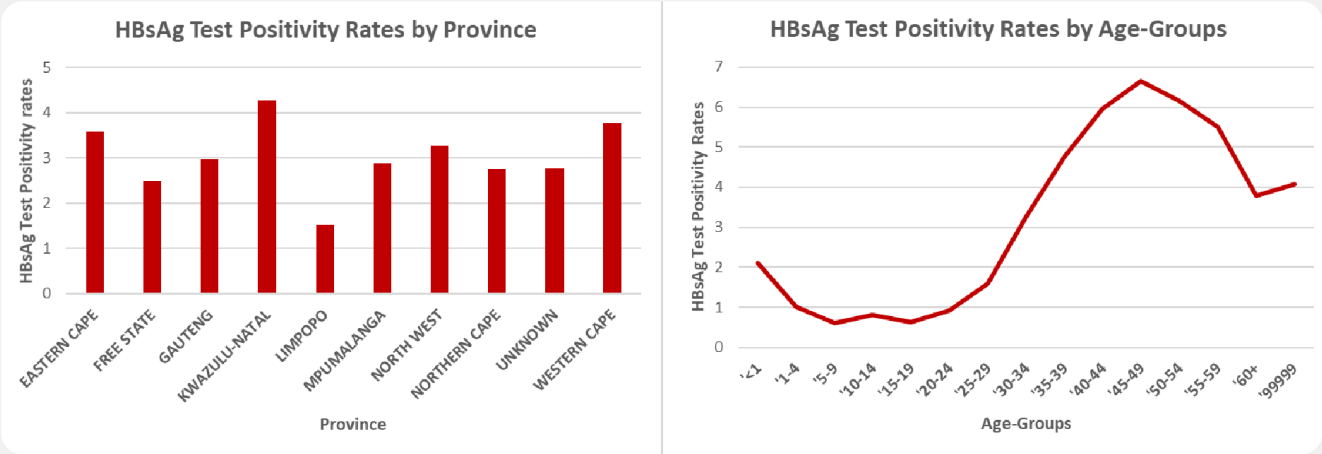

Fig. 2: HBsAg test positivity rates by province and age group, 01 April 2024 to 31 March 2025.

HEPATITIS C

From 01 April 2024 to 31 March 2025, 58,883 patients were tested for hepatitis C virus exposure using a hepatitis C antibody test, with a positivity rate of 2.7% (1,561). Of the 1,561 positive patients, 329 (21.1%) underwent a hepatitis C viral load test, of which 64.1% (211) had active hepatitis C infection. The median age of HCV-exposed individuals was 49.5 years, ranging from 10 to 103 years of age. HCV infections were seen to be highest in people aged 33 to 39 years, compared to other age groups, and

contributed to 44% of the HCV-infected population. The surveillance data showed gaps in follow-up testing patterns and insufficient evidence of linkage to care. Patient care and testing algorithms should be reviewed to achieve the goal of eliminating viral hepatitis by 2030. HCV genotypes 1 to 5 were reported in South Africa during the review period.

OUTBREAKS

From epidemiological week 1 to week 13 of 2025, 131 laboratory-confirmed measles cases and 249 rubella cases were reported by the Measles Reference Laboratory at the NICD in South Africa. Of the 131 laboratory-confirmed measles cases reported, 85 (64.9%) cases were in Gauteng province; meanwhile, 38.6% (96/249) of laboratory-confirmed rubella cases were reported in North West province. Both measles and rubella affected mostly children aged 1–15 years, with an increase in measles and rubella cases seen in the age group 15–49 years in the fever rash surveillance used to monitor measles and rubella virus circulation.

The Centre also assisted with the hand, foot and mouth disease (HFMD) outbreak that began in February 2025 in KwaZulu-Natal and later spread to other provinces. By 31 March 2025, the Centre had received 48 samples from five provinces: Eastern Cape (16), Gauteng (19), KwaZulu-Natal (8), Mpumalanga (4), and North West (1). Of these, 44 samples tested positive for enterovirus using real-time reverse transcription (RT) PCR. Genotyping of two samples from the uMgungundlovu District identified Enterovirus A strains: *Coxsackievirus A6 and Coxsackievirus A16*.

RESEARCH ACTIVITIES

Strengthening wastewater-based environmental surveillance for key vaccine-preventable diseases

NICD Investigator: Kerrigan McCarthy

WHC Investigators: Mukhlid Yousif, Nkosenhle Ndlovu, Emmanuel Phalane, Mokgaetji Macheke, Sipho Gwala, Natasha Singh, Thabo Mangena, Mantshali Motaung, Lebohang Rabotapi, Lethabo Monametsi, Fiona Els, Chenoa Sankar, Sibonginkosi Maposa

Key activities conducted during the review period included:

- Assay development for the optimisation of detection of SARS-CoV-2, influenza A and B, hepatitis A and E, measles, and rubella.
- Compilation of the SOPs for the assays.
- Development of a sample collection and handling standard operating procedure (SOP).
- SOP for the training of field sample collectors.

This research project is funded by the Gates Foundation. The NICD co-funded all activities through the provision of a staff member, laboratory space, some reagents and consumables, and courier services for a third of the samples processed at the NICD.

Integrated environmental surveillance implementation in South Africa

NICD Investigator: Kerrigan McCarthy
WHC Investigators: Mukhlid Yousif, Nkosenhle Ndlovu, Emmanuel Phalane, Mokgaetji Macheke, Sipho Gwala, Natasha Singh, Thabo Mangena, Mantshali Motaung, Lebohang Rabotapi, Lethabo Monametsi, Fiona Els, Chenoa Sankar, Sibonginkosi Maposa.

Key achievements under this project include:

Successful expansion of the wastewater epidemiology sentinel sites network. The programme has now grown to 44, spread across the whole country (Table 1). The sites are monitored at least once a week.

Table 1: Wastewater surveillance programme sites in South Africa

Provinces	Municipalities	Wastewater Treatment Plants (Sites)
Eastern Cape	Nelson Mandela Bay Metropolitan Municipality	East Bank, Mdantsane, Brickfield and KwaNobuhle
Free State	Mangaung Metropolitan Municipality	Sterkwater (Dewetsdorp Pad) and Bloemspruit
Gauteng	City of Johannesburg Metropolitan Municipality	Northern Works and Goudkoppies and six more in a closed catchment that includes Chris Hani Baragwanath Hospital and Bushkoppies Wastewater Treatment Works
	Ekurhuleni Metropolitan Municipality	Vlakplaas and Hartbeesfontein and seven more in a closed catchment that includes Tembisa Hospital, Midstream, Olifantsfontein Water Treatment Works and Tembisa Mall
	City of Tshwane Metropolitan Municipality	Rooiwal and seven more sites in a closed catchment that includes Daspoort and Kalafong Hospital
KwaZulu-Natal	eThekwini Metropolitan Municipality	Northern and Central
	uMkhanyakude District Municipality	Jozini and Manguzi
Limpopo	Vhembe District Municipality	Musina (town) and Nancefield
Mpumalanga	Nkomazi Local Municipality	Komatipoort
	Mbombela Local Municipality (Silulumanzi concession)	Silulumanzi
North West	Mahikeng Local Municipality	Mahikeng and Mmabatho
	Mbombela Local Municipality (Silulumanzi concession)	Rustenburg and Boitekong
Northern Cape	Cape Town Metropolitan Municipality	Homevale
Western Cape	Sol Plaatjie Local Municipality	Borchards Quarry and Zandvliet

Monitoring and evaluation of aircraft wastewater for communicable disease surveillance in South Africa

NICD Investigator: Kerrigan McCarthy
WHC Investigators: Mukhlid Yousif, Nkosenhle Ndlovu, Emmanuel Phalane, Mokgaetji Macheke, Sipho Gwala, Natasha Singh, Thabo Mangena, Mantshali Motaung, Lebohang Rabotapi, Lethabo Monametsi, Fiona Els, Chenoa Sankar, Sibonginkosi Maposa

Key activities conducted during the review period included:

- Identified geographical regions with significant migration into South Africa and from where

vaccine-preventable disease pathogens or new variants of pathogens may emerge.

- Set up an aircraft surveillance system that can be flexibly reoriented should another outbreak or pandemic emerge.

- Conducted aircraft wastewater sampling, processing, PCR detection and sequencing from inbound aircraft from these destinations for SARS-CoV-2, influenza, measles, rubella, hepatitis A and E virus and mpox particles, and where possible sequence the detected pathogens.

- Provided detection and sequence data to appropriate experts and authorities in South Africa (National Institute for Communicable Diseases, and the National Department of Health) and to the South African IHR Focal Point to support risk assessment, public health decision-making and to support South Africa's fulfilment of IHR Regulations.

This research project is funded by the Centres for Disease Control and Prevention. The NICD co-funded all activities through the provision of key staff members, laboratory space and some reagents and consumables.

HOST-DERIVED BIOMARKER FOR TB (IDO PROTEIN)- IMMUNOLOGY PROJECT

WITS Investigator: Clement Gascua

Building on our previous work on indoleamine 2,3-dioxygenase-1 (IDO) activity as a potential non-sputum-based TB biomarker, we are now assessing whether plasma IDO protein measured with a commercial ELISA can serve as a blood-based biomarker to diagnose active TB. In this study, we are also comparing plasma IDO protein levels to IDO activity previously measured as the Kynurenine/Tryptophan (K/T) ratio in the same cohort. The (K/T) ratio is a blood-based biomarker that measures the relative amounts of kynurenine and tryptophan, reflecting the activity of the enzyme IDO-1. With higher K/T ratios associated with various conditions, including active TB, this test may aid in TB diagnoses and monitor treatment outcomes. During the period of review, the CVI immunology laboratory has completed method optimisation and validation.

TEACHING AND TRAINING

UNDERGRADUATE

GEMPII and PHII (viral hepatitis), medicine (medical immunology, vaccinology)

POSTGRADUATE

Registrar rotation, FETP, MSc, MMed, PhD, MPH, DTM&H

INTERN SCIENTISTS

6 intern scientists over this period.

PROFESSIONAL DEVELOPMENT

POSTGRADUATE STUDENTS

Seven students were enrolled for postgraduate studies as follows:

- MSc: 3
- PhD: 3
- SAFETP: 1

POSTGRADUATE STUDENTS

Three students graduated in the period under review. These comprised the following:

- PhD: 2
- MSc: 1

One intern scientist completed her internship at the CVI.

OTHER ACTIVITIES

1. During the measles and rubella outbreak, Dr K McCarthy, Dr N Prabdial-Sing and Mr MJ Manamela gave multiple media interviews related to the outbreak and surveillance.

2. Dr K McCarthy and Dr M Yousif provide responses to social media requests related to the wastewater dashboard.

3. Dr Shelina Moonsamy and Ms Lerato Seakamela were among a team of auditors who audited the Ibadan and Uganda National Polio Reference Laboratories for Poliovirus VP1 Sequencing as part of expanding sequencing capacity in AFRO (10 to 21 February 2025).

4. Dr Shelina Moonsamy participated as part of a team of auditors conducting a follow-up accreditation visit to the Zimbabwe National Polio Laboratory (10 to 14 March 2025).

5. Dr Mukhlid Yousif was invited to speak at the 2024 Global Wastewater Conference (GLOWACON) Regional Conference in Addis Ababa, Ethiopia. December 2024

6. The wastewater Genomics Group hosted a workshop at the conference (Session 37, Workshop 18) on 13 June 2024, at the Water Institute of Southern Africa (WISA) 2024.

7. The wastewater Genomics Group hosted a workshop at the conference (Session 37, Workshop 18) on 13 June 2024, at the Water Institute of Southern Africa (WISA) 2024.

8. Ms Fiona Els presented at the International Water Association Webinar on non-sewered settings with a presentation entitled "SARS-CoV-2 surveillance in non-sewered settings in South Africa" on the 16th of May 2024.

9. The Wastewater Genomics Syndicate hosted the inaugural modelling consortium in Stellenbosch from 4 to 5 March 2025.

10. Dr Mukhlid Yousif and Dr Victor Mabasa participated in a workshop organised by the Africa CDC in Nairobi, Kenya, March 2025, aimed at strengthening the capacity of African countries to utilise wastewater surveillance for Mpox.

11. Dr N Prabdial-Sing presented a World Hepatitis day webinar for Limpopo Province on hepatitis B and C

RESEARCH OUTPUT

Journal Articles

1. Moonsamy S, Pillay P, Singh BA, Puren A, Ward JW, Prabdial-Sing N. Hepatitis B infection (HBsAg and HBeAg) status among women attending antenatal care at public healthcare facilities of South Africa, 2017. PLOS Glob Public Health. 2025 Jan 22;5(1): e0003567. doi: 10.1371/journal.pgph.0003567. PMID: 39841729; PMCID: PMC11753652.

2. Maree G, Els F, Naidoo Y, Naidoo L, Mahamuza

P, Macheke M, Ndlovu N, Rachida S, Iwu-Jaja C, Taukobong S, Maposa S, O'Reilly K, Yousif M, McCarthy K. (2025). Wastewater surveillance overcomes socioeconomic limitations of laboratory-based surveillance when monitoring disease transmission: The South African experience during the COVID-19 pandemic. PLoS ONE 20(2): e0311332.

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https://doi.org/10.1371/journal.pone.0311332

3. Bhagwandin K, Thaver-Kleitman J, Subramoney K, Manamela MJ, Prabdial-Sing N. Exploring the Epidemiological Surveillance of Hepatitis A in South Africa: A 2023 Perspective. Viruses. 2024 May 31;16(6):894. doi: 10.3390/v16060894.

4. Subramoney K, Manamela J, Korsman S, Bezuidenhoudt J, Lawrence C, Thaver J, Bhagwandin K, Khosa J, Khalishwayo Z, Prabdial-Sing N. Molecular characterisation of hepatitis A in the Western Cape province, South Africa in 2023. BMC Infect Dis. 2024 Aug 21;24(1):845. doi: 10.1186/s12879-024-09738-7

5. Brown L, Bingham J, Pulliam J, Mthombothi Z, Sereo T, Kamupira M, Botha S, Molema K, Maseti E, Schönfeldt M, Mabhena N, Prabdial-Sing N, von Gottberg A, McCarthy K, van Schalkwyk C. Estimation of the poliovirus type 2 immunity gap in South Africa. Vaccine. 2024 Oct 3;42(23):126062. doi: 10.1016/j.vaccine.2024.06.029. Epub 2024 Jul 4.

6. Sankar C, Meyer JC, Schönfeldt M, Gunter H, Dawood H, Sekiti V, Pickard N, Mubaiwa L, Mawela D, Dlamini S, Peter J, Spencer D, Gray C, Patel V, Bamford L, Sehloho T, McCarthy K. Vaccine safety surveillance in South Africa through COVID-19: A journey to systems strengthening. Vaccine. 2024 Dec 6:126535. doi: 10.1016/j.vaccine.2024.126535.

7. Diamond MB, Whistler T, Rando K, Nwachukwu C, Yousif M. Policy dimensions of global wastewater surveillance.Bull World Health Organ. 2024 Sep 1;102(9):622-622A. doi: 10.2471/BLT.24.292245

8. Kleinhans I, Mahanjana S, Els F, Mabona M, Pitso LA, Malatje G, et al. The prevalence and distribution of malaria in Mpumalanga Province before and during COVID-19 (2017 - 2022). S Afr Med J [Internet]. 2024 Aug. 2 [cited 2024 Sep. 23];114(8):e1736. Available from:

Click Here »»»

https://samajournals.co.za/index.php/samj/article/view/1736

9. Nkosenhle Ndlovu, Victor Mabasa, Chenoa Sankar, Nosihle Msomi, Emmanuel Phalane, Natasha Singh, Sipho Gwala, Fiona Els, Mokgaetji Macheke, Sibonginkosi Maposa, Mukhlid Yousif, Kerrigan M. McCarthy. Wastewater testing during the South African 2022-2023 measles outbreak demonstrates the potential of environmental surveillance to support measles elimination.

Click Here »»»

https://www.medrxiv.org/content/10.1101/2024.09.01.24312904v1

OTHER PUBLICATIONS

Book chapter.

RESEARCH OUTPUT

1. International: 6
2. National: 6

Poliovirus ITD 6.0 Refresher/KF DUO Workshop: (French session) 21–25 October 2024. The workshop was facilitated by Phethegile from CVI.

Advanced Sanger Sequencing Workshop: 7-11 October 2024. Attended by Ms Melissa and Ms Lerato from CVI.

References:

1.

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https://app.powerbi.com/view?r=eyJrIjoiMTNiYzk4MGQtNWM1Mi00MjM3LWFkZWYtM2I2ZjExYzhlODM0IiwidCI6IjI1M2Q3NGI2LThlMDAtNDc3OC04NWEyLTMwOWIwODA4YzQ2MyJ9

2.

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https://app.powerbi.com/view?r=eyJrIjoiYTYxZWQwM2YtYWQ5My00N2MzLTliNWUtODZhOTVhNWJkMDVjIiwidCI6IjI1M2Q3NGI2LThlMDAtNDc3OC04NWEyLTMwOWIwODA4YzQ2MyJ9

3.

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https://github.com/andersen-lab/Freyja

DIVISION FOR PUBLIC HEALTH SURVEILLANCE AND RESPONSE (DPHSR)

DIVISION FOR PUBLIC HEALTH SURVEILLANCE AND RESPONSE (DPHSR)

DR SUSAN NZENZE

Centre Head

BACKGROUND

The DPHSR plays a pivotal role in surveillance and response activities related to communicable disease threats in South Africa. The DPHSR comprises the following units: GERMS-SA (the oldest surveillance programme, which has been running for over 21 years), the Provincial Epidemiology Team (PET) (consisting of eight epidemiologists based in the provinces and their manager), the Notifiable Medical Conditions (NMC) Surveillance Unit, and the Outbreak Response Unit (ORU), which hosts the Emergency Operations Centre (EOC). Together, these units, in conjunction with the NICD specialist centres' teams, carry out the function of national communicable disease surveillance, pandemic preparedness, and response. This is achieved through real-time alerts and notifications of diseases of public health importance (NMC), monitoring trends in disease burden, antimicrobial susceptibility, and circulating isolates (GERMS-SA), as well as providing technical expertise to national, provincial, and district health departments (PET and ORU). The DPHSR also facilitates communication and data sharing among national and provincial health departments, the NICD, and regional and international partners.

During the past year, the DPHSR was integral to the continued national and provincial response to several outbreaks, including mpox, diphtheria, agricultural stock remedy poisoning, hand-food-and-mouth disease (HFMD), pink eye, and rabies in seals. Through our various teams, the DPHSR provided epidemiological expertise and maintained data platforms to monitor trends in cases, tests, hospitalisations, and deaths. Epidemiological support from the EOC, ORU, and PET led to a well-coordinated and structured data flow, data management, and analysis. Event-based surveillance activities continued, and EOC staff conducted training on emergency management locally and in several other African countries. At the national level, several staff members were involved in efforts to implement integrated disease surveillance and response (IDSR) as well as South Africa's second joint external evaluation (JEE). Coming from the joint external evaluation, further work is needed to develop national action plans for health security and resource mapping to undertake the identified activities.

The NMC surveillance system continues to provide coordinated collection, collation, analysis, interpretation, and dissemination of public and private sector NMC data through a real-time surveillance system and provides information for targeted public health response, decision-making, and resource allocation. Through the NMC, timely alerts are issued, and the public health response is initiated. Lastly, GERMS-SA collaborates with NICD centres to provide a national active surveillance programme for laboratory-confirmed bacterial and fungal infections, complemented by enhanced surveillance at sentinel hospital sites. This provides a robust platform for monitoring disease trends, which guide public health policy decisions.

SURVEILLANCE

In the last 21 years, the NHLS microbiology laboratories and those in the private sector have participated in the GERMS-SA laboratory surveillance programme and sent specimens matching the GERMS-SA case definitions to NICD reference centres for further characterisation. Through the NHLS Corporate Data Warehouse (CDW), full case counts from NHLS laboratories are added to our GERMS-SA databases for all isolates matching published case definitions. This provides the minimum burden of disease for each pathogen, reflecting over 300,000 cases over the last 21 years. At 30 sentinel public sector sites nationally, nurse surveillance officers enhance our surveillance by collecting clinical information and outcome data on patients relating to specific pathogens. The GERMS-SA core team also supports the operational side of syndromic surveillance programmes, including pneumonia and influenza-like illnesses (with CRDM) and diarrhoea (with CED) and smaller site-specific studies with CHARM and CVI. Over the years, work from the GERMS-SA platform has informed the introduction of new vaccines into the expanded programme of immunisation (EPI), specifically *Haemophilus infuenzae* B, pneumococcal conjugate vaccine, rotavirus, and maternal pertussis vaccination. Also, clinical management guidelines for cryptococcal meningitis in patients with advanced immunodeficiency syndrome (AIDS).

The NMC reporting application was initially rolled out in 2018 and facilitates real-time notification for the prompt diagnosis of NMCs. This strengthens NMC surveillance, as required by the International Health Regulations (2005). NMCs are reported electronically through mobile applications on Android, Huawei, and iPhone, and a web-based application. Electronic notification is preferred, although paper-based forms can still be used. As of March 2025, there were 32,688 authorised users; the mean number of active users per month in 2024 was 427 compared to 368 in 2023 and 279 in 2022, respectively. The number of active users in March 2025 (412) was slightly higher compared to March 2024 (371), indicating stability in the number of users of the system. In the year under review (2024), the NMC surveillance system received 171,852 notifications (excluding COVID-19), of which 20% (34,055/171,852) were Category 1 NMCs and 79% (136,160/171,852) were Category 2. The most common Category 1 notifications were clinical and laboratory notifications of rubella cases (42%), followed by measles cases (33%), reflecting the ongoing rubella outbreak. Common Category 2 notifications included pulmonary tuberculosis (58%), followed by extra-pulmonary tuberculosis (13%). Agricultural stock remedy poisoning was gazetted as a Category 1 NMC in response to national efforts to curb deaths among children from poisoning.

The PET continued to support provincial departments of health with public health surveillance data management, analysis, report writing, and report dissemination. Our North West province epidemiol-

ogist was selected for a World Health Organization (WHO) Global Outbreak Alert and Response Network (GOARN) fellowship, and through this opportunity, trained the rest of the PET in epidemic intelligence and disease modelling. The Western Cape and North West PETs demonstrated the use of technology to improve disease surveillance through the development and publication of tailored public health surveillance dashboards. Routine surveillance dashboards (rabies in seals, malaria, and TB notifications; HIV/TB Phuthuma weekly indicators) and outbreak response dashboards were produced and published to inform and support public health action and decision-making. In Limpopo province, the provincial epidemiologist assisted in threshold setting for schistosomiasis (bilharzia).

The ORU continues to produce a weekly (event-based surveillance) EBS bulletin that provides updates on current local, regional, and international infectious disease threats for the NICD and NDoH stakeholders, as well as support various capacity-building initiatives.

OUTBREAKS

The ORU provided epidemiological and communications support and technical expertise to the NDoH and provinces related to several outbreak preparedness and response activities of national importance, such as cholera, measles, rubella, tanapox, chickenpox, mpox, several foodborne poisoning events, conjunctivitis, HFMD, and diphtheria. In addition, the ORU continued its stellar work of coordinating the clinical hotline for infectious disease queries. The most significant development in the last year was the ORU's role as a major stakeholder in the continued development of the national IDSR on behalf of the NDoH. Part of this was the ORU assisting in facilitating the Africa Centres for Disease Control and Prevention (Africa CDC) supported training-of-trainers national workshop for event-based surveillance (EBS) and subsequent provincial rollout of the NDoH EBS pilot in the Mpumalanga and Free State provinces. The EBS environment also provided the platform for the ORU to partner with the Robert Koch Institute on the Health Security Partnership in Africa phase one for South Africa, which included capacity building in the form of infectious disease modelling training being hosted at the NICD and supporting a PET member on the GOARN Berlin Fellowship Programme.

To sustain the implementation of the media monitoring and hotline components of EBS, the ORU was able to secure funding for additional staff capacity through the United States Centers for Disease Control and Prevention (US CDC). This allows the ORU to implement the adopted Africa CDC framework for EBS and the WHO's Epidemic Intelligence from Open Sources on behalf of the NDoH. The ORU continues to interact with several other public health agencies globally and is an active member of the WHO GOARN, and continues to contribute to national planning and preparedness activities, such as the national action plan for the health security agenda and the South African WHO JEE for International Health Regulations core capacities. Additionally, an ORU staff member has completed the basic requirements and is now a rostered qualified expert nominated by Member States to the United Nations Secretary-General's Mechanism for Investigations of Alleged Use of Chemical and Biological Weapons.

In terms of response activities, the ORU has provided epidemiology support to the national mpox incident management team, served on vaccine technical working groups, and supported risk communications efforts, including supporting a rapid quality assessment with the assistance of experts deployed through the UK Health Security Agency and clinical awareness for mpox. The ORU supported cholera response efforts by assisting in finalising national guidelines. In response to an increase in reports of suspected foodborne poisoning events, the

Presidency activated the National Joint Operations Centre, and an ORU epidemiologist was deployed and has been an integral component of the public health workstream. ORU staff actively contributed to the HFMD response activities by conducting several media engagements and, in collaboration with epidemiologists and laboratory staff, developed guidance documents for healthcare workers and the public.

The EOC continues to support the NDoH in establishing a public health EOC (PHEOC) for all hazards, while the EOC based at the NICD continues to be operationalised for infectious diseases only. The EOC supported the NDoH in the cascading of EOC capacity to the Eastern and Western Cape provinces and has contributed towards pandemic preparedness exercises, planning locally and regionally (Mozambique and Ethiopia), and the JEE. The NICD EOC team plans to continue supporting the NDoH project towards the establishment of functional national and provincial PHEOCs and to further develop training material for a broader range of emergency management topics. The EOC Manager was onboarded as a member of the Africa CDC Public Health Emergency Management Fellowship and a mentor for the West African Public Health Emergency Preparedness, Response, and Recovery Fellowship.

The PET provided technical support for local outbreak preparedness and response activities in the provinces and was part of Provincial Joint Meetings. The PET supported outbreak investigation and report writing for local outbreaks, including the HFMD outbreak (mainly in KwaZulu-Natal), the conjunctivitis outbreak (in KwaZulu-Natal), diphtheria (in the Western Cape, Mpumalanga, and Limpopo), mpox (in Gauteng), and several foodborne illness outbreaks occurring in schools reported in the different provinces. Furthermore, the PETs ensured the ongoing maintenance and regular updating of the Provincial Outbreak Registers.

POLICY CONTRIBUTIONS

- The DPHSR contributed to the development and drafting of the national integrated disease surveillance and response strategy.

- Ms Genevie Ntshoe was appointed as a member of the cholera taskforce responsible for the review and update of the national cholera guidance documents.

- Dr Susan Nzenze, Ms Lehlohonolo Kumalo, Dr Ruvimbo Chingonzoh, and Ms Janine Bezuidenhoudt were trained as trainers for the Data-2-Policy (D2P) programme and mentored the second cohort of D2P participants, which included several staff from the DPHSR (Dr Vanessa Quan, Dr Susan Meiring, Ms Genevie Ntshoe, Ms Moipone Shonhiwa, Ms Poncho Phafane, Ms Zandile Nukeri, and Ms Zikhona Jojozi).

Policy briefs
Protect our future leaders: Meningococcal vaccination to prevent meningitis amongst students in South Africa

This policy brief proposes options to increase vaccine coverage to prevent meningococcal meningitis outbreaks in South African universities.

Boost drug-resistant TB testing: Optimising the drug-resistant TB reflex testing algorithm in South Africa

This policy brief explores the policy option of collecting an additional sputum sample from each patient at the initial TB screening visit for follow-up reflex drug resistance testing.

Can you spare a little drop? Increasing and sustaining blood supply in South Africa

This policy brief endeavours to increase life-saving blood stocks within the South African National

Blood Service (SANBS) by assessing policy options to improve existing recruitment and retention strategies.

Silent Struggles: The bitter taste of undiagnosed diabetes among people with TB in Gauteng

The policy brief assesses general and targeted screening algorithm options for early diabetes diagnosis to improve integrated care among people receiving TB treatment in Gauteng public health care facilities.

Eliminating hepatitis C in South Africa: improving testing and treatment coverage in public healthcare sector

This policy brief examines policy options for the use of point-of-care screening and treatment of hepatitis C at lower levels of care to reach both the general population and high-prevalence key populations.

Mother's touch, baby's lifeline: Championing lodger mother and kangaroo mother care facilities to save babies in South Africa

This policy brief focuses on reducing the number of deaths related to premature births at a Gauteng tertiary hospital by exploring the policy options of building a lodger mother facility or extending the neonatal ward to accommodate additional Kangaroo Mother Care beds.

RESEARCH ACTIVITIES

The DPHSR conducted several research activities in collaboration with NICD centres and national and international partners.

The ORU conducted several research activities, including:

A review of legal instruments for Emergency Management and Outbreak Response in South Africa: NICD perspective

NICD Investigators: Nevashan Govender
Collaborators: Sayuri Pillay (University of Witwatersrand)

To discuss the development and the extent of the roles and responsibilities of ORU and the National EOC in South Africa. To identify gaps in the current outbreak response and EOC legal structure in South Africa. To ascertain if the ORU/EOC at the NICD is legally mandated. In addition, to provide recommendations for the ideal Public Health Emergency Operations Centre (PHEOC) set-up, in terms of legislation, functions, and others, for all the relevant stakeholders involved.

Burnout and mental health resilience among frontline workers providing pandemic response in South Africa, NICD

NICD Investigators: Nevashan Govender
Collaborators: Inge Kleinhans (Sefako Makgatho Health Sciences University)

To describe the knowledge, attitudes, and practices of frontline staff regarding burnout and mental health resilience, as well as to provide a situational analysis that can inform policy and strengthen the overall wellness of employees within the workplace.

Prevalence and distribution of protozoal enteropathogens in South Africa between 2016 and 2021

NICD Investigators: Nevashan Govender, Bhavani Moodley, Charlotte Sriruttan
Collaborators: Inge Kleinhans (Sefako Makgatho Health Sciences University)

A descriptive, retrospective, and cross-sectional analysis of secondary data from the NHLS CDW. We assessed the prevalence and distribution of selected protozoal enteropathogens *(Cryptosporidium, Entamoeba histolytica* and *Giardia lamblia)* in public-health sector patients in South Africa from 2016 to 2021.

The epidemic of knowing: An ethnographic study of biomedical knowledge production in the South African Covid-19 epidemic

NICD Investigators: Nevashan Govender
Collaborators: Praveer Patel (University of Johannesburg)

To study how biomedical knowledge is being produced through the surveillance of the COVID-19 pandemic, we will look at how digital technology, such as various COVID-19 dashboards and social media, is used as a tool for research and for sharing knowledge, as COVID-19 has emphasised the importance of digital technology.

GERMS-SA conducted several research activities, including:

Identifying zoonotic aetiologies in adults with acute febrile illness and baseline seroprevalence for selected zoonotic conditions at the human-wildlife-livestock interface, Mpumalanga, South Africa, 2012 to 2024

NICD Investigators: Vanessa Quan and CEZPD
Collaborators: Marinda Oosthuizen and others (University of Pretoria)

Baby GERMS-SA (with CHARM)

NICD investigators: S Meiring, R Mathebula, O Perovic, M Smith, R Mpembe, V Quan, A von Gottberg, L de Gouveia, S Walaza, C Cohen, E van Schalkwyk, NP Govender
Collaborators: C Mackay, R Phayane, T Mailula, O Mekgoe, C Kapongo, N Maphosa, A Dramowski
Funder: Bill and Melinda Gates Foundation

Baby GERMS provides a baseline description of the aetiology, antimicrobial susceptibility profile, and clinical characteristics of culture-confirmed neonatal bloodstream infections and meningitis in South Africa. Results show a high burden of antimicrobial-resistant Gram-negative sepsis in this vulnerable population.

TEACHING AND TRAINING

The DPHSR staff provided and contributed to the teaching, training, and supervision of intern scientists, SAFETP residents, public health medicine registrars, and microbiology registrars from various South African universities. Staff provided lectures for undergraduates and postgraduates in the Faculty of Health Sciences at the University of the Witwatersrand and at other South African universities. Ongoing teaching and training are provided on a request basis, as well as on current infectious disease outbreaks, such as national cholera webinars. Several staff continue in training activities to capacitate provinces and support the rollout of IDSR in South Africa.

During the reporting period, Mr Wellington Maruma participated in the GOARN Fellowship Programme, contributing to key activities aimed at strengthening epidemic preparedness and response. His work focused on enhancing data analytics and surveillance systems in support of public health action. Mr Maruma played a pivotal role in strengthening data analytics capacity by applying R/RStudio and GIS tools to support epidemiological analysis. He facilitated a national workshop on epidemic intelligence, focusing

on digital tools, outbreak detection, and disease modelling. To improve data workflows, he completed advanced Applied Epi training in R Markdown reporting and GIS for applied epidemiology. This training assisted him in significantly improving data management workflows by introducing automation, efficiency, and reproducibility. He developed customised R scripts for key surveillance reports, including the Annual Cholera Report, monthly NMCSS reports, and DHIS indicator summaries. This assisted in streamlining reporting processes, reducing manual tasks, and enhancing the timeliness of epidemiological outputs. His participation in the GOARN Tier 1.5 Training, the WHO Speaker Series, and international conferences such as ESCAIDE and the European Public Health Conference provided valuable global exposure and supported stakeholder collaboration for improved outbreak response.

PROFESSIONAL DEVELOPMENT

GRADUATIONS

Nine students graduated during the period under review:

- PhD: 1
- MPH: 1
- Bachelor of Commerce in Supply Chain Management: 1
- Bachelor of Business Administration: 2
- Diploma in Management Project Management: 1
- Diploma in Business Management: 1
- Honours Supply Chain Management: 1
- Postgraduate Diploma in Project Management: 1

POSTGRADUATE STUDENTS

Twenty students are currently enrolled, comprising the following:

- PhD in Public Health: 1
- PhD in Public Health (Epidemiology): 1
- PhD in Environmental Health: 1
- Master in Public Health: 1
- Master in Business Administration: 1
- MSc Epidemiology and Biostatistics: 1
- MM Governance: 1
- Bachelor of Commerce in Project Management: 2
- Bachelor of Commerce in Public Administration: 1
- Bachelor of Arts in Environmental Health: 1
- Bachelor of Commerce in Project Management: 1
- Postgraduate Diploma in Public Health: 3
- Diploma in Public Health: 2
- Diploma in Business Administration: 1
- Diploma in TB and HIV management: 1
- Postgraduate Diploma in Public Health: 1

RESEARCH OUTPUT

Journal Articles

1. Ziad A Memish 1, **Lucille Blumberg** 2, Amal Saif Al-Maani 3, Rama Baru 4, Eve Dube 5, George F Gao 6, Daniel B Jernigan 7, Yee-Sin Leo 8, Joseph Sriyal Malik Peiris 9, Jakir Hossain B Masud 10, Jodie McVernon 11, Justice Nonvignon 12, Folasade Tolulope Ogunsola 13, Helen Reese 14, Rana Muhammad Safdar 15, Kumnuan Ungchusak 16, Lothar H Wieler 17, David Heymann; Moving cholera vaccines ahead of the epidemic curve. Lancet. 2024 Jan 13;403(10422): 127-129.doi: 10.1016/S0140-6736(23)02244-4. Epub 2023 Oct 17.

2. Francis B Kolo 1, Abiodun A Adesiyun 2, Folorunso O Fasina 1, Bernice N Harris 3, Jennifer Rossouw 4, Charles Byaruhanga 1, Hermanus De Wet Geyer 4, **Lucille Blumberg** 4, John Frean 4 5, Henriette van Heerden 1; Brucellosis Seropositivity Using Three Serological Tests and Associated Risk Factors in Abattoir Workers in Gauteng Province, South Africa, Pathogens. 2024 Jan 9;13(1): 64.doi: 10.3390/pathogens13010064.

3. Jassat W, Mudara C, Ozougwu L, Welch R, Arendse T, Masha M, **Blumberg L**, Kufa T, Puren A, Groome M, **Govender N**, Pisa P, Govender S, Sanne I, Brahmbhatt H, Parmley L, Wolmarans M, Rousseau P, Selikow A, Burgess M, Hankel L, Parker A, Cohen C. Trends in COVID-19 admissions and deaths among people living with HIV in South Africa: analysis of national surveillance data; Lancet HIV. 2024 Feb;11(2): e96-e105. doi: 10.1016/S2352-3018(23)00266-7.

4. Collins Iwuji 1 2, Catherine E Martin 3, Diantha Pillay 3, Patience Shamu 3, **Susan Nzenze** 3, Mercy Murire 3, Laura Ashleigh Cox 3, Alec Miners 4, Carrie Llewellyn 5, Saiqa Mullick 3, Implementation preferences for the management of sexually transmitted infections in the South African health system: a discrete choice experiment; Sex Transm Infect, 2024 Jan 17;100(1):10-16. doi: 10.1136/sextrans-2023-055816.

5. James A Banaski Jr 1 2, **Nevashan Govender** 3, Michelle J Groome 3 4, Ryan Houser 1 5, Ashley Greiner 6, Sharanya Krishnan 7, Brenna Means 1 5, Ryan Remmel 1 8, Ileana Vélez Alvarado 1 5, Claire J Standley 1 9; Introducing www.epidemic-em.org: A collection of online resources and training materials for strengthening use of Emergency Operations Centers for epidemic response, Disaster Med Public Health Prep, 2024 Feb 23:1-16. doi: 10.1017/dmp.2024.36.

6. Maxwell Mabona 1 2 3, Thembekile Zwane 4, Jaishree Raman 5 6 7, Lazarus Kuonza 4, Babongile Mhlongo 8, **Poncho Phafane** 8 9; Evaluation of the malaria case surveillance system in KwaZulu-Natal Province, South Africa, 2022: a focus on DHIS2, Malar J, 2024 Feb 14;23(1):47. doi: 10.1186/s12936-024-04873-7.

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https://doi.org/10.1186/s12936-024-04873-7

7. Andrew C K Lee 1, Bjorn G Iversen 2, Sadaf Lynes 3, Jean-Claude Desenclos 4, **Janine E Bezuidenhoudt** 5, Gerd M Flodgren 2, Thidar Pyone 6, The state of integrated disease surveillance globally: synthesis report of a mixed methods study, Public Health, 2024 Mar:228:85-91. doi: 10.1016/j.puhe.2024.01.003. Epub 2024 Feb 9.

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https://doi.org/10.1016/j.puhe.2024.01.003

8. Sung Hee Ko 1, Pierce Radecki 1, Frida Belinky 1, Jinal N Bhiman 2 3, **Susan Meiring** 2, Jackie Kleynhans 2 4, Daniel Amoako 2 5, Vanessa Guerra Canedo 1, Margaret Lucas 1, Dikeledi Kekana 2, Neil Martinson 6 7, Limakatso Lebina 6, Josie Everatt 2, Stefano Tempia 2 4, Tatsiana Bylund 1, Reda Rawi 1, Peter D Kwong 1, Nicole Wolter 2 8, Anne von Gottberg 2 8, Cheryl Cohen 2 4, Eli A Boritz 1, Rapid Emergence and Evolution of SARS-CoV-2 Variants in Advanced HIV Infection,

bioRxiv, 2024 Jan 6:2024.01.05.574420. doi: 10.1101/2024.01.05.574420.

9. Article Erratum: Investigation of two suspected diarrhoeal-illness outbreaks in Northern Cape and KwaZulu-Natal provinces, South Africa, April–July 2013: The role of rotavirus has just been published and is available at the following link:

Click Here

https://sajid.co.za/index.php/sajid/article/view/597

10. Carter ED, Stewart DE, Rees EE, **Bezuidenhoudt JE**, Ng V, Lynes S, Desenclos JC, Pyone T, Lee ACK. Surveillance system integration: reporting the results of a global multicountry survey. Public Health. 2024 Apr 10; 231:31-38. doi: 10.1016/j.puhe.2024.03.004. Epub ahead of print. PMID: 38603977.

11. Lee ACK, Iversen BG, Lynes S, Desenclos JC, **Bezuidenhoudt JE**, Flodgren GM, Pyone T. The state of integrated disease surveillance globally: synthesis report of a mixed methods study. Public Health. 2024 Mar; 228:85-91. doi: 10.1016/j.puhe.2024.01.003. Epub 2024 Feb 9. PMID: 38340506.

12. **Moshibudi Poncho Phafane** et al. Factors associated with mortality among laboratory-diagnosed drug-resistant tuberculosis patients on treatment, KwaZulu-Natal Province, 2017-2019. Pan African Medical Journal. 2024; 47:181. [doi: 10.11604/pamj.2024.47.181.34571] **Meiring S**, Govender NP, Maluleke C, Kleynhans J, von Gottberg A, Lutchminarain K, Lebaka T and **Quan, V**. 2023 GERMS-SA Annual Surveillance Review: Key Findings.

Click Here

https://www.phbsa.ac.za/2023-germs-sa-annual-surveillance-review-key-findings/

13. Meiring S, Quan V, Mashau R, Perovic O, Magobo R, Smith M, Mpembe R, von Gottberg A, de Gouveia L, Walaza S, Cohen C. Pathogen aetiology and risk factors for death among neonates with bloodstream infections at lower-tier South African hospitals: a cross-sectional study. The Lancet Microbe. 2025 Feb 25.

14. Buhle Ntozini, Sibongile Walaza, Benjamin Metcalf, Scott Hazelhurst, Linda de Gouveia, **Susan Meiring**, Dineo Mogale, Senzo Mtshali, Arshad Ismail, Kedibone Ndlangisa, Mignon Du Plessis, **Vanessa Quan**, Sopio Chochua, Lesley McGee, Anne von Gottberg,, and Nicole Wolter Molecular Epidemiology of Invasive Group B Streptococcus in South Africa, 2019–2020 Journal of Infectious Diseases. 2024 Dec 31.

Click Here

https://doi.org/10.1093/infdis/jiae633

15. Sumegha Asthana, Sanjana Mukherjee, Alexandra L Phelan, Ibrahim B Gobir, JJ Woo, Clare Wenham, Mohammad Mushtuq Husain, Tahmina Shirin, **Nevashan Govender**, Mohannad Al Nsour, Winifred Ukponu, Adachioma Chinonso Ihueze, Roujia Lin, Sumit Asthana, Renee Vongai Mutare, Claire J Standley, Decision-making under epistemic, strategic and institutional uncertainty during COVID-19: findings from a six-country empirical study, BMJ Glob Health, 2025 Feb 5; 10(2):e018124.doi:10.1136/bmjgh-2024-018124.

16. Mignon du Plessis, Rito Mikhari, Linda de Gouveia, Noluthando Duma, Tamsin Lovelock, Charlene Lawrence, Prasha Mahabeer, Yesholata Mahabeer, Nevashan Govender, Susan Nzenze, Jonathan Featherston, Mishalan Moodley, Jocelyn Moyes, Sibongile Walaza, Cheryl Cohen, Anne von Gottberg, Corynebacterium diphtheriae Infections, South Africa, 2015–2023, Emerg Infect Dis, 2025 Mar; 31(3): 417–426. doi: 10.3201/eid3103.241211.

17. **Brian Brummer**, Natalie Fischer, Jacqueline Weyer, Veerle Msimang, **Susan Nzenze**, **Nevashan Govender,** Lessons learned from the mpox outbreak in South Africa: A case study for comparing suspected mpox cases between a notifiable medical conditions surveillance system and laboratory testing data, Goarn, January 2025 - World [Internet]. ReliefWeb. 2025 [cited 2025 Mar 31]. Available from:

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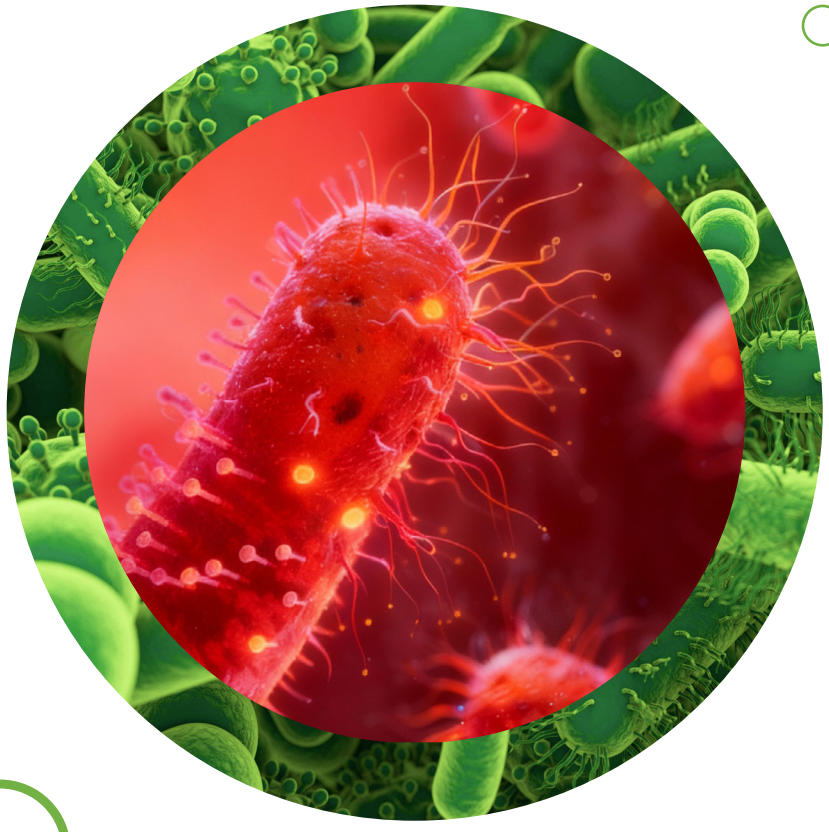
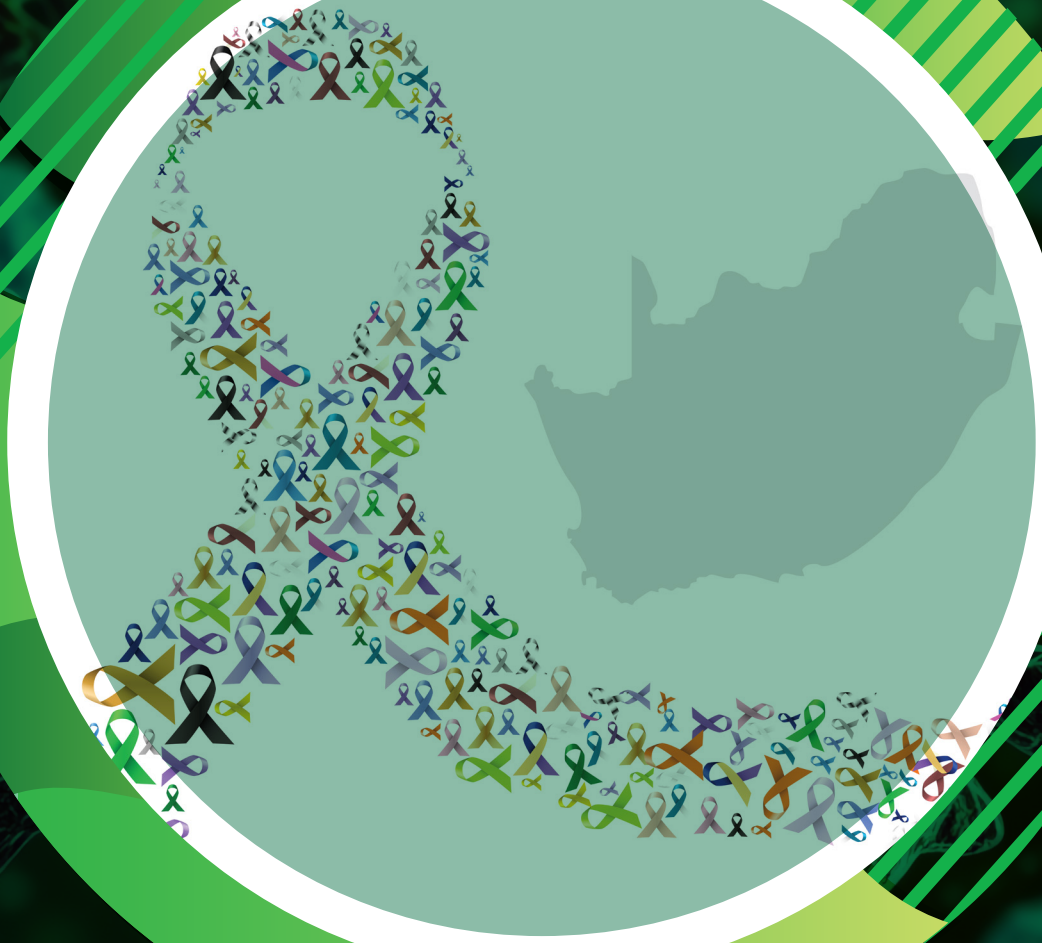
https://reliefweb.int/report/world/ioa-field-exchange-volume-9-january-2025



NATIONAL CANCER REGISTRY (NCR)



NATIONAL CANCER REGISTRY (NCR)

DR MAZVITA MUCHENGETI

Centre Head

BACKGROUND

The National Cancer Registry (NCR) is responsible for cancer surveillance, which is the systematic collection, storage, analysis, interpretation, and reporting of cancer cases. National pathology-based cancer surveillance, childhood cancer surveillance, and the implementation of population-based cancer registration are the primary roles of the NCR. Within the NHLS/NICD, the NCR is the only unit conducting non-communicable disease surveillance. The information provided by the national pathology-based cancer registry informs the prioritisation of cancers of public health importance by the National Department of Health.

The NCR continued to provide technical support to the recently launched KwaZulu-Natal Population-based Cancer Registry (KZN-PBCR). The first annual report from this registry (2023 report) was published on 31 March 2025, alongside the routinely published annual reports for the NCR (Ekurhuleni PBCR, Pathology-based cancer registry, and Childhood cancer registry). As one of three International Agency for Research on Cancer – Global Initiative for Cancer Registry Development (IARC-GICR) Centres of Expertise for Sub-Saharan Africa (SSA), the NCR has been supporting cancer registries within the continent by training them on record linkage for cervical cancer elimination and childhood cancer registration. From the record linkage training held in August 2024, participants from South Africa, Mauritius, Tanzania, Rwanda, and eSwatini managed to link their records successfully and were invited to present at the EUROGIN International HPV Multidisciplinary Conference (16-17 March 2025). The two sessions were convened and co-chaired by Dr Mazvita Muchengeti and Mr Sizeka Mashele from the NCR. The themes of the sessions were "Structural and Social Factors that impact HPV-driven Cancers in sub-Saharan Africa" and "Cervical Cancer in sub-Saharan Africa."

SURVEILLANCE

PATHOLOGY-BASED CANCER REGISTRY

In the year under review, the 2023 cancer incidence report was published on the NCR website

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(https://www.nicd.ac.za/centres/national-cancer-registry/)

Compared to 2022, there was a 0.3% decrease in the number of cancer cases reported in 2023 (87 567 versus 87 853, respectively). The cancer cases reported in 2023 surpassed the pre-COVID pandemic ones (87 321 in 2019 versus 87 853 in 2023). Data on cancers diagnosed in 2024 are currently being coded and cleaned. Due to the current austerity measures, the Data Manager post has remained unfilled since the 2022/2023 financial year. The positions for two Coding Supervisors fell vacant after the retirement of two NCR coding supervisors in the year under review. The vacant posts pose a threat to the continuity of surveillance activities.

EKURHULENI POPULATION-BASED CANCER REGISTRY (EPBCR)

This is the seventh year of population-based cancer registration in the Ekurhuleni metropolitan municipality, Gauteng province, South Africa. The published report includes cancers that were diagnosed between 1 January and 31 December 2023. The overall case finding and data collection for the year 2023 was 3978 (compared to 4116 in 2022). The registry encountered some challenges from 2022 to 2023, as reflected in the decrease in reported cases. These include delays in filling vacant surveillance officer posts due to prevailing cost-containment measures. The most common cancers reported were prostate, colorectal, and lung cancers among males and breast, cervix, and colorectal cancers among females. Among children (0-14 years), the most common cancers were nephroblastoma, central nervous system cancers, and lymphomas, respectively. Neuroblastoma and retinoblastoma were the fourth most common cancers in children, respectively.

One of the two surveillance officer posts that were approved was filled. The successful candidate was Mr Simphiwe Javu, who was previously a surveillance officer in EPBCR on a temporary contract. This brings the total number of surveillance officers in the EPBCR on permanent contracts to two out of the seven posts. Funding for the remaining five surveillance officer posts has run out. The contracts have been extended to 31 March 2026 using the NICD operational budget. A budget was submitted to the National Department of Health to fund five population-based cancer registries and is under review.

KWAZULU-NATAL POPULATION-BASED CANCER REGISTRY (KZN-PBCR)

Population-based cancer registration for the KZN-PBCR caters for the eThekwini Metropolitan Municipality and Zululand District Municipality. This registry, launched in 2023, is funded by the Bristol Myers Squibb Foundation (BMSF), and the NCR offers technical support through Ms Babongile Ndlovu (an NCR epidemiologist), who leads NCR work on population-based cancer surveillance. The first cancer incidence report from the KZN-PBCR was published on the NCR web page on 31 March 2025.

This report includes cancers that were diagnosed between 1 January and 31 December 2023 in the eThekwini Metropolitan Municipality. Of the 2 795 cancer cases registered, the most common cancers were those of the breast, cervix, and uterus among females, and colorectal, lung, and prostate cancers among males. Retinoblastoma was the most common cancer in children (0-14 years). The funding for this registry, which covers staff salaries in the eThekwini Metropolitan Municipality, is ending in 2026. Lack of funding presents a threat to the continuity of population-based cancer surveillance.

CHILDHOOD CANCER REGISTRY

The National Childhood Cancer Registry published its fourth report on childhood cancer incidence for the year 2021 on 31 March 2025. This latest report includes the age group 15-19 years old for the first time. The inclusion of adolescents aged 15-19 years aligns with international childhood classification standards. A total of 1 378 cancers were diagnosed in children aged 0-19 years old in South Africa in 2021. This equated to an overall age-standardised rate of 63.5 cases per million (95%CI: 53.1-75.7). We found the most common cancer group diagnosed to be leukaemias, and the second most common cancers were lymphomas. Approximately 32% of the cases (n=437) were diagnosed in children aged 0-4 years old, followed by the 15-19-year age group (n=339; 24%). Our results are comparable to results from within the African region and global trends. Annual reports of childhood cancers are the first step towards improving the reporting of childhood cancers and raising awareness of the burden of childhood cancers. Efforts are ongoing to receive data from all possible sources.

POLICY CONTRIBUTIONS

Dr Muchengeti and Mr Sizeka Mashele continue to serve on the task team for adopting the WHO cervical cancer elimination strategy for South Africa. Dr Muchengeti and Dr Mwansa-Kambafwile are Technical Leads of the Surveillance and Data Analytics Technical Working Groups of the United States-South Africa Cancer Care and Research Alliance (US-SACCRA). During the reporting period, work on a cancer incidence report for South Africa was started, and preliminary findings were presented at a National Cancer Meeting organised by the National Department of Health.

Dr Muchengeti was appointed to two IARC advisory groups: the IARC Initiative for Resilience in Cancer Control (IRCC) Advisory Group and the IARC Monographs Volume 139 – Hepatitis D Virus, Human Cytomegalovirus, and Merkel Cell Polyomavirus Advisory Group.

RESEARCH ACTIVITIES

South African HIV Cancer Match Study (SAM)

NCR Investigators: Natasha Abraham, Carole Metekoua, Tinashe Tombe-Nyahuma, Judith Mwansa-Kambafwile, and Mazvita Muchengeti

Collaborators: Institute of Social and Preventive Medicine, University of Bern, Bern, Switzerland; Swiss Tropical and Public Health Institute, Allschwil, Switzerland; University of Basel, Basel, Switzerland; University of the Witwatersrand, School of Public Health, South Africa.

Funders: International epidemiology databases to evaluate AIDS (IeDEA), National Institutes of Health, USA, and Swiss National Foundation.

The SAM study is a national cohort of HIV-positive people created from NHLS HIV data (HIV tests, CD4 count, and HIV viral load tests) and linked probabilistically to the National Cancer Registry to determine the spectrum and risk of cancer in the HIV population. The linkage and deduplication of the HIV data and the NCR data were completed, and the cohort has been updated to include data up to 2021. It includes about 9.4 million HIV records, and of these, about 92 000 have a concurrent cancer diagnosis. Application for renewal of ethics approval was successful. Continuity of this work is under threat due to recent changes in US funding priorities.

Johannesburg Cancer Case-control Study (JCS) and Evolving Risk Factors for Cancer in African Populations (ERICA-SA)

NCR Investigators: Mazvita Muchengeti, Wenlong Carl Chen.

Collaborators: Freddy Sitas, Debbie Bradshaw, Chris Mathews, Tim Waterboer, Gary Clifford, Melitah Motlhale, Mwiza Singini, Valerie McCormack.

Funders: South African Medical Research Council and the UK Government's Newton Fund through the UK Medical Research Council.

The JCS is a case-control study of newly diagnosed (<6 months) Black cancer patients (1995-2016), with over 26 000 patients interviewed and over 20 000 blood samples stored to examine genetic and emerging and/or novel risk factors for cancer.

South African Cervical Cancer Screening Cohort (SACCS study)

NCR Investigators: Sizeka Mashele, Matshediso Mohlala, Carole Metekoua, Wenlong Carl Chen, Judith Mwansa-Kambafwile, and Mazvita Muchengeti.

Collaborators: National Institutes of Health, USA; Swiss Tropical and Public Health Institute, Allschwil, Switzerland; University of Basel, Basel, Switzerland.

Funders: Office of AIDS Research, National Institutes of Health, USA.

The SACCS is linking cervical cancer screening from cytology records, cervical cancer incidence records (using NCR data), and precancer treatment (using histology records), HIV records from the SAM study, and mortality data from Statistics South Africa (Stats SA) to monitor the national cervical cancer screening programme. Continuity of this work is under threat due to recent changes in US funding priorities.

TEACHING AND TRAINING

The NCR continued to offer cancer surveillance lectures to students of the SAFETP programme and the University of the Witwatersrand. Public health medicine specialists rotated through the centre during their scheduled rotations at the NICD. The other training activities are covered under the section below (IARC-GICR Centre of Expertise Sub-Saharan Africa).

The NCR held a webinar workshop on Imposter Syndrome in the Workplace to commemorate Women's Month in South Africa (26 August 2024). This was attended by over 300 people from within and outside the NICD. This was followed by a physical

closed session for female staff members from the NCR, IT department, Facilities, and Centre of HIV and STIs, where participants shared their experiences regarding imposter syndrome.

The NCR, in collaboration with the Living with Cancer (LWC) organisation, launched the first patient-led cancer registry in South Africa during the previous reporting period and continues to work with LWC. During the period under review, the NCR collaborated with the Cancer Association of South Africa (CANSA) on a "No Tobacco" campaign at a school in the south of Johannesburg. The NCR also participated in a Bioderma skin cancer awareness campaign and co-hosted a colorectal awareness event with the Global Colon Cancer Association and the NICD Communications Department in Harrismith, Free State Province.

IARC-GICR CENTRE OF EXPERTISE FOR SUB-SAHARAN AFRICA

As part of the IARC-GICR centre of expertise activities, the NCR conducted an in-person training for cervical cancer record linkage during the second quarter of the financial year. Fifteen participants from sub-Saharan Africa (South Africa, Tanzania, Rwanda, Mauritius, Zimbabwe, and Namibia) were trained. Five of the participants who successfully linked their databases presented their work at the EUROGIN Conference in Portugal in March 2025.

The Partnership to Strengthen Cancer Surveillance Data Quality and Accessibility in Sub-Saharan Africa with the U.S. National Cancer Institute (NCI) Center for Global Health, the Nairobi Cancer Registry, the South African National Cancer Registry, the International Agency for Research on Cancer (IARC), the Nairobi Cancer Registry, and the African Cancer Registry Network was launched on 30 September 2024. Continuity of this work is under threat due to recent changes in US funding priorities.

PROFESSIONAL DEVELOPMENT

POSTGRADUATE STUDENTS

There were nine PhD and 16 master's students in training in the period under review.

GRADUATIONS

One PhD student graduated in the period under review.

RESEARCH OUTPUT

Publications

1. Berrington de González A, Masten SA, Bhatti P, Fortner RT, Peters S, Santonen T, Yakubovskaya MG, Barouki R, Barros SBM, Barupal D, Beane Freeman LE, Calaf GM, Dillner J, El Rhazi K, Fritschi L, Fukushima S, Godderis L, Kogevinas M, Lachenmeier DW, Mandrioli D, **Muchengeti MM**, Niemeier RT, Pappas JJ, Pi J, Purdue MP, Riboli E, Rodríguez T, Schlünssen V, Benbrahim-Tallaa L, de Conti A, Facchin C, Pasqual E, Wedekind R, Ahmadi A, Chittiboyina S, Herceg Z, Kulasingam S, Lauby-Secretan B, MacLehose R, Sanaa M, Schüz J, Suonio E, Zavadil J, Mattock H, Madia F, Schubauer-Berigan MK. **Advisory Group recommendations on priorities for the IARC Monographs**. Lancet Oncol. 2024 May;25(5):546-548. doi: 10.1016/S1470-2045(24)00208-0. Epub 2024 Apr 12. PMID: 38621402.

2. Olago V, Nimako G, Bartels L, Bohlius J, Dhokotera T, Egger M, Singh E, **Sengayi-Muchengeti M. Cancer diagnostic service use in people living with HIV in South Africa: A cross-sectional study**. PLoS One. 2024 Jun 13;19(6): e0291897. doi: 10.1371/journal.pone.0291897. PMID: 38870151; PMCID: PMC11175394.

3. Davidović M, Dhokotera T, Dos-Santos-Silva I, Bohlius J, **Sengayi-Muchengeti M. Breast cancer in women by HIV status: A report from the South African National Cancer Registry**. PLoS One. 2024 Jun 17;19(6): e0305274. doi: 10.1371/journal.pone.0305274. PMID: 38885245; PMCID: PMC11182510.

4. van Wyk AC, Lal P, Ogunbiyi JO, Kyokunda L, Hobenu F, Dial C, Jalloh M, Gyasi R, Oluwole OP, Abrahams AD, Botha AR, Mtshali NZ, Andrews C, Mante S, Adusei B, Gueye SM, Mensah JE, Adjei AA, Tettey Y, Adebiyi A, Aisuodionoe-Shadrach O, Eniola SB, Serna A, Yamoah K, **Chen WC**, Fernandez P, Robinson BD, Mosquera JM, Hsing AW, Agalliu I, Rebbeck TR. **Multinational, Multicenter Evaluation of Prostate Cancer Tissue in Sub-Saharan Africa: Challenges and Opportunities**. JCO Glob Oncol. 2024 Jun;10: e2300403. doi: 10.1200/GO.23.00403. PMID: 38870437; PMCID: PMC11191871.

5. Brandenburg JT, Chen WC, Boua PR, Govender MA, Agongo G, Micklesfield LK, Sorgho H, Tollman S, Asiki G, Mashinya F, Hazelhurst S, Morris AP, Fabian J, Ramsay M. Genetic Association and Transferability for Urinary Albumin-Creatinine Ratio as a Marker of Kidney Disease in four Sub-Saharan African Populations and non-continental Individuals of African Ancestry. Front Genet. 2024 May 15; 15:1372042. doi: 10.3389/fgene.2024.1372042. PMID: 38293229; PMCID: PMC10827237.

6. Fackler MJ, Pleas M, Li Y, Soni A, Xing D, Cope L, Ali S, Van Le Q, Van Nguyen C, Pham HT, Duong LM, Vanden Berg E, Wadee R, Michelow P, **Chen WC**, Joffe M, Fjeldbo CS, Lyng H, Sukumar S. **Discovery and technical validation of high-performance methylated DNA markers for the detection of cervical lesions at risk of malignant progression in low- and middle-income countries**. Clin Epigenetics. 2024 Apr 20;16(1):56. doi: 10.1186/s13148-024-01669-z. PMID: 38643219; PMCID: PMC11032610.

7. Singini MG, **Muchengeti M**, Sitas F, **Chen WC**, Combes JD, Waterboer T, Clifford GM. **Antibodies against high-risk human papillomavirus proteins as markers for noncervical HPV-related cancers in a Black South African population, according to HIV status**. Int J Cancer. 2024 Jul 15;155(2):251-260. doi: 10.1002/ijc.34919. Epub 2024 Apr 5. PMID: 38577820.

8. Odeny TA, Fink V, **Muchengeti M**, Gopal S. **Cancer in People with HIV**. Infect Dis Clin North Am. 2024 Sep;38(3):531-557. doi: 10.1016/j.idc.2024.06.007. PMID: 39111924.

9. Hoffmann TJ, Graff RE, Madduri RK, Rodriguez AA, Cario CL, Feng K, Jiang Y, Wang A, Klein RJ, Pierce BL, Eggener S, Tong L, Blot W, Long J, Goss LB, Darst BF, Rebbeck T, Lachance J, Andrews C, Adebiyi AO, Adusei B, Aisuodionoe-Shadrach OI, Fernandez PW, Jalloh M, Janivara R, **Chen**

WC, Mensah JE, Agalliu I, Berndt SI, Shelley JP, Schaffer K, Machiela MJ, Freedman ND, Huang WY, Li SA, Goodman PJ, Till C, Thompson I, Lilja H, Ranatunga DK, Presti J, Van Den Eeden SK, Chanock SJ, Mosley JD, Conti DV, Haiman CA, Justice AC, Kachuri L, Witte **JS. Genome-wide association study of prostate-specific antigen levels in 392,522 men identifies new loci and improves prediction across ancestry groups**. Nat Genet. 2025 Feb;57(2):334-344. doi: 10.1038/s41588-024-02068-z. Epub 2025 Feb 10. PMID: 39930085; PMCID: PMC11821537.

10. Nietz, S, Cubasen, H, Buccimazza, I, Cacala, S, Phakathi, B, Joffe, M, **Chen, W C**, Norris, S A, & Ruff, P. (2025). **An initial benchmark of the quality of the diagnosis and surgical treatment of breast cancer in South Africa**. SAMJ: South African Medical Journal, 115(1), 17-24.

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https://doi.org/10.7196/SAMJ.2025.v115i1.2292

11. Metekoua C, Ruffieux Y, **Mwansa-Kambafwile J, Kellett P**, Egger M, Muchengeti M, Rohner E, Wiggill T. **Patterns of incident Burkitt lymphoma during the HIV epidemic among the Black African and White population in South Africa**. Br J Cancer. 2025 Mar;132(5):462-468. doi: 10.1038/s41416-024-02937-8. Epub 2025 Jan 14. PMID: 39809970; PMCID: PMC11876306.

12. Ferndale L*, **Chen WC***, Mpangase PT, Brandenburg JT, Ngundu LN, Moodley M, Wadee R, Wright CA, Parker MI, Willem P, Aldous C, Mathew CG. **Somatic mutation profiles in non-tobacco smoking and non-alcohol drinking South African female oesophageal squamous cell carcinoma patients of African ancestry**. 10.1016/j.genrep.2025.102174

13. Janivara R, Hazra U, Pfennig A, Harlemon M, Kim MS, Eaaswarkhanth M, Chen WC, Ogunbiyi A, Kachambwa P, Petersen LN, Jalloh M, Mensah JE, Adjei AA, Adusei B, Joffe M, Gueye SM, Aisuodionoe-Shadrach OI, Fernandez PW, Rohan TE, Andrews C, Rebbeck TR, Adebiyi AO, Agalliu I, Lachance J. **Uncovering the genetic architecture and evolutionary roots of androgenetic alopecia in African men**. HGG Adv. 2025 Mar 24;6(3):100428. doi: 10.1016/j.xhgg.2025.100428. Epub ahead of print. PMID: 40134218.

14. Ruffieux Y, **Mwansa-Kambafwile J, Metekoua C, Tombe-Nyahuma T**, Bohlius J, Muchengeti M, Egger M, Rohner E. **HIV-1 Viremia and Cancer Risk in 2.8 million People: The South African HIV Cancer Match Study**. Clin Infect Dis. 2024 Dec 30: ciae652. doi: 10.1093/cid/ciae652. Epub ahead of print. PMID: 39736138.

15. Ismail N, Moultrie H, **Mwansa-Kambafwile J**, Copas A, Izu A, Moyo S, Skinner D, Ismail F, Gosce L, Omar SV, Abubakar I, Madhi SA. **Effects of conditional cash transfers and pre-test and post-test tuberculosis counselling on patient outcomes and loss to follow-up across the continuum of care in South Africa: a randomised controlled trial**. Lancet Infect Dis. 2025 Feb 6: S1473-3099(24)00816-8. doi: 10.1016/S1473-3099(24)00816-8. Epub ahead of print. PMID: 39923785.

16. Motlhale M, Sitas F, de Villiers CB, Simba H, Feliu A, **Chen WC**, Schüz J, **Muchengeti M**, McCormack V. **Smokeless tobacco (snuff) and site-specific cancer risks in adult Black South African women: Findings from the Johannesburg Cancer Study**. Int J Cancer. 2025 May 15;156(10):1916-1925. doi: 10.1002/ijc.35293. Epub 2024 Dec 16. PMID: 39679969.

17. Ms Babongile Ndlovu (Epidemiologist) published an article in Occuzone: **Skin Cancer in South Africa: Trends, Risks, and Strategies for Prevention**

CONFERENCE PRESENTATIONS

Oral Presentations:

1. NAACCR Annual Conference, Boise, Idaho, USA (27 June 2024). "HIV-Associated Diffuse Large B Cell Lymphoma in the Black and White Population in South Africa 2011–2021" – Ms Carole Metekoua

2. NAACCR Annual Conference, Boise, Idaho, USA (27 June 2024). "Declining Incidence of Burkitt Lymphoma with Improved Antiretroviral Treatment Access in South Africa (1986–2021)" – Ms Carole Metekoua

3. World Congress of Epidemiology, Cape Town, South Africa (27 September 2024)"HIV-Associated Diffuse Large B Cell Lymphoma in the Black and White Population in South Africa 2011-2021" – Ms Carole Metekoua.

4. Network for Oncology Research in Africa and African Cancer Registry Network annual meeting in Cape Town, 19–23 October 2024.

- "Childhood Cancers Registration in Africa" – Ms Natasha Abraham
- "Cervical Cancer Prevention and Elimination in Africa" – Mr Sizeka Mashele
- "Cancer and HIV in South Africa" – Dr Mazvita Muchengeti

5. International Conference on Malignancies in HIV/AIDS (24–25 October 2024 in Bethesda, United States). "Trends in Burkitt Lymphoma among people with HIV in South Africa 2005–2021" – Ms Carole Metekoua

6. International Association of Cancer Registries (4–7 November 2024; Beijing, China).

- Trends in Prostate Cancer – Dr Judith Mwansa-Kambafwile
- Data Sources and Harmonization in the National Cancer Registry, South Africa
- Trends in Lung Cancer – Ms Matshediso Mohlala
- Trends in Mesothelioma – Dr Judith Mwansa-Kambafwile

7. Dr Mazvita Muchengeti and Mr Sizeka Mashele co-chaired sessions on "Structural and social factors that impact HPV driven cancers" and "Cervical Cancer in sub-Saharan Africa" at the EUROGIN International HPV Multidisciplinary on 16 and 17 March 2025:

- Racial differences in HPV-related cancers in South Africa – Mr Sizeka Mashele
- Harmonising cervical cancer screening data and population-based cancer registries in sub-

Saharan Africa – Mr Sizeka Mashele

8. Pan African Cancer Research Institute (PACRI) International Conference (23–26 March 2025, Johannesburg, South Africa).

- Enhancing HIV and Cancer Surveillance: Utilising Record Linkage Methods to Update the South African HIV Cancer Match Study (2004–2021) – Ms Tinashe Tombe-Nyahuma
- Beyond "Top Five Plus One" Cancers in South Africa: An Analysis of the 2022 Pathology-Based Registry Data – Dr Judith Mwansa-Kambafwile
- Pregnancy Related Cancer deaths among South African women: a cross-sectional study (1999–2016) – Ms Lerato Khoali

9. Epidemiology Monday Morning Meeting of the Swiss Tropical and Public Health Institute on 27 January 2025. "Cancer Disparities in South Africa" – Dr Judith Mwansa-Kambafwile.

Poster Presentations

1. International Papillomavirus Conference, Edinburgh, Scotland, from 12–15 November 2024. "Evaluation of Availability and Accessibility of Colposcopy Services in South Africa, 2023: A GIS Mapping Study" – Mr Sizeka Mashele

2. International Conference on Malignancies in HIV/AIDS (24–25 October 2024 in Bethesda, United States). "Multiple Myeloma among People Living with HIV in South Africa, 2004-2021" – Ms Carole Metekoua

3. Pan African Cancer Research Institute (PACRI) International Conference (23-26 March 2025, Johannesburg, South Africa). "The Effect of HIV and Antiretroviral Treatment on National Cancer Patterns in South Africa" – Dr Judith Mwansa-Kambafwile

4. Pan African Cancer Research Institute (PACRI) International Conference (23–26 March 2025, Johannesburg, South Africa). "Age at Breast Cancer Diagnosis by Ethnicity: An Analysis of the Pathology-based National Cancer Registry" – Dr Judith Mwansa-Kambafwile.

5. The NCR got two awards (Best Poster and 2nd Best Poster) at the PACRI conference.

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