ANNUAL REPORT

2022-2023

saMRC
advancinglife

ABOUT SAMRC

Our mandate

The mandate of the South African Medical Research Council (SAMRC), in terms of the MRC Act 58, 1991 (as amended), is to improve the health and quality of life of South Africans. This needs to be realised through research, development, and technology transfer.

Who we are?

The SAMRC was established in 1969 and is dedicated to improving the health of people in South Africa, through research, innovation, development, and technology transfer. The scope of research includes laboratory investigations, clinical research, and public health studies.

We conduct research on South Africa's quadruple burden of disease: maternal, newborn and child health, HIV/AIDS and TB, non-communicable diseases, and interpersonal violence. Our work is to acquire evidence-based information to inform health policy and practice and improve the quality and health status of people in South Africa.

We are the largest local funder of health research, medical diagnostics, medical devices, and therapeutics. We are pioneers in cutting edge medical innovations focusing on genomic research, the development of novel treatment regimens, vaccine development, diagnostic tools, and developing new drugs and devices.

Transformation remains an integral part of building sustainable health research capacity in South Africa. through Self-Initiated Research (SIR) grants, the Mid-Career Scientist programme, the Bongani Mayosi National Health Scholars Programme, and other programmes and platforms, the SAMRC will continue to address gender, racial, institutional, and geographic parity, and strengthen our capacity to flourish in the 21st century.
As a custodian of health research, the SAMRC is building a
healthy nation through research and innovation.

Our values

Our vision

Building a healthy nation through research, innovation and transformation.

Our mission

To advance the nation's health and quality of life and address inequality by conducting and funding relevant and responsive health research, capacity development, innovation, and research translation.

CONTENTS

PART A: GENERAL INFORMATION

SAMRC'S GENERAL INFORMATION 5

A NOTE FROM THE BOARD CHAIRPERSON 6

A NOTE FROM THE PRESIDENT AND CEO 8

ACHIEVEMENTS AND HIGHLIGHTS 10
NGS-SA Genomics Surveillance Programme 10
COVID-19 Vaccine studies 10
mRNA Technology Transfer Hub 11
Chan Soon-Shiong and SAMRC Collaboration 12

TRANSFORMATION AT THE SAMRC 14

PARTNERSHIPS WITH OTHER COUNTRIES 17
BRICS TB research network 17
South Africa-US programme for collaborative Biomedical Research 17
BRICS STI COVID-19 Projects 17
BRICS Multilateral Joint Science and Technology Research Collaoration 18
Collaboration with George Institute, Australia 19
Global Forum on Bioethics in Research (GFBR) 19
South Africa admitted to the International Human Frontier Science Programme Organization 19

PART B: PERFORMANCE INFORMATION

STATEMENT OF RESPONSIBILITY FOR PERFOMANCE FOR THE YEAR ENDED 31 MARCH 2022 21

STRATEGIC OUTCOME ORIENTED GOALS 22
SAMRC's Performance Information 22

STRATEGIC OBJECTIVES, PERFORMANCE INDICATORS, PLANNED TARGETS AND ACTUAL ACHIEVEMENTS 26

OUR RESEARCH PROFILE 32

RESEARCH PROGRAMMES AND UNITS 36

FUNDING HEALTH INNOVATION 38

GRANTS INNOVATION AND PRODUCT DEVELOPMENT 38

RESEARCH CAPACITY DEVELOPMENT 53

SAMRC STRATEGIC RESEARCH PROGRAMMES 63

PROGRAMME 1: HEALTH PROMOTION & DISEASE PREVENTION 63
PURPOSE OF THE PROGRAMME 63
UNITS THAT CONSTITUTE THIS PROGRAMME 63
PROGRAMME STRATEGIC OBJECTIVES 63
RESEARCH HIGHLIGHTS UNDER THIS PROGRAMME 64

PROGRAMME 2: MATERNAL, CHILD AND WOMENS'S HEALTH 101
PURPOSE OF PROGRAMME 101
UNITS THAT CONSTITUTE THIS PROGRAMME 101
PROGRAMME STRATEGIC OBJECTIVES 101
RESEARCH HIGHLIGHTS UNDER THIS PROGRAMME 102

PROGRAMME 3: HIV, AIDS, TB AND OTHER COMMUNICABLE DISEASES 116
PURPOSE OF THE PROGRAMME 116
UNITS THAT CONSTITUTE THIS PROGRAMME 116
PROGRAMME STRATEGIC OBJECTIVES 116
RESEARCH HIGHLIGHTS UNDER THIS PROGRAMME 117

PART B: PERFORMANCE INFORMATION

PROGRAMME 4: HEALTH SYSTEMS STRENGTHENING 160
PURPOSE OF THE PROGRAMME 160
UNITS THAT CONSTITUTE THIS PROGRAMME 160
PROGRAMME STRATEGIC OBJECTIVES 160
RESEARCH HIGHLIGHTS UNDER THIS PROGRAMME 161

PROGRAMME 5: PUBLIC HEALTH INNOVATION 179
PURPOSE OF THE PROGRAMME 179
UNITS THAT CONSTITUTE THIS PROGRAMME 179
PROGRAMME STRATEGIC OBJECTIVES 179
RESEARCH HIGHLIGHTS UNDER THIS PROGRAMME 180

PROGRAMME 6: BIOMEDICAL RESEARCH 201
PURPOSE OF THE PROGRAMME 201
UNITS THAT CONSTITUTE THIS PROGRAMME 201
PROGRAMME STRATEGIC OBJECTIVES 201
RESEARCH HIGHLIGHTS UNDER THIS PROGRAMME 202

SAMRC COLLABORATING CENTRES AND TB REPORT SA 230

STAKEHOLDER ENGAGEMENTS 233
Corporate Social Responsibilities and Campaigns 233
Digital Platforms and Services 240

PART C: GOVERNANCE

INTRODUCTION 243

OUR BOARD 245

ENTERPRISE RISK MANAGEMENT 266

B-BBEE COMPLIANCE PERFORMANCE INFORMATION 273

PROCUREMENT THROUGH OTHER MEANS 274

OTHER NOTABLE RELATIONSHIPS 275

PART D: HUMAN RESOURCES MANAGEMENT

SAMRC ORGANOGRAM 283
Executive Management Committee 283

PART E: FINANCIAL INFORMATION

NATURE OF BUSINESS AND PRINCIPAL ACTIVITIES 312

REPORT OF THE CHIEF EXECUTIVE OFFICER & PRESIDENT 313

REPORT OF THE AUDITOR GENERAL TO PARLIAMENT ON THE SOUTH AFRICAN MEDICAL RESEARCH COUNCIL 314

ANNEXURE-AUDITOR GENERAL'S RESPONSIBILITY FOR THE AUDIT 317

ACCOUNTING AUTHORITY'S RESPONSIBILITIES AND APPROVAL 320

AUDIT COMMITTEE REPORT 321

STATEMENT OF FINANCIAL POSITION 323

STATEMENT OF FINANCIAL PERFORMANCE 324

STATEMENT OF CHANGES IN NET ASSETS 325

CASH FLOW STATEMENT 326

STATEMENT OF COMPARISON OF BUDGET AND ACTUAL AMOUNTS 327
Accounting Policies 328

NOTES TO THE ANNUAL FINANCIAL STATEMENTS 357

DETAILED INCOME STATEMENT 391

PART A: GENERAL INFORMATION

GENERAL INFORMATION

REGISTERED NAME:
South African Medical
Research Council

REGISTRATION NUMBER (IF APPLICABLE):
Not applicable

PHYSICAL ADDRESS (HEADQUARTERS):
Francie van Zijl Drive
Parow Valley
Cape Town

POSTAL ADDRESS:
PO Box 19070
Tygerberg
7505

TELEPHONE NUMBER/S:
+27(0)21 938 0911

FAX NUMBER:
+27(0)21 938 0200

EMAIL ADDRESS:
info@mrc.ac.za

WEBSITE ADDRESS:
www.samrc.ac.za

EXTERNAL AUDITORS:
Auditor General of South Africa, Western Cape

BANKERS:
ABSA

COMPANY/BOARD SECRETARY:
Mr Nizar Davids
Email: nizar.davids@mrc.ac.za

DEPUTY INFORMATION OFFICERS:
Dr. Seeiso Koali
Email: seeiso.koali@mrc.ac.za
Ms Nobubele Tandwa
Email:nobubele.tandwa@mrc.ac.za

ISBN:
978-1-928340-71-3

DATE OF PUBLICATION:
31 August 2023

A NOTE FROM THE BOARD CHAIRPERSON

PROFESSOR JOHNNY MAHLANGU

The mandate of the South African Medical Research Council, in terms of the MRC Act 58, 1991 (as amended), is to improve the health and quality of life of South Africans. This needs to be realised through research, development and technology transfer.

As the Chairperson of the Board, I am pleased to present the 2022/23 SAMRC Annual Report. This report provides a comprehensive overview of the research conducted and funded by this organisation in support of the above-mentioned mandate.

Our role as the SAMRC Board is to ensure that the SAMRC achieves its goals. By setting the strategic direction, providing oversight, building partnerships, and advocating for research, the Board ensures that the SAMRC operates effectively and efficiently. This, in turn, enables this organisation to make a significant contribution to improving the health and well-being of the people of South Africa as per the mandate.

To do that, the SAMRC's financial and operational performance is essential for ensuring the sustainability of its activities and achieving its strategic objectives.

The SAMRC continues to be exemplary in many areas of its mandate including excellence in its fiscal discipline, effective organisational governance characterised by multiyear clean audits, more money directed towards research, aligning research efforts and activities to the health priorities and needs of the country, disseminating its research, leading the transformation agenda in medical science research, including innovation and training a diverse cadre of the next generation of researchers, and translating research to inform policy and practice. These achievements were all in line with SAMRC 2020/21 –

2024/25 Strategic Plan and were realised without lowering the high standard of locally impactful and globally competitive research conducted and supported by the SAMRC.

The SAMRC's research programmes address national priorities as articulated by the President of South Africa, and are aligned with various national strategies and frameworks, such as the National Development Plan, the Medium-Term Strategic Framework 2019-2024, and the national policies, particularly those of the National Department of Health.

Transformation remains at the top of our agenda to ensure that the medical and science graduates within the intramural programme and the staff, in general, reflect the demographic of the country in all positions in the organisation. To this end, in the year under review, the SAMRC Board supported the introduction of a new position of the Executive Director-Transformation on the Executive Management Committee. The purpose of this position is to reimagine transformation in the SAMRC in the broader context, to strengthen and expand the transformation forum and to make sure that while the organization transforms it remains relevant and fit for purpose.

The Board welcomes this edition of the annual report as a comprehensive document that provides insights into the state of health research in South Africa. The report highlights the council's achievements and challenges in conducting and funding research that addresses the country's health challenges. The report also provides insights into the council's capacity development initiatives, partnerships and collaborations, and financial performance. The work represented in this Annual Report is essential for informing policy decisions, advancing scientific knowledge, and building a skilled workforce that can address the country's health challenges.

In 2022, the Minister of Health, Dr Joe Phaahla, appointed a new Board of the SAMRC. I would like to take this opportunity to pass my gratitude to the previous Board members and in the same breath, welcome the new Board members.

No organisation can succeed without proper and exemplary leadership. I would like to thank the President and CEO Prof Glenda Gray and her executive management committee for passionately leading this organisation.

It is also said that employees are the lifeblood of a company who keeps it alive. Without our researchers and support staff, our offices and laboratories are just empty buildings. Our staff brings life to these buildings and laboratories by implementing the organisation's strategy, vision and mission.

And lastly to our stakeholders – locally and internationally – we appreciate the great partnerships that we have, and it is through collaboration that we can tackle the health challenges in this world and make a meaningful impact on the people we serve.

Professor Johnny Mahlangu
SAMRC Board Chairperson

A NOTE FROM THE PRESIDENT AND CEO

South Africa has made significant strides in improving its health status over the past few decades. However, the country still faces numerous challenges, including high rates of HIV/AIDS, tuberculosis, and non-communicable diseases while still trying to recover from the Coronavirus pandemic. The South African Medical Research Council (SAMRC) plays a crucial role in addressing these challenges through its research and science advocacy. Efforts made to lead in such a pivotal time demand an interconnectedness in the 5th Industrial Revolution (5IR) health space, taking up a strategic adaption to new technologies that enable more innovation.

The SAMRC is a statutory body that conducts research on health and related social issues in South Africa. Our mission is to advance the nation's health and quality of life and address inequality by conducting and funding relevant and responsive health research, capacity development, innovation and research translation. The SAMRC's research focuses on a wide range of health issues, including infectious diseases, non-communicable diseases, mental health and environmental health.

Transformation in science remains an integral part of our strategy. More women and black South Africans and scholars and researchers from Historically Disadvantaged Institutions are the beneficiaries of our masters and doctoral and other capacity development programmes.

Reflecting on the 2022/23 financial year, a lot of good work was done and achieved. For instance, despite the tight fiscal environment, the SAMRC has delivered impactful scientific research and will continue to do so effectively and efficiently, as guided by the Public Finance and Management Act.

Our research during COVID-19 continued as we re-orientated our research funding to allocate resources to surveillance, the development of diagnostics, therapeutics, immunological research and vaccine development.

In a true spirit of partnership, Biovac, Afrigen and the SAMRC collaborated on the establishment of the mRNA hub in South Africa in an endeavour to support vaccine development on the continent. The SAMRC's role in the hub is to drive the R&D programme which is aimed at the research, development and testing of mRNA vaccine candidates for COVID-19 and other priority diseases to ensure a pipeline of products for manufacture by the spokes in South Africa and other low- and middle-income countries. The SAMRC is also the clinical trial partner for the mRNA Technology Transfer Hub.

The Chan Soon-Shiong Family Foundation (CSSFF) – SAMRC Biomanufacturing Capacity Development Programme commenced in the 2022/23 financial year with the first cohort of studentships. This is an ambitious programme to build a vaccine manufacturing workforce, with a commitment of R100 million over 5 years from the Chan Soon-Shiong Family Foundation and co-funding from the SAMRC.

South Africa's first COVID-19 Antigen Self-test was launched by Medical Diagnostech (Pty) Ltd. This project was funded by the SAMRC, and the self-test has a mobile phone application called HealthPulse TestNow, aiming to reduce reliance on international test kit supplies, whilst being robust enough to produce results before patients leave the testing site.

The SAMRC and NRF were appointed to represent South Africa as institutional members of the International Human Frontier Science Programme. South Africa is the 16th country to be admitted, and the only country from Africa. This membership underscores the value that South Africa places on supporting fundamental research in the understanding of complex mechanisms in the life sciences to advance industry, health, and human well-being.

The Wastewater Surveillance and Research Project (WSARP) was formalised as an SAMRC Research Programme. The surveillance of wastewater is being conducted at a total of 77 wastewater treatment plants in four provinces and involves four historically disadvantaged university partners as part of skills transfer and capacity development.

An international study funded by the SAMRC and led by the University of KwaZulu-Natal's (UKZN's) Professor Dhayendre Moodley, confirmed the safe use of tenofovir disoproxil fumarate and emtricitabine as pre-exposure prophylaxis (PrEP) in pregnant women not living with HIV. Until December 2019, pregnant and lactating women were excluded from the PrEP roll-out in South Africa based on the absence of safety data for its use in pregnancy. The novel study, published in The Lancet HIV, is a pioneering approach providing much-needed safety data to allow for a more informed choice during pregnancy to protect mother and baby from the long-term effects of HIV.

Looking into the future, one of the key areas of focus for the SAMRC is the localisation of research and development (R&D) and the impact it has on scaling up innovation. We believe that localisation of R&D is critical to developing innovative solutions that are relevant and effective in addressing the health challenges faced by South Africans. This includes investing in local talent, building partnerships with local institutions, and conducting research that is relevant to the South African context. We also support the development of local capacity in research and innovation through training and mentorship programmes.

All these achievements could not become possible without the support of our National Department of Health under the leadership of Minister Dr Joe Phaahla, our SAMRC Board chaired by Professor Johnny Mahlangu, the Executive Committee Management, the leadership, researchers, staff, partners and service providers of the SAMRC. Thank you to all of you for making SAMRC a success.

Professor Glenda E. Gray
President and CEO: SAMRC

PROFESSOR GLENDA E. GRAY

ACHIEVEMENTS AND HIGHLIGHTS

Pandemic and Vaccine Preparedness

Since the start of the COVID-19 pandemic in South Africa in March 2020, the SAMRC has, together with key partners such as the National Department of Science and Innovation (DSI), driven the research and innovation response, with more than R500 million raised and/or reallocated to support more than 50 projects. While a portfolio of these projects is still being managed, in the 2022/23 financial year the SAMRC has focused its pandemic preparedness and response on surveillance and the vaccine response through continued support of the Network for Genomic Surveillance in South Africa (NGS-SA) and the Wastewater Surveillance and Research Programme; the execution of various COVID-19 vaccine studies; participation in the mRNA Technology Transfer Hub; and initiation of the Chan Soon-Shiong Family Foundation-SAMRC Capacity Development Programme.

The **NGS-SA Genomics Surveillance Programme**, led by Prof Tulio de Oliveira from the Centre for Epidemic Response and Innovation (CERI), is a shining example of collaboration and harnessing the skills set within our borders to enable a rapid and coordinated response to the COVID-19 pandemic. The network, initiated with funds from the SAMRC and DSI at the Kwa-Zulu Natal Research Innovation and Sequencing Platform (KRISP), aimed to rapidly sequence as many outbreak samples as possible and to log the data on the global GISAID database, which is used to track the global COVID-19 pandemic. It took a major team effort using next-generation sequencing technologies and a cutting-edge bioinformatics pipeline to enable real-time analysis and reporting of the data and contribution to the global database, enabling rapid release of information on the magnitude and characteristics of the South African pandemic. The network was also enabled by the already robust workflow in place at the National Institute for Communicable Diseases (NICD), leveraging off the National Health Laboratory Services laboratory network for a streamlined workflow from access to samples to sequencing to data generation and analysis. We saw technology suppliers also playing their role within the consortium with bulk reagent deals and this helped the network exceed their sequencing targets.

The network has been a pillar of the South African COVID-19 pandemic response, generating data to uncover new COVID-19 variants, informing pandemic control measures, and gaining international recognition for South Africa's role in the global pandemic response through a plethora of high impact publications in journals such as Nature and the Lancet. Furthermore, the success of the consortium was magnified by the pivotal role they played in capacity development and the roll out of pathogen genomic sequencing in other African countries to assist in their pandemic response. The NGS-SA Programme model was leveraged to develop the Pathogen Genomics Initiative (PGI) for Pandemic Preparedness through the Africa Centres for Disease Control. PGI has managed to enable capacity for pathogen genomics sequencing across the African continent, helping some countries localize omics technologies and data capacities.

The SAMRC has continued to drive several **COVID-19 vaccine studies** to ensure that globally developed vaccines are tested in our populations and to inform policy around vaccination and boosting. The Sisonke and Sisonke Homologous Boost studies delivered the Johnson and Johnson Ad26.COV2.S vaccine and boost to 496,424 and 230,488 participants, respectively, during 2021. Follow up and data analysis on these studies have continued during 2022/23 with a total follow up time of 2 years included in the protocol. Results from the study will be published during 2023/24. The Sisonke studies were funded by an allocation from National Treasury through the National Department of Health and grant funding from the Michael and Susan Dell Foundation, the ELMA Vaccines and Immunisation Foundation, the Solidarity Fund, the Bill and Melinda Gates Foundation and Janssen Vaccines & Prevention B.V. The SAMRC initiated the Sisonke Heterologous mRNA-1273 boost after prime with Ad26.COV2.S (SHERPA) study in May 2022 to examine the real-world effectiveness of a heterologous boost with the Moderna mRNA-1273 vaccine in those who received either a single or double dose of

the Johnson and Johnson Ad26.COV2.S vaccine. The study enrolled >12,000 participants between May and November 2022, with a further 200 enrolled in a more detailed immunogenicity sub-study. Results from this study are due in 2023/24.

The SAMRC has also supported the BaSiS Study at Wits RHI Shandukani, which is a phase II randomised open label trial of full and half dose J&J Ad26.CoV2.S and Pfizer BNT162b2 booster vaccinations after receiving the J&J Ad26.CoV2.S prime vaccine through the SISONKE phase IIIB implementation study. The aim of this study is to evaluate immunogenicity (humoral and cellular) and safety of a 1:4 randomization of either homologous J&J Ad26.COV2.S or heterologous Pfizer BNT162b2, at full or half dose booster vaccinations, given at least 4 months after a single J&J Ad26.COV2.S prime at 4 clinical trial sites. The study enrolled 291 participants by 31 August 2022, which represents 97% of the enrolment target of 300 participants. A high number of the population enrolled (39.9%) are people living with HIV (PLHV). Data analysis for the study is ongoing. The BaSIS study was funded from a National Treasury allocation through the National Department of Health for a Vaccine Rollout Research Programme. The PI has raised additional funding from the Bill & Melinda Gates Foundation to extend the study follow-up time to 24 months post enrolment. This will enable the collection of data on longer term immunity to prime/boost vaccination, evaluation of the memory response in participants and tracking of long-term effects of comorbidities such as HIV, TB and diabetes.

The **mRNA Technology Transfer Hub** was established in 2021 with the objective of building capacity in low- and middle-income countries to produce mRNA vaccines through a centre of excellence and training. The hub is intended to drive greater and more diversified vaccines manufacturing capability, strengthen African regional health security and respond more equitably to the current COVID-19 pandemic and future pandemics. The consortium partners include the World Health Organization (WHO), Medicines Patent Pool (MPP), Afrigen Biologics (Pty) Limited, the Biologicals and Vaccines Institute of Southern Africa (Biovac), the SAMRC, and the Africa Centres for Disease Control and Prevention (Africa CDC). The SAMRC's role in the hub is to drive the R&D programme which is aimed at the research, development and testing of mRNA vaccine candidates for COVID-19 and other priority diseases to ensure a pipeline of products for manufacture by the spokes in South Africa and other low- and middle-income countries. The SAMRC is also the clinical trial partner for the mRNA Technology Transfer Hub.

The SAMRC has convened a consortium of development partners known as the South African mRNA Vaccine Consortium (SAMVAC), comprising of the University of the Witwatersrand, the University of Cape Town, the African Health Research Institute, the University of Stellenbosch, North-West University, the National Institute for Communicable Diseases, the SAMRC and Afrigen Biologics. SAMVAC is leveraging off existing research expertise and prior SAMRC and DSI investments to develop a portfolio of (m)RNA vaccine candidates by Africa for Africa. It is also leveraging off the surveillance programme of the Africa CDC, of which the NGS-SA are leading partners, to ensure the most appropriate immunogens are identified for vaccine development. The SAMVAC Programme commenced in January 2022, focusing initially on vaccine candidates for African COVID-19 variants and rapidly expanding to include research and development on TB and HIV vaccine candidates. The early development work is underway at the University of Witwatersrand (Prof Arbuthnot and Prof de Koning) with the development of ionisable lipids and mRNA-encoding plasmids that include the Omicron spike variant of concern. The immunogen components of the TB and HIV projects are led by Dr Musvosvi and Prof Scriba and Prof Chapman, respectively, from the University of Cape Town. The programme will also see the technology transfer of a hamster challenge model from the University of Marseille in France to UCT.

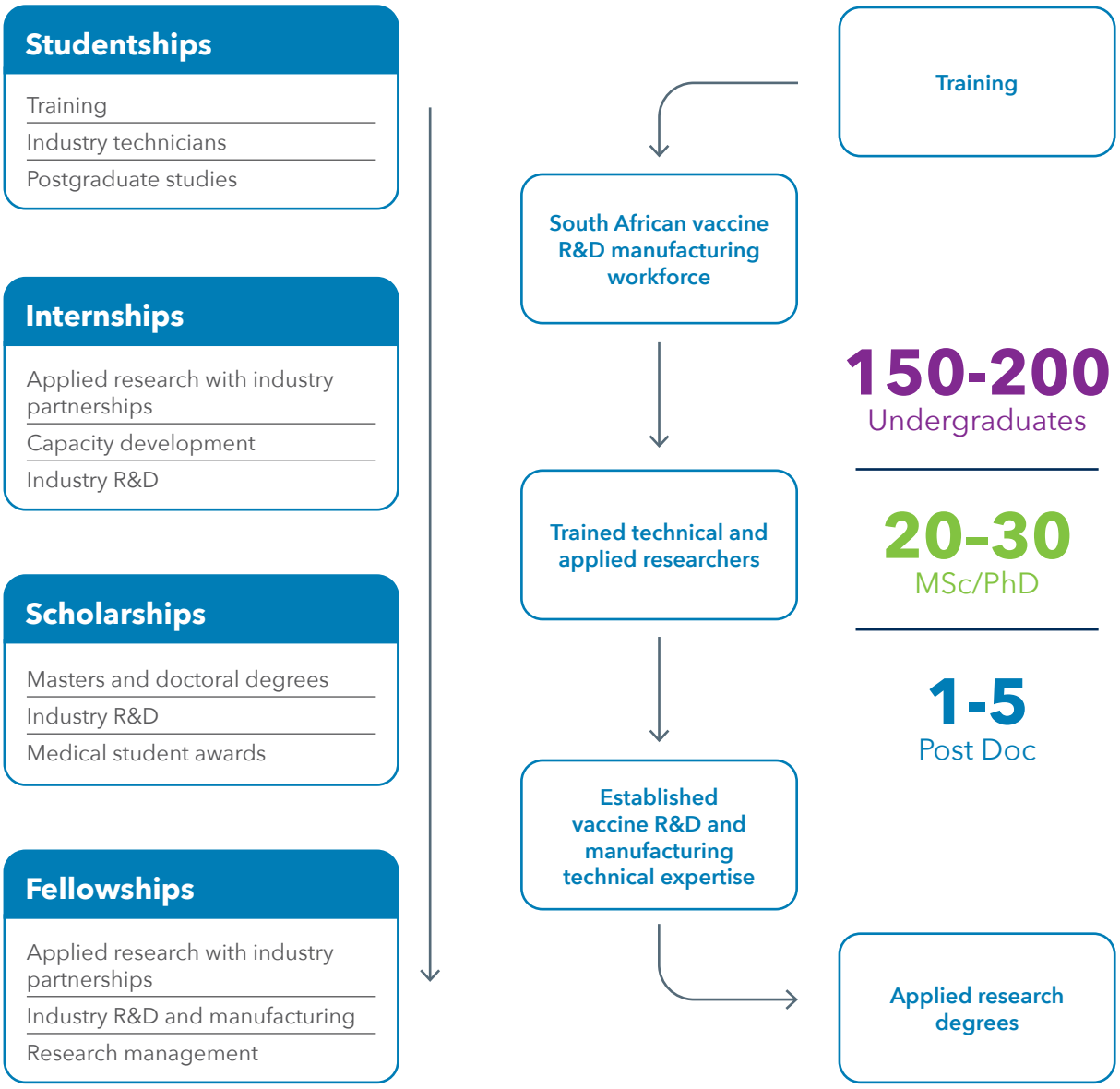
SAMVAC is funded by the SAMRC, the DSI, ELMA Vaccines and Immunization Foundation and funds raised by MPP and the WHO.

The Chan Soon-Shiong Family Foundation (CSSFF) – SAMRC Biomanufacturing Capacity Development Programme commenced in the 2022/23 financial year with the first cohort of studentships. This is an ambitious programme to build a vaccine manufacturing workforce, with a commitment of R100M over 5 years from the Chan Soon-Shiong Family Foundation and co-funding from the SAMRC. The programme (as depicted in the Figure) includes Studentships, Scholarships for Masters and doctoral degrees and Fellowships aimed at graduates and researchers in vaccine-related disciplines in the health, life and allied sciences. The first call for Studentships was launched in August 2022 and two cohorts of students have been selected. The first cohort of 15 trainees commenced their training in February 2023 and the second cohort will commence in July 2023. They are receiving technical training that will equip them to work in a commercial biomanufacturing environment, including in laboratory science, process engineering and quality assurance as well as scientific and research processes, such as experimental design and scientific writing. Promising candidates may be offered industry internships or opportunities for postgraduate studies upon completion of their training. An open competitive call was also run for Masters and doctoral scholarships for studies focussed on vaccine-related research to build the next generation of researchers. These will commence in the next financial year. The CSSFF-SAMRC Fellowship programme will also be initiated in 2023/24. These fellows will be expected to build vaccine research in Africa, provide mentorship and establish robust industry partnerships.

The CSSFF-SAMRC capacity development programme will grow the next generation of vaccine professionals, researchers, and technical experts, build much needed capacity and infrastructure, and establish a network through which vaccine R&D and innovation can be nurtured and thrive. Ultimately, this is aimed at growing the industry, contributing to the economy and ensuring that LMICs, including South Africa, are prepared to rapidly respond to the next pandemic.

Some of the first cohort of students, who started their training in February 2023.

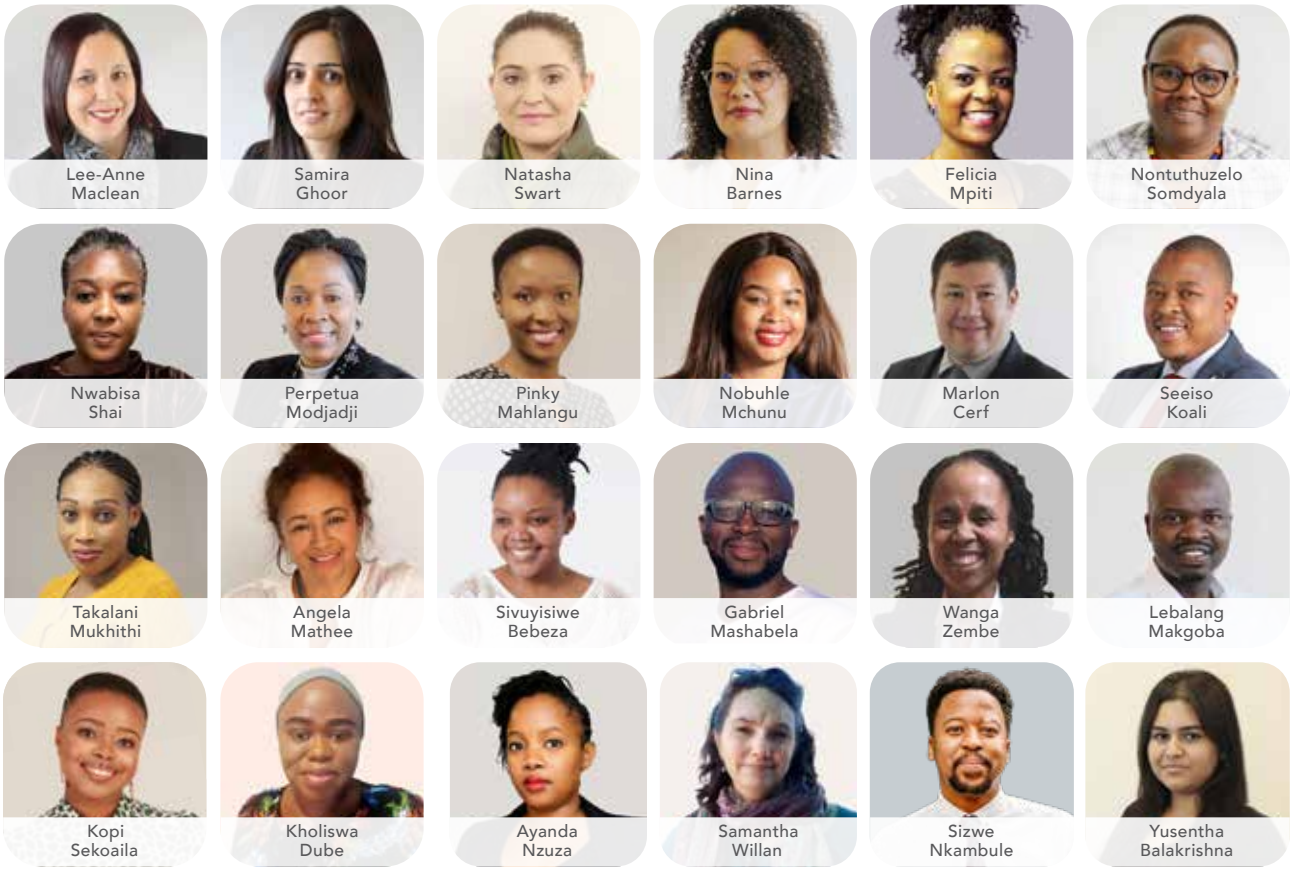
Overview of the Chan Soon-Shiong Family Foundation – SAMRC Biomanufacturing Capacity Development Programme



TRANSFORMATION AT THE SAMRC

The Transformation Office works in partnership with a range of Units and Divisions, especially the Human Resources Department, to implement the SAMRC's Transformation Plan. The strategic importance of Transformation at the SAMRC is reflected in the revised organogram of the organisation, with the Transformation Office reporting directly to the SAMRC President, and the Executive Director for Transformation forming part of the SAMRC's Executive Management Committee. Transformation is also a standing item on the agenda of the SAMRC Board meetings. The Transformation Forum plays a pivotal role in informing, monitoring and reviewing the SAMRC's Transformation Plan; its members have been selected to represent the organisation across its vertical and horizontal dimensions, and constitute a critical mechanism for bi-way communication on Transformation matters.

transformation
WORKING TOGETHER FOR EXCELLENCE



SAMRC Transformation Forum

The SAMRC's Transformation Plan responds to three time-based categories of challenge to meeting our strategic goals:

- We strive for employment equity to break down the consequences of past injustices;
- We are committed to address the challenges of the present day, with particular emphasis on employee perceptions of our culture and values, as well as external contextual factors; and
- We are working hard to anticipate future challenges and build an organisation that is resilient and agile, and that has the greatest prospects of flourishing in a world that appears increasingly volatile and uncertain, including from external, contextual factors such as climate change, the 4th and 5th industrial revolutions, wars and conflict, political uncertainty and dysfunction in basic environmental health services.

The 2022/23 financial year constitutes the first in our 3-year Transformation Plan 2022 – 2025. During this first year we have invested in listening to, and learning from, the SAMRC community, and are currently translating many of their suggestions into actions and campaigns to improve the work experience and productivity of the organisation. These are being complemented by interventions arising from the perspectives of our leadership, organisational Transformation experts we have consulted and our reading of the scientific literature on organisational change. Our interventions may be categorised into four key areas of action:

1. Our systems, policies and practices
2. Our culture, values and relationships within our teams;
3. The education, training, skills and capacities of individual employees;
4. The personal values, world views and personal struggles of our employees.

Highlights from the past year

Culture and Values Campaigns

In response to employee proposals, greeting and appreciation campaigns were designed and implemented. All societies use a form of greeting. Greetings constitute a first step toward social inclusion, and in some cultures are viewed as a way to recognise people's humanity. A failure to greet may lead to misunderstandings, or feelings of rejection or hurt. To promote the practice of greeting, pop-up stands, posters and a list of basic greetings in South Africa's official languages were designed and widely distributed across the organisations.

Expressions of appreciation or recognition reinforce trust, good behavior, performance or practices that result in better outcomes for organisations. Two dimensions of appreciation are important: private and public. Over the past year, we initiated a campaign to increase private, "in the moment" expressions of appreciation at the SAMRC. Appreciation cards were designed for the SAMRC President, as well as for senior leaders and management, and are being very well regarded by recipients. The current private appreciation interventions will be complemented with public appreciation mechanisms later in the year.

SAMRC Greetings campaign

Environmental Transformation

In response to perceptions that aspects of the main SAMRC campuses could benefit from aesthetic improvements, thereby creating a more stimulating workspace, the Ridge Road (Durban) Environmental Transformation Committee of volunteers was established. The Committee, in partnership with the Transformation Office, has undertaken various assessments and employee consultations, and the EMC has undertaken a physical campus inspection. The findings have informed a Plan of Action to transform the campus and a multi-stakeholder group has been formed to track progress.

Employment Equity

A two-dimensional approach is in place to ensure that we build health research leadership capacity, and meet our demographic targets: (1) "growing our own timber" and (2) sound employment equity practices. With regard to the former, we have been building a multi-faceted leadership development programme, that includes tertiary training in management/leadership, self-awareness development (including personal coaching, personality analyses, mentorship), the establishment of a Community of Practice and a range of "soft skills" including lobbying for change, communication and emotional intelligence. To ensure employment equity our Human Resources department provides targets in advance of all recruitment processes and have also provided employment equity training to members of our Transformation Forum to enable their active participation in recruitment processes. In addition, the EMC scrutinizes all proposals for senior leadership appointments at the organization.

Employee Consultations

We have resolved to consult our employees on an ongoing basis on matters of Transformation. To this end, environment consultation workshops have been held in all regions, on general concerns, diversity and inclusion, the experiences of women in the workplace and prejudice/implicit bias. The issues raised are being translated into a range of interventions to build a productive, agile and resilient organisation in which all employees are shifted toward reaching their full potential.

Building Capacity

The Transformation Office has initiated or supported a range of capacity building interventions in line with the SAMRC's Transformation Plan. Included are the provision of a library of electronic and hard copy personal development books and articles, the production of an intramural science newsletter, facilitating employee wellness workshops, supporting a shift to teams coaching and structuring of mentorship systems.

Women's Month: "Work & Life" themed workshop series with women to better understand the challenges faced by female employees.

PARTNERSHIPS WITH OTHER COUNTRIES

BRICS TB Research Network

The Network, established in 2017, is an endeavour to collaborate with BRICS Ministries of Health and scientists to address the problems of TB in BRICS countries and to mobilise resources to find local solutions.

- One virtual meeting – hosted by China – was held in June 2022.
- The SAMRC hosts the Network's website (www.brics-tb.net) and is hosting the Network's secretariat until further notice.

South Africa-US Programme for Collaborative Biomedical Research

The US-South Africa Programme for Collaborative Biomedical Research was established through a Memorandum of Understanding between the SAMRC and the US National Institutes of Health (NIH) in 2013. Phase 1 of the joint programme was initiated in 2015 and enabled US and South African scientists to collaborate on biomedical research in the fields of tuberculosis, HIV/AIDS, and HIV-related co-morbidities, including malignancies.

Phase 2 (2019-2024) expands on the original scientific areas of interest to also include sexually transmitted infections, parasitic infections, arboviruses and emerging/re-emerging viral pathogens, vector biology and control and the impact of alcohol use on HIV/AIDS. Phase 2 also encouraged collaboration with under represented scientists and Historically Disadvantaged Institutions (HDIs) in South Africa, and scientists in Kenya, Lesotho, Uganda and Zimbabwe.

Eighteen (18) joint US – SA projects are being funded in Phase II of the programme. The total funding awarded to these projects during 2022 was US $3,515,198 to which the SAMRC contributed R45m during 2022.

In addition, two (2) one-year supplemental awards made by Fogarty International Center to existing D43 grantees in South Africa to support career enhancement opportunities and enable under represented scientists to build research skills and experience in biomedical research.

BRICS STI Covid-19 Projects

In response to the Covid-19 pandemic, the BRICS STI Framework Programme (http://brics-sti.org/) launched a call in July 2020 for multilateral basic, applied and innovation research projects in an effort to facilitate cooperation among the researchers and institutions in the five BRICS countries.

The Department of Science and Innovation (DSI) invited the SAMRC to manage the above call for project proposals in South Africa on their behalf.

Of the seven (7) collaborative projects awarded in 2021-22 under this programme, the following six (6) collaborative projects are ongoing.

Project Title	Principal Investigator	Institution
Multidisciplinary platform based on artificial intelligence for accelerating drug discovery and repurposing for COVID-19	Prof. Kelly Chibale	University of Cape Town
BRICS-ICT Alliance for Smart Resource Utilization to Combat Global Pandemic Outbreaks	Prof. Hanlie Smuts	University of Pretoria
SARS-CoV-2 Network for Genomic Surveillance in Brazil, Russia, India, China and South Africa	Prof. Tulio de Oliveira	University of KwaZulu-Natal/ Stellenbosch University

Project Title	Principal Investigator	Institution
Impact of Covid-19 on clinical manifestations, diagnosis, treatment outcome and immune response for pulmonary tuberculosis (Nickname: ABRICOT – Associative BRICS Research in Covid-19 and Tuberculosis)	Prof. Bavesh Kana	University of the Witwatersrand & National Health Laboratory Services
Epidemiological impact and intersection of the COVID-19 and tuberculosis pandemics in Brazil, Russia, India and South Africa	Prof. Anneke C Hesseling	Stellenbosch University
Repurposing of drugs and validation of lead compounds against main protease and RNA dependent RNA polymerase of SARS-CoV2	Prof. Anil Chuturgoon,	University of KwaZulu-Natal

BRICS Multilateral Joint Science and Technology Research Collaboration – 2021 Call for Joint Project Proposals

The BRICS STI Framework Programme (FP) aims to support excellent research in priority areas which can best be addressed by a multinational approach. To this end, a call for joint project proposals in ten (10) thematic areas was launched in 2021.

DSI invited the SAMRC to manage the call in the following two thematic areas:

- Antimicrobial resistance: technologies for diagnosis and treatment
- Simulation and big data analytics for advanced precision medicine and public healthcare

Eighteen (18) full proposals were reviewed and of the four (4) joint projects selected for funding in the thematic area 'Antimicrobial resistance: technologies for diagnosis and treatment', three (3) have a SA component. No projects were selected for funding in the thematic area 'Simulation and big data analytics for advanced precision medicine and public healthcare'.

The three (3) selected projects to commence on 1 April 2023 and end on 31 March 2026 are:

Project Title	Principal Investigator	Institution
Novel siderophore fragments and hybrids for the diagnosis and treatment of drug resistant-infectious pathogens	Prof Rui Krause	Rhodes University
Unlocking bacterial resistance to antibiotics with the development of novel metallo-β-lactamase inhibitors	Associate Prof Tricia Naicker	University of KwaZulu-Natal
Target identification and efficacy enhancement of proven MDR overcoming Piper spp derived compounds towards candidate drug development against WHO priority 1 (critical) MDR pathogens: P. aeruginosa, E. coli, K. pneumoniae, and M. tuberculosis	Dr Awelani Mutshembele	South African Medical Research Council, TB Platform

Collaboration with The George Institute, Australia

A Memorandum of Understanding has been signed between the SAMRC and The George Institute for Global Health (TGI) on 28 October 2022 for 3 years to expand collaboration between SAMRC and TGI scientists in the area of health research. More particularly, the Participants intend to increase their common efforts in addressing major challenges in areas of high priority for both organisations, namely:

i. Health Systems including Universal Health Coverage (UHC) and National Health Insurance (NHI); and

ii. Burden of Disease including injury surveillance and multimorbidity.

Other fields of health research may be identified and explored for possible collaborative projects and programmes at a future time.

Global Forum on Bioethics in Research (GFBR)

The Global Forum on Bioethics in Research (GFBR) hosted the 16th Global Forum in Somerset West, South Africa on 29 and 30 November 2022. The focus of the 2022 Forum was *'Ethics of artificial intelligence in global health research'*.

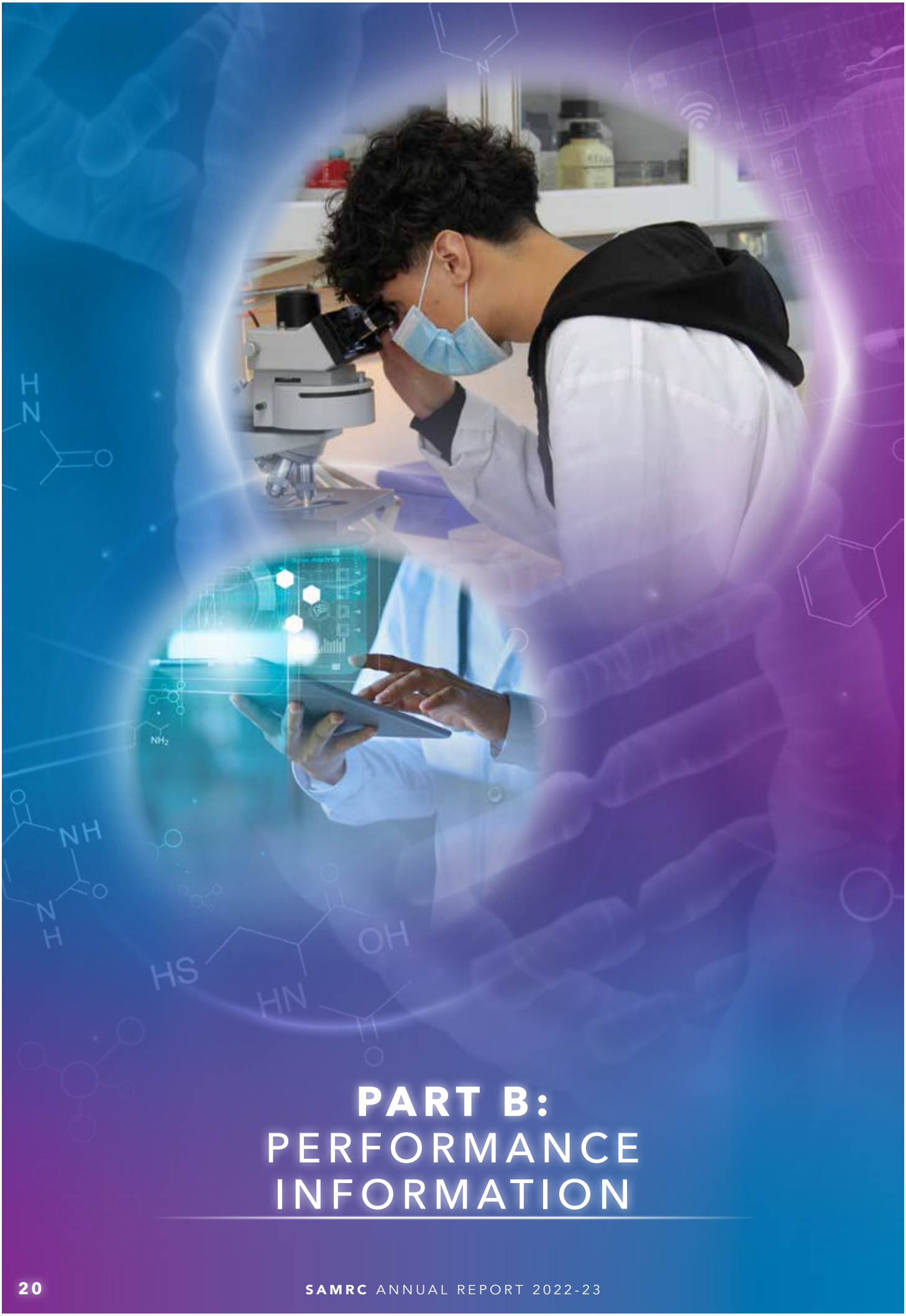
The GFBR, with its Secretariat hosted by WHO, is supported by a number of international research funders including the Wellcome Trust, UK Medical Research Council, the U.S. National Institutes of Health and the SAMRC. The Forum serves as a global platform for debate on ethical issues in international health research bringing together research ethics experts, researchers, policy makers and community members from developing and developed countries. Participants are selected on a competitive basis, based on structured submissions requiring a motivated account of each applicant's engagement. A total of 85 participants from several countries attended the conference, with the majority from LMICs. The conference was co-hosted by the SAMRC and Dr Niresh Bhagwandin from the SAMRC served on the Forum Planning Committee.

South Africa admitted to the International Human Frontier Science Programme Organisation

The Human Frontier Science Programme Organization (HFSP), the National Research Foundation of South Africa (NRF), and the SAMRC entered into a Memorandum of Understanding (MoU) on 24 February 2023. The SAMRC and the NRF will serve as joint institutional members. South Africa is the 16th country to be admitted, and the only country from Africa.

This membership underscores the value that South Africa places on supporting fundamental research in the understanding of complex mechanisms in the life sciences to advance industry, health, and human well-being. As a member, South Africa will work closely with other HFSP members to support innovative basic research; apply novel and interdisciplinary approaches; and enable scientific exchanges across national and disciplinary boundaries to address fundamental biological problems.

Furthermore, this membership will significantly contribute to the research and education programmes supported by the NRF and the SAMRC and, by implication, the African continent. The membership will be informed by building critical relationships between researchers, students and other HFSP partner institutions that champion co-discovery, co-creation, skills development, knowledge sharing, innovation, and advancement in basic sciences. The annual financial contribution of South Africa as a full member of the HFSP is US $500,000 for the financial years 2023-2026. The NRF and SAMRC will make an equal contribution towards this membership fee.



PART B: PERFORMANCE INFORMATION

STATEMENT OF RESPONSIBILITY FOR PERFORMANCE FOR THE YEAR ENDED 31 MARCH 2023

PROFESSOR GLENDA E. GRAY

The President is responsible for the preparation of the South African Medical Research Council's performance information and for the judgements made in this information.

The President is responsible for establishing and implementing a system of internal controls designed to provide reasonable assurance as to the integrity and reliability of performance information.

In my opinion, the performance information fairly reflects the actual achievements against planned objectives, indicators, and targets as per the Strategic and Annual Performance Plan of the South African Medical Research Council for the financial year ended 31 March 2023. The South African Medical Research Council's performance information for the year ended 31 March 2023 has been examined by external auditors and their report is presented on pages 314 to 317.

The performance information of the South African Medical Research Council set out on the following pages 26 to 31 have been approved by the Board.

Professor Glenda E. Gray
President & Chief Executive Officer
South African Medical Research Council

31 March 2023

STRATEGIC OUTCOME ORIENTED GOALS

The South African Medical Research Council is guided by five strategic goals/programmes, which are aligned with the four outputs of the health sector Negotiated Service Delivery Agreement (NSDA), a charter that commits key sectors and partners to the delivery of identified outputs as they relate to a particular sector of Government. These strategic goals are aligned with the NSDA that contributes to outcome 2 "A long and healthy life for all South Africans".

SAMRC's Performance Information

Administer health research effectively and efficiently

STRATEGIC GOAL 1

Impact Statement

Strengthening of corporate governance processes towards an unqualified audit opinion from the Auditor General

Measuring Outcomes

Outcome	Outcome indicator	Baseline SP (2015-19)	Five-year target
1.1 To ensure good governance, effective administration and compliance with government regulations	1.1.1 A clean audit opinion on the SAMRC from the Auditor-General	Clean audit	Clean Audit
1.2 To promote the organisation's administrative efficiency to maximise the funds available for research	1.2.1 Percentage of the government allocated SAMRC budget spent on administration	20%	20%

Lead the generation of new knowledge

STRATEGIC GOAL 2

Impact Statement

Promote the improvement of health and quality of life (prevention of ill health, improvements in public health and treatment) in South Africa through research

Measuring Outcomes

Outcome	Outcome indicator	Baseline SP (2015-19)	Five-year target
2.1. To produce and promote scientific excellence and the reputation of South African health research	2.1.1. Number of accepted and published journal articles, book chapters and books by SAMRC affiliated and funded authors	3 150	3 550
	2.1.2. Number of accepted and published journal articles by SAMRC grant – holders with acknowledgement of the SAMRC	825	930
2.2. To provide leadership in the generation of new knowledge in health	2.2.1. Number of accepted and published journal articles where the first and/or last author is affiliated to the SAMRC	1 830	1 925
2.3. To provide funding for the conduct of health research	2.3.1. Number of research grants awarded by the SAMRC	750	750

Support, through funding and other mechanisms, technology development and implementation, and innovations in health and technology delivery to improve health

STRATEGIC GOAL 3

Impact Statement

To build an innovation community, developing life changing health solutions for South Africa, Africa and beyond

Measuring Outcomes

Outcome	Outcome indicator	Baseline SP (2015-19)	Five-year target
3.1 To support the development of n ew or improved innovations aimed at improving health and targeting priority health research areas of focus	3.1.1 Number of new innovation and technology projects funded by the SAMRC aimed at developing, testing and/or implementing new or improved health solutions	NEW	20
	3.1.2 Number of ongoing innovation and technology projects funded by the SAMRC aimed at developing, testing and/or implementing new or improved health solutions	NEW	150
3.2 To develop new or improved innovations aimed at improving health priority research areas of focus	3.2.1 Number of innovation disclosures made by the SAMRC intramural research and innovation	NEW	5

Build human capacity for the long-term sustainability of the South African health research

STRATEGIC GOAL 4

Impact Statement

To provide research support in the form of funding and supervision to the next generation of scientists in the broad field of health

Measuring Outcomes

Outcome	Outcome indicator	Baseline SP (2015-19)	Five-year target
4.1 To enhance the long-term sustainability of health research in South Africa by providing funding and supervision for the next generation of health researchers	4.1.1 Number of awards (scholarships, fellowships and grants) by the SAMRC for MSc, PhD, Postdocs and Early Career Scientists	435	660
	4.1.2 Number of awards by the SAMRC to female MSc, PhD, Postdocs and Early Career Scientists	NEW	488
	4.1.3 Number of awards by the SAMRC to Black South African citizens and permanent resident MSc, PhD, Postdocs and Early Career Scientists classified as African	NEW	495
	4.1.4 Number of awards by the SAMRC to MSc, PhD, Postdocs and Early Career Scientists from historically disadvantaged institutions (HDIs)	NEW	368
	4.1.5 Number of MSc and PhD students graduated or completed	NEW	360

STRATEGIC GOAL 5

Translate new knowledge into policies and practices to improve health

Impact Statement

To contribute to building public and policy-maker understanding of health, drivers of ill-heath, and practice, interventions and technologies that can prevent ill health and strengthen health services and encouraging use of research evidence in policymaker, practitioner and public decision-making

Measuring Outcomes

Outcome	Outcome indicator	Baseline SP (2015-19)	Five-year target
5.1. To facilitate the translation of health research	5.1.1. Number of local or international policies, reports and guidelines that reference SAMRC research	27	27
	5.1.2. Number of reports and guidelines (co)produced by the SAMRC intramural researchers	NEW	25
	5.1.3. Number of national or international bodies/committees that SAMRC employees serve on	NEW	250
	5.1.4. Number of conferences, seminars and continuing development points workshops supported by the SAMRC	NEW	50

STRATEGIC OBJECTIVES, PERFORMANCE INDICATORS, PLANNED TARGETS AND ACTUAL ACHIEVEMENTS

South African Medical Research Council 2022/23 Annual Performance Report

No.	Purpose	Impact statement	No.	Outcome	
Programme 1 – Administration					
1	Administer health research effectively and efficiently in South Africa	Strengthening of corporate governance processes towards an unqualified audit opinion from the Auditor General	1.1	To ensure good governance, effective administration and compliance with government regulations	
			1.2	To promote the organisation's administrative efficiency to maximise the funds available for research	
Programme 2 – Core Research					
2	Lead the generation of new knowledge	Promote the improvement of health and quality of life (prevention of ill health, improvements in public health and treatment) in South Africa through research	2.1	To produce and promote scientific excellence and the reputation of South African health research	
			2.2	To provide leadership in the generation of new knowledge in health	
			2.3	To provide funding for the conduct of health research	

	No.	Output indicator	Performance target 2022/23	Final 2022/23 Performance	Variance
	1.1.1	A clean audit opinion on the SAMRC from the Auditor-General	Clean Audit	Clean Audit	
	1.2.1	Percentage of the government allocated SAMRC budget spent on administration	20%	17%	Overperformance because of our efficient and effective processes, and directing more financial resources towards the mandate of the SAMRC of conducting and funding research.
	2.1.1	Number of accepted and published journal articles, book chapters and books by SAMRC affiliated and funded authors	700	1 455	Compliance to the publications standard operating procedures, mobilization of additional (financial) resources and stakeholders' engagements increased outputs. At the time of setting target, it was not expected that SAMRC will receive temporary resources to conduct and fund more research.
	2.1.2	Number of accepted and published journal articles by SAMRC grant-holders with acknowledgement of the SAMRC	180	445	Compliance to the publications standard operating procedures, mobilization of additional (financial) resources and stakeholders' engagements increased outputs. At the time of setting target, it was not expected that SAMRC will receive temporary resources to conduct and fund more research.
	2.2.1	Number of accepted and published journal articles where the first and/or last author is affiliated to the SAMRC	420	775	Compliance to the publications standard operating procedures, mobilization of additional (financial) resources and stakeholders' engagements increased outputs. At the time of setting target, it was not expected that SAMRC will receive temporary resources to conduct and fund more research.
	2.3.1	Number of research grants awarded by the SAMRC	150	174	Receipt of additional financial resources by the SAMRC led to awarding of more research grants than projected.

No.	Purpose	Impact statement	No.	Outcome	
Programme 3 – Innovation and Technology					
3	Support, through funding and other mechanisms, technology development and implementation, translation of research into policy and practice, and innovations in health and technology delivery to improve health	To build an innovation community, developing life changing health solutions for South Africa, Africa and beyond	3.1	To support the development of new or improved innovations aimed at improving health and targeting priority health research areas of focus	
				To develop new or improved innovations aimed at improving health priority research areas of focus	
Programme 4 – Capacity Development					
4	Build human capacity for the long-term sustainability of the South African health research	To provide research support in the form of funding and supervision to the next generation of scientists in the broad field of health	4.1	To enhance the long-term sustainability of health research in South Africa by providing funding for the next generation of health researchers	

	No.	Output indicator	Performance target 2022/23	Final 2022/23 Performance	Variance
	3.1.1	Number of new innovation and technology projects funded by the SAMRC aimed at developing, testing and/or implementing new or improved health solutions	4	20	Mobilization of more funds led to more support for innovation projects.
	3.1.2	Number of ongoing innovation and technology projects funded by the SAMRC aimed at developing, testing and/or implementing new or improved health solutions	30	44	The delay in many of the projects due to COVID has resulted in a larger portfolio of ongoing innovation projects carried over to this financial year.
	3.2.1	Number of innovation disclosures made by the SAMRC intramural research and innovation	1	1	
	4.1.1	Number of awards (scholarships, fellowships and grants) by the SAMRC for MSc, PhD, Postdocs and Early Career Scientists	140	171	Projected target exceeded because of mobilization and redirection of resources leading to funding more scholars.
	4.1.2	Number of awards by the SAMRC to female MSc, PhD, Postdocs and Early Career Scientists	100	120	Projected target exceeded because of mobilization and redirection of resources, and targeted funding strategy leading to funding more female scholars.
	4.1.3	Number of awards by the SAMRC to Black South African citizens and permanent resident MSc, PhD, Postdocs and Early Career Scientists classified as African	105	118	Projected target exceeded because of mobilization and redirection of resources, and targeted funding strategy leading to funding more Black South African citizens and permanent resident scholars.
	4.1.4	Number of awards by the SAMRC to MSc, PhD, Postdocs and Early Career Scientists from historically disadvantaged institutions (HDIs)	75	60	Target was overestimated at the time of development of the strategic plan. However, SAMRC does not intend to adjust the targets as they set the tone for the organization to significantly drive inclusion of HDI's in the process of building next generation of research leaders. During the reporting period, SAMRC put resources and processes to improve performance on this indicator. As part of its transformation strategy, SAMRC aims to continue with this improvement trajectory.
	4.1.5	Number of MSc and PhD students graduated or completed	80	93	Projected target exceeded because SAMRC funded more scholars and SAMRC researchers supported and supervised more scholars.

No.	Purpose	Impact statement	No.	Outcome	
Programme 5 – Research Translation					
5	Translate new knowledge into policies and practices to improve health	To contribute to building public and policy-maker understanding of health, drivers of ill-heath, and practice, interventions and technologies that can prevent ill health and strengthen health services and encouraging use of research evidence in policymaker, practitioner and public decision-making.	5.1	To facilitate the translation of SAMRC research into public understanding policy and practice	

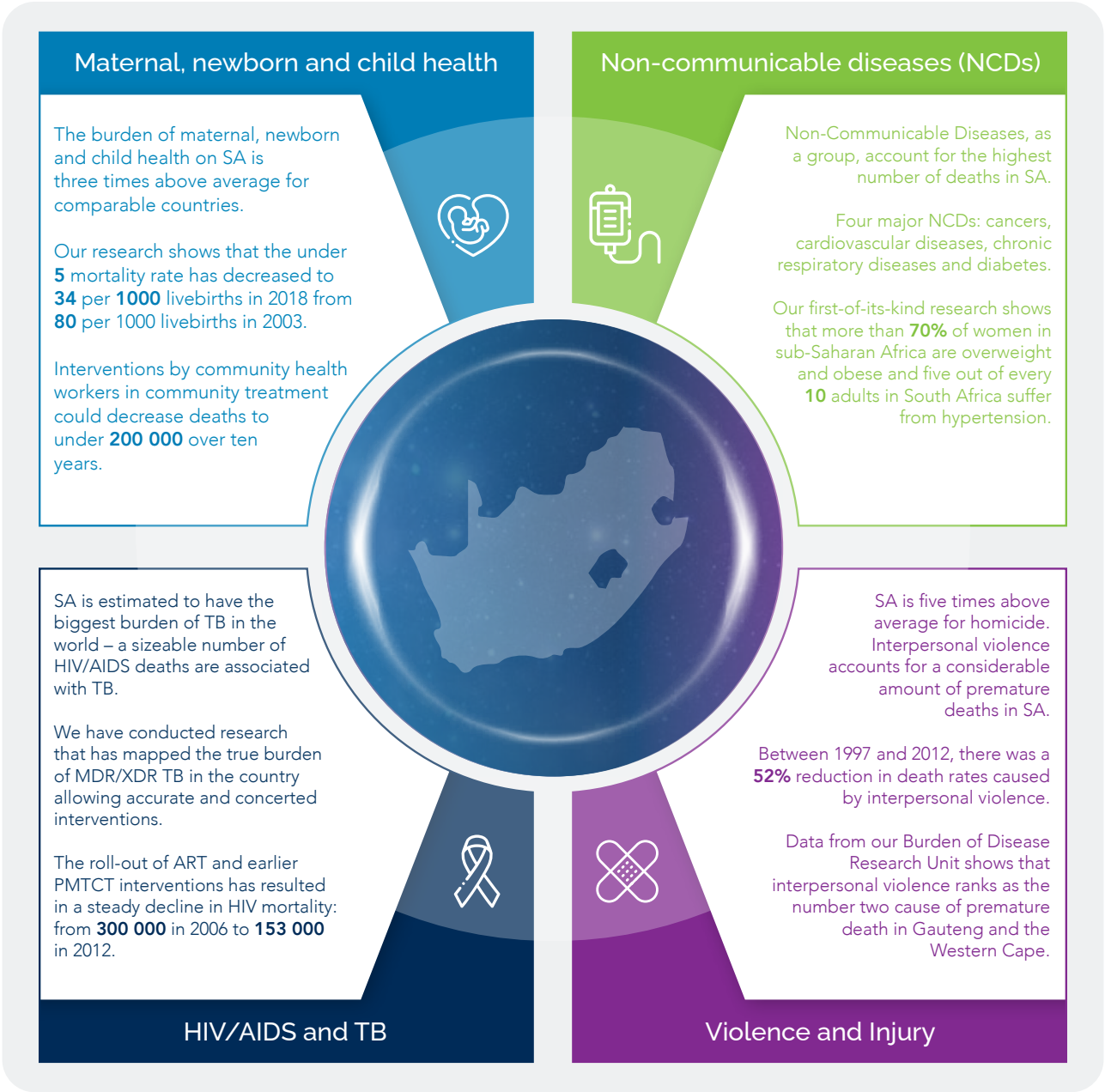
	No.	Output indicator	Performance target 2022/23	Final 2022/23 Performance	Variance
	5.1.1	Number of local or international policies, reports and guidelines that reference SAMRC research	5	120	SAMRC is a world-renowned science council, and its researchers are invariably approached for scientific input into finding solutions for health issues, which led to overperformance when compared to the target set for 2022/23. Overperformance is not a concern to us as it indicates that SAMRC plays a role in research translation by producing these documents that inform health policies and practices.
	5.1.2	Number of reports and guidelines (co)produced by the SAMRC intramural researchers	5	68	SAMRC is a world-renowned science council and its researchers were highly involved in production of reports and guidelines mostly as a result of the prevailing COVID situation, hence the target is exceeded. Overperformance is not a concern to us as it indicates that SAMRC plays a role in research translation by producing these documents that inform health policies and practices.
	5.1.3	Number of national or international bodies/committees that SAMRC employees serve on	50	205	SAMRC researchers are well sought after for their scientific expertise. This is evident in the number of committees and bodies that staff serve on. Overperformance is not a concern to us as it indicates that SAMRC researchers are good national and international "citizens", and they play a role in research translation.
	5.1.4	Number of conferences, seminars and continuing development points workshops supported by the SAMRC	10	73	The continuing COVID-19 situation led to SAMRC supporting and hosting many meetings and workshops than projected, hence the target is exceeded. Overperformance is not a concern to us as it indicates that SAMRC plays a role in research translation by hosting and supporting these engagements.

OUR RESEARCH PROFILE

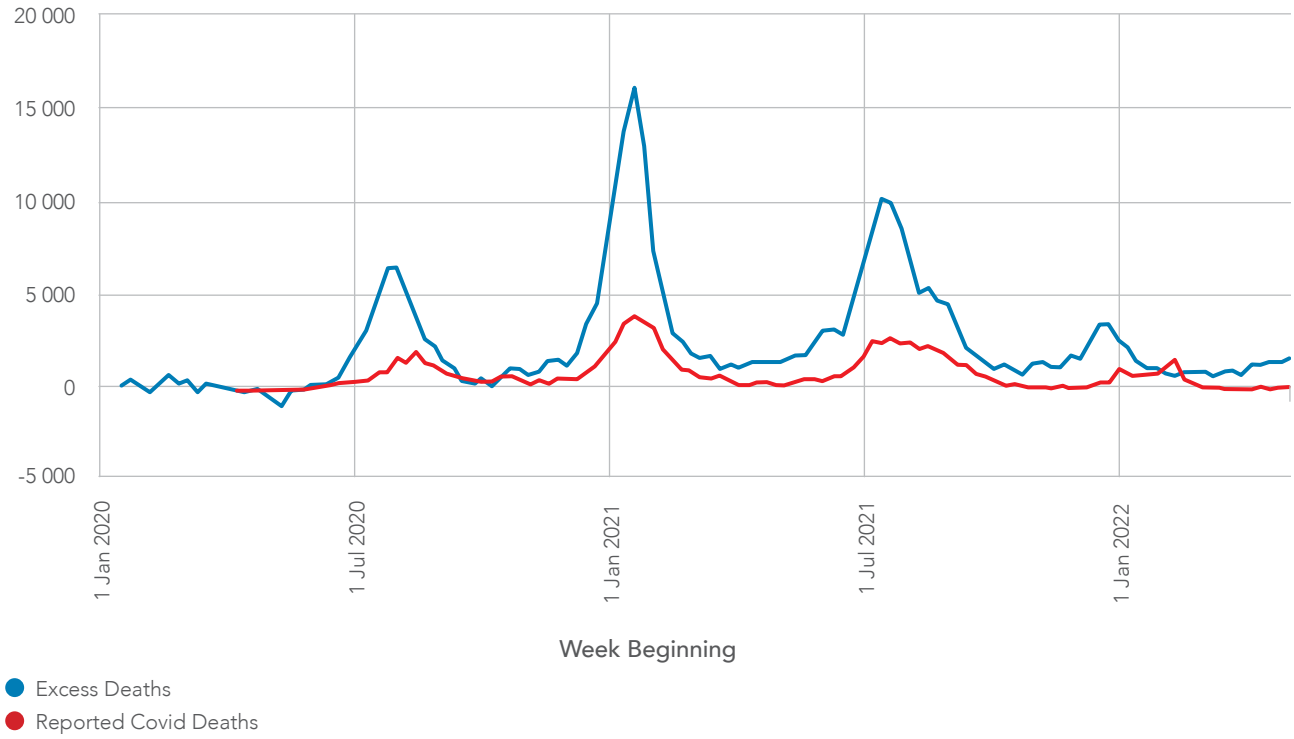
The burden of disease in South Africa

The SAMRC's steadfast focus on the key strategic pillars guides our teams of scientists and support staff to help us in enabling the National Department of Health (NDOH) to deliver on their commitment and promise of a long and healthy life for all South Africans. Our research facilitates and supports the NDOH in implementing evidenced-based policies and programmes. We have provided research support to the NDOH programmes through task teams, commissioned research, national surveys, and ministerial committees.

South Africa still faces a huge burden of four colliding epidemics as depicted in the picture below. In response to this burden of diseases, SAMRCs research focus on top ten causes of death and disability and associated factors. We assess how healthcare system function to strengthen health policy, to improve the impact and efficiency of health systems and services, and provide policy makers with the tools for informed healthcare decisions.



COVID-19 may be grouped with other communicable diseases, HIV/AIDS and TB burden, but has been shown to create havoc in management of the diseases. The work undertaken by the SAMRC's Burden of Disease Research Unit has supported the understanding of morbidity and mortality in South Africa and has during the Covid-19 pandemic tracked the number of deaths and estimate the number of excess deaths from natural causes on a weekly basis (see figure below).



Leading causes of death in South Africa

The Rapid Mortality Surveillance Report 2019 & 2020 derives estimates of key health status indicators primarily from data obtained from the National Population Register.

This report shows that in 2020, the average life expectancy in South Africa was 64.7 years, a slight decline from the 65.3 years experienced in 2019 after having increased by more than 10 years since the low of 53.7 in 2005. The increase in life expectancy prior to 2019 is due to both the decrease in child mortality as well as the decrease in young adult mortality while the decrease in life expectancy in 2020 resulted from SARS-CoV-2. Infant and under-five mortality rates reached lows of 21 and 28 per 1 000 live births, respectively, in 2020 having increased to 27 and 37 per 1 000 livebirths in 2019, respectively. However, the neonatal mortality rate continues to show little change at 12 per 1 000 live births.

There was also a noticeable decline in the level of mortality of older children and young adolescents aged 5-14 years (10q5) in 2020, again due to effects of lockdown on both natural and unnatural deaths.

Mortality among older adolescents and youth (the probability of a 15-year-olds dying before the age of 25 years) has dropped from 25.5 to 22.7 per 1 000 in 2020 for males and from 15.5 to 14.8 per 1000 for females. The decrease in deaths from unnatural causes likely contributed to this decline.

Life expectancy at age 60 had shown little change between 2000 and 2019. However, associated with COVID-19, life expectancy at age 60 dropped from 19.6 to 18.9 years for females, and from 16.1 to 14.8 years for males, resulting in an overall decrease of 1.5 years.

The rates of premature mortality from preventable non-communicable diseases (NCDs) also declined from 2016 to 2017, mainly due to a decline in deaths due to cardiovascular disease, and in males also cancer. The impact of COVID-19 cannot be assessed until more recent cause of death data become available.

Key Mortality Indicators, Rapid Mortality Survey 2015-2020

Indicator		2015	2016	2017	2018	2019	2020
Life expectancy at birth	Total	63.3	63.9	64.6	64.8	65.3	64.7
	Male	60.1	60.9	61.6	61.8	62.4	62.2
	Female	66.6	66.9	67.6	67.9	68.2	67.2
Adult mortality (45q15)	Total	34%	33%	32%	31%	29%	31%
	Male	40%	39%	38%	37%	35%	36%
	Female	28%	27%	26%	25%	24%	26%
Indicator		**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
Under-5 mortality rate (U5MR) per 1 000 live births		39	36	33	35	36	28
Infant mortality rate (IMR) per 1 000 live births		28	26	23	26	27	21
Neonatal mortality rate (<28 days) per 1 000 live births		12	12	12	11	12	12
Indicator[1]		**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
Maternal mortality ratio (MMR) per 100 000 live births		164	153	166	153	137	109
Indicator		**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
Older children & young adolescents (10q5 per 1 000)	Total	7.0	6.5	6.0	6.2	5.9	5.3
	Male	7.8	7.4	7.0	7.0	6.7	6.1
	Female	6.2	5.6	5.1	5.3	5.0	4.5
Indicator		**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
Older adolescents & youth (10q15 per 1 000)	Total	22.3	21.7	21.4	20.8	20.5	18.7
	Male	26.3	25.8	26.0	25.2	25.5	22.7
	Female	18.4	17.5	16.9	16.4	15.5	14.8

Indicator		2015	2016	2017	2018	2019	2020
Life expectancy at age 60 (e60)	Total	17.6	17.7	17.8	17.9	18.0	16.5
	Male	15.5	15.6	15.7	15.9	16.1	14.8
	Female	19.3	19.3	19.5	19.6	19.6	18.0
Indicator[1]		**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
NCD 40q30	Total	29%	29%	30%	30%	29%	27%
	Male	34%	34%	35%	35%	34%	32%
	Female	24%	24%	24%	24%	24%	23%
Indicator[1]		**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
Cardiov. disease 40q30	Total	14%	14%	14%	14%	14%	13%
	Male	18%	17%	18%	18%	17%	16%
	Female	12%	11%	11%	11%	11%	10%
Cancer 40q30	Total	9%	9%	9%	9%	9%	9%
	Male	10%	11%	11%	11%	10%	10%
	Female	7%	7%	8%	8%	8%	7%
Diabetes 40q30	Total	5%	5%	5%	5%	5%	5%
	Male	5%	5%	6%	6%	5%	5%
	Female	5%	5%	5%	5%	5%	5%
Chronic resp. disease 40q30	Total	4%	4%	4%	4%	4%	4%
	Male	6%	6%	6%	6%	6%	5%
	Female	3%	2%	2%	2%	2%	2%

Source: Dorrington RE, Bradshaw D, Laubscher R, Nannan N (2021). Rapid mortality surveillance report 2019 & 2020. Cape Town: South African Medical Research Council. ISBN: 978-1-928340-58-4. Available at www.mrc.ac.za/bod/reports.htm

RESEARCH PROGRAMMES AND UNITS

Intramural and extramural research units constitute our six research programmes. Intramural Research Units (IRUs) are based at the SAMRC campuses and the scientists are directly employed by the organisation. Extramural Research Units (ERUs) enable scientists based at tertiary institutions to conduct research funded by the SAMRC. The research programmes and units are specified as follows:

Health promotion and disease prevention — RESEARCH PROGRAMME 1

NSDA 1: INCREASING LIFE EXPECTANCY

RESEARCH UNITS

1. Alcohol, Tobacco and Other Drugs Research Unit (IRU)
2. Non-Communicable Diseases Research Unit (IRU)
3. Environment and Health Research Unit (IRU)
4. Rural Public Health and Health Transition Research Unit (ERU)
5. Masculinity and Health Research Unit (ERU)
6. Hypertension and Cardiovascular Disease Research Unit (ERU)
7. Microbial Water Quality Monitoring Research Unit (ERU)
8. Centre for Health Economics and Priority Setting Research Unit (ERU)
9. Risk and Resilience in Mental Disorders Research Unit (ERU)
10. Antimicrobial Resistance and Global Health Research Unit Research Unit (ERU)

Maternal, child and women's health — RESEARCH PROGRAMME 2

NSDA 2: DECREASING MATERNAL AND CHILD MORTALITY

RESEARCH UNITS

1. Gender and Health Research Unit (IRU)
2. Maternal and Infant Health Care Strategies Research Unit (ERU)
3. Development Pathways Research Unit (ERU)
4. Child and Adolescent Lung Health (ERU)

HIV, AIDS, TB and other communicable diseases — RESEARCH PROGRAMME 3

NSDA 3: COMBATING HIV AND AIDS, AND DECREASING THE BURDEN OF DISEASE FROM TB

RESEARCH UNITS

1. HIV and other Infectious Diseases Research Unit (IRU)
2. Centre for Tuberculosis Research Unit (IRU)
3. HIV-CAPRISA TB Pathogenesis and Treatment Research Unit (ERU)
4. Vaccine and Infectious Diseases Analytics Research Unit (ERU)
5. Centre for the Study of Antimicrobial Resistance Research Unit (ERU)
6. Antibody Immunity Research Unit (ERU)
7. Intersection of Communicable Disease and Infectious Disease Research Unit (ERU)
8. Office of AIDS and TB Research (IRU)
9. TB Platform (IRU)
10. Malaria Research Group (IRU)
11. Molecular Mycobacteriology Research Unit (ERU)

Health systems strengthening

RESEARCH PROGRAMME 4

NSDA 4: STRENGTHENING HEALTH SYSTEM EFFECTIVENESS

RESEARCH UNITS

1. Burden of Disease Research Unit (IRU)
2. Biostatistics Research Unit (IRU)
3. South African Cochrane Centre (IRU)
4. Health Systems Research Unit (IRU)
5. Health Services to Systems Research Unit (ERU)

Public health innovation

RESEARCH PROGRAMME 5

RESEARCH UNITS

1. Drug Discovery and Development Research Unit (ERU)
2. Primate Unit and Delft Animal Centre (IRU)
3. The Biomedical Research and Innovation Platform (IRU)
4. Herbal Drugs Research Unit (ERU)
5. Genomics Centre (IRU)
6. Pan African Centre for Epidemics Research Unit (ERU)

Biomedical research

RESEARCH PROGRAMME 6

RESEARCH UNITS

1. Bioinformatics Capacity Development Research Unit (ERU)
2. Precision and Genomic Medicine Research Units (ERU)
3. Stem Cell Research and Therapy Unit (ERU)
4. Antiviral Gene Therapy Research Unit (ERU)
5. Genomics of Brain Disorders Research Unit (ERU)
6. Precision Oncology Research Unit (ERU)
7. Wound and Keloid Scarring Translational Research Unit (ERU)
8. Cardiometabolic Health Research Unit (ERU)
9. Platform for Pharmacogenomics Research and Translation Research Unit (ERU)

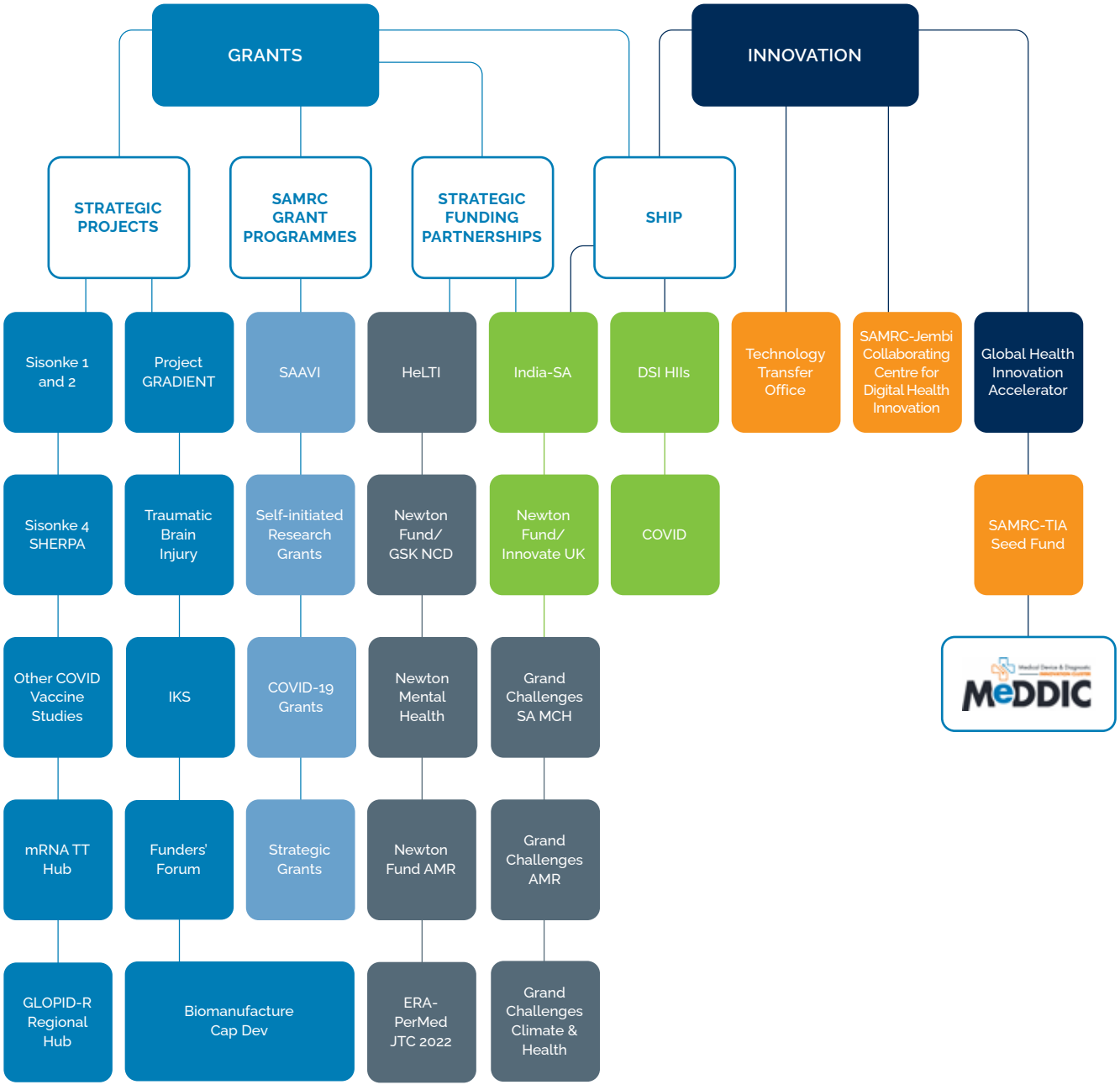
FUNDING HEALTH INNOVATION

Grants Innovation and Product Development

Funding research and facilitating innovation are two of the core activities of the SAMRC that enable the organisation to achieve its broad mandate. While designing and implementing ambitious and impactful grant programmes and strategic projects requires highly skilled individuals supported by experienced project managers and coordinators, there remains a commitment to maximise the proportion of funding that directly funds research and innovation. As such, the Grants, Innovation and Product Development (GIPD) Unit has a small but skilled team that, together, manages more than 260 active grants under 11 programs and 5 strategic projects (depicted in the figure below), with a total spend on research and innovation of R298,204,103 during the 2022/23 financial year. These funds contribute directly to the generation of new knowledge by the SAMRC's grantees, with high impact publications, capacity development and the advancement of innovations being some of the key outputs that speak directly to the SAMRC's strategic objectives. The unit's robust grant management standard operating procedures ensure that health research funding is effectively and efficiently administered by the SAMRC.

Innovation is supported by GIPD both internally and externally. The unit manages funding programs aimed at delivering new health solutions, including the Strategic Health Innovation Partnerships (SHIP) Programme and Grand Challenges South Africa. It also hosts the SAMRC's Technology Transfer Office (TTO), the Global Health Innovation Accelerator (GHIA) and the Medical Device and Diagnostic Innovation Cluster (MeDDIC), all of which provide innovation support to protect and advance technologies towards commercialized products in response to strategic goal 3 of the SAMRC.

Strategic partnerships with local and global funders enable the SAMRC to substantially expand the funding pool for research and innovation and most of these are managed by GIPD. The SAMRC's major funding partners over the last 5-10 years include the Department of Science and Innovation (DSI), the Newton Fund, the Bill and Melinda Gates Foundation (BMGF) and the Technology Innovation Agency (TIA). More recently, the SAMRC has established important partnerships with additional funders such as the ELMA Vaccines and Immunization Foundation, the Solidarity Response Fund, the Michael and Susan Dell Foundation, and the Gabriel Foundation.



Overview of the grant and innovation programmes and strategic projects managed by the Grants Innovation and Product Development unit

Although the SAMRC and DSI are the largest local contributors, there are many other local and international funders that support health research and innovation in South Africa. In an attempt to increase alignment between different funding mechanisms and avoid duplication, GIPD has been involved in 2 funding coordination initiatives as described below.

Sub-Saharan Africa Funder's Forum

At the beginning of 2022, the SAMRC was awarded a grant by the New Venture Fund to support the coordination of health research and innovation funders operating in sub-Saharan Africa. The funds were allocated to host meetings where relevant funders share strategies and coordinate approaches to fund projects and initiatives addressing priority health problems in the region. The first meeting, whose primary goal was to provide a platform for funders to share information regarding their focus areas and funding mechanisms, was held in May 2022. It was a major success with more than 30 funding organizations represented at the meeting. Based on feedback from the meeting, a second meeting organized around thematic areas of interest was held in November 2022. This was another major success with over 50 funding organizations from a wide variety of countries represented. One of the major outcomes of the Funder's Forum thus far is the establishment of a working group focusing on drug manufacturing in Africa. The group, which includes representatives from governments, development funding agencies, public private partnerships and not-for-profits, met in February 2023 and has committed towards the development of local manufacturing plans for four drugs (two HIV and two malaria drugs).

GloPID-R Africa Regional Hub

GloPID-R is an alliance of global funders investing in research related to new or re-emerging infectious diseases, with the aim of increasing preparedness and speeding up the research response to outbreaks with pandemic potential. To increase participation by LMICs and enable a stronger focus on regional research priorities and capabilities, GloPID-R developed a regional hub strategy, which it began implementing in 2021. The SAMRC was identified as a host for the GloPID-R Africa Regional Hub, and the kick-off meeting was held in September 2022. The GIPD unit is working together with the Cochrane Centre and the GloPID-R Secretariat to establish the hub, which will involve mapping of relevant funders in Africa, and a kick-off conference planned for the second half of 2023. Financial support for the establishment of the GloPID-R Africa Regional Hub is provided by the EDCTP.

SAMRC representatives and the GloPID-R Secretariat meeting of the African Regional Hub in Cape Town.

Programme and Strategic Project Updates

Strategic Health Innovation Partnerships (SHIP)

SHIP is a partnership between the SAMRC and the DSI to facilitate and support health innovation to address national priorities and enable the national system of innovation more broadly. Over the past year, SHIP has been supporting a portfolio of over 50 projects spanning TB, HIV, maternal and child health, malaria, antimicrobial resistance, COVID-19 and non-communicable diseases. In addition to these, the DSI has further contributed funding for the mRNA hub through SHIP.

In alignment with the SAMRC and DSI's transformation strategy, SHIP has intensified its efforts to support transformation and capacity development. There were at least 18 female-led projects in the SHIP portfolio in 2022/23 and over 50 postgraduate students supported by SHIP projects. Some of the exciting developments arising from the past year include the award of funding to two TB drug discovery projects led by black African principal investigators at the University of Limpopo (Prof Winston Nxumalo) and the University of Venda (Prof Isaiah Ramaite). These two projects are aimed specifically at developing drug discovery capacity at the two institutions using the so-called "twinning" model. The UCT Holistic Drug Discovery Centre (H3D) supported the two PIs during the development of their project proposals and will provide a platform for screening compounds created by the two universities as well as hosting post-graduate students from UL and UniVen for short-term training visits at UCT. In addition to the TB project, H3D and UL are also collaborating on a National Institutes of Health (NIH)-funded malaria drug discovery project, which arose as a result of seed funding provided by SHIP.

Another new project led by a black African PI, Prof Mushi Matjila, whose goal is to investigate biomarkers that can be utilized to detect pregnancies at risk of adverse outcomes, was added to the portfolio. This project has the potential to address the significant knowledge gap regarding the contribution of placental dysfunction towards poor pregnancy outcomes in low- and middle-income countries (LMICs) such as South Africa, despite LMICs having the highest burden of stillbirths and maternal mortality.

Another significant development was the signing of a Memorandum of Understanding between the DSI, SAMRC, and the Innovative Pharmaceutical Association of South Africa (IPASA). The purpose of the MoU is to establish a framework for collaboration between the three parties to support research

SHIP-funded TB project meeting at the University of Limpopo.

and capacity development activities aimed at the development and commercialization of innovative health solutions in South Africa. SHIP will be the DSI and SAMRC's implementing vehicle for the collaboration.

Precision Medicine

Precision Medicine is a key priority within the SHIP programme that is being advanced through a portfolio of funded projects focused on pharmacogenomics and precision medicine for various cancers and cardiometabolic diseases, as well as participation in the EU-Africa PerMed Project, and is a key example of the application of 5IR to healthcare. As an example, the GIPD precision medicine programme manager convened a high-level dialogue on *"How Genomic Medicine will Transform Healthcare in Africa"* at the AERAP Africa-Europe Science and Innovation Forum held from 7-10 March 2023 in Brussels. This meeting was a hybrid event with various ministries and political leaders from the EU, AU, and UN designed to inform and engage with policymakers to ensure that the role and contribution of science, enabled through digital technologies, is reflected in the European Union and its Member States' policies concerning Africa. The meetings were also designed to increase the level of participation and reinforce the networking by African nations with their partners in related EU programmes. Digital capacities, existing and new, for expanding science inclusion and citizen participation by all groups in society across Africa were explored. An output from this engagement was a proposal for the SAMRC to participate in "The European Health Data Space" initiative and to be assisted to push forth our policy dialogue on the development of the African personalised medicine agenda with both the UN and EU.

The Europe-Africa Personalised Medicine EU-Africa PerMed Consortium

The EU-Africa PerMed is a Coordination Support Action Project, funded by the Horizon 2020 programme with the aim to develop research and innovation collaboration between Africa and Europe in personalised medicine (PM). It comprises of 13 partners from Africa and Europe.

The EU-Africa PerMed Consortium partners convened for the 11th Consortium Meeting in Cape Town.

The project has conducted several core stakeholder engagement initiatives from February 2022 to January 2023. These workshops allowed discussions on the perception of PM, the main challenges and opportunities of PM in Africa and potential advantages of a closer collaboration with Europe in integrating local knowledge and practice. In-depth regional engagements followed across the African continent, as a mode for advancing PM in Africa on various levels. This has resulted in regional analyses of the Southern, Northern, Eastern, Western and Central African regions, uncovering the gaps, needs, areas of interest and prioritization to develop PM in Africa. The project has given rise to policy briefs and numerous reports enabling an African-centric approach to developing PM on the continent. A focus on research translation has enabled high-level dialogues between the AU and EU to assist in developing the PM Agenda in Africa. The SAMRC hosted two EU Africa PerMed Events – the 2nd Stakeholder Workshop and PerMed Summer School in Cape Town from 20-23 February 2023.

The organization of the 2nd Stakeholder Workshop of the EU Africa PerMed consortium was led and hosted by the SAMRC, in collaboration with the Agence Nationale de la Recherche (ANR), L'Institut National de la Santé et de la Recherche Médicale (Inserm) and Innovatec.

The second stakeholder workshop brought together around 80-100 key representatives from government, academia and industry such as health system policymakers, researchers, regulatory authorities, funding agencies, science councils, health care providers, scientific societies, regional technology developers and international organisations, from 28 countries in Africa, Europe and North America. The results of the workshop will feed into the activities concerning the exploitation and analysis of the potential and advantages of collaboration in PM between Africa and Europe. The final expected outcome will be to define an Action Plan for EU-AU collaboration in PM.

To achieve its objectives, the EU-Africa PerMed consortium has a series of activities planned within the project, such as webinars and in-person interactive training events or "Summer Schools", which allow young professionals to acquire new knowledge and skills in PM research. Lectures on key topics, illustrated by case studies and examples of current and past work of the lecturers, are followed by "working groups" where participants analyze a case study, respond to a questionnaire or perform other interactive work with their peers. Prior to the training event, participants are provided with a bibliography on the topics to be covered. At the end of the event, participants have to pass a short

Participants in the EU-Africa PerMed 2nd Stakeholders Workshop held in Cape Town.

exam on the content of the lectures to obtain their certificate of attendance.

The Summer Schools provide a platform for sharing insight and experiences in PM research in both regions, and to share and discuss examples of EU-Africa PM collaborations. The aim is to foster collaboration in PM research between EU and African research teams, providing an opportunity for networking among participants and lecturers. The first Summer School focusing on "Standards in personalised medicine research" covered key stages of PM research to allow participants to understand the importance of integrating standards for quality research at each stage for international collaborations in PM. It also had a session focused on research teams with ongoing Africa – EU collaborations to allow participants to exchange with research teams opportunities and challenges for bi-regional collaboration. The organization of this first summer school of the EU Africa PerMed consortium, was hosted by the SAMRC and led by the European Clinical Research Infrastructure Network (ECRIN), in collaboration with the African Population and Health Research Center (APHRC), the Italian Ministry of Health, the Institute for Health Research Epidemiological Surveillance and Training (IRESSEF) and Innovatec.

Participants in the first Summer School hosted by the SAMRC, focused on "Standards in personalised medicine research".

International Consortium for Personalised Medicine (ICPerMed)

An important spin-off of the EU-Africa PerMed Project is that the SAMRC has become a member of the International Consortium for Personalised Medicine (ICPerMed), and the SAMRC Programme Manager in Precision medicine is a member of the Executive Committee of ICPerMed. Currently the SAMRC is the only African institution to be a member of the ICPerMed consortium. The consortium includes participation in the largest funding partnership in PM, the European Research Area Network (ERA-PerMed) joint transnational call 2022. This competitive call has resulted in a successful project award with a South African PI coordinating a project with Sweden and Germany. This shows that African scientists, though still very few, are playing a role in leading and developing PM approaches.

Grand Challenges South Africa

The SAMRC, through GIPD, runs the Grand Challenges South Africa Programme, which is a co-funding initiative with the BMGF and forms part of the global Grand Challenges partner network. In 2022/23, the Grand Challenges South Africa programme continued to support a portfolio of projects whose goal is to contribute towards the characterisation of the burden of antimicrobial resistance in South Africa. The projects were funded utilising the "Explorations" format, which means they received seed funding to generate proof of concept data. Although they were all significantly delayed by the COVID-19 pandemic, four of the five projects have now been completed and generated important data. At least 4 publications have arisen from the projects, with several more in preparation. A significant development arising from the portfolio is that the output from the project led by an Indian female PI from the Durban University of Technology, Prof Poovendree Reddy, has caught the attention of the Clinton Health Access Initiative (CHAI), Boston. CHAI has invited the PI to advise on the development of a wastewater-based TB surveillance project in Vietnam.

Grand Challenges South Africa has co-funded a project with Grand Challenges Canada aimed at scaling a protein-to-creatinine rapid test for screening preeclampsia in pregnancy in South Africa, Ghana, and Kenya. This project was concluded in 2022 with the test having been successfully registered in all three countries and distributors secured. The product has generated interest in other countries and is now being sold in several LMICs, including South Africa, Kenya, Philippines, and Indonesia, and has received registration in Nigeria. The test is sold to over 100 clinics in Kenya, with no product-related problems reported to-date. CHAI has also recently placed an order to use the tests in Mozambique. Importantly, the company reported that it has been able to reduce the price of 50 tests down from $3.50 to only $1.80, through localization of materials and manufacturing.

A team from GIPD attended the Grand Challenges Annual Meeting in Brussels from 23-26 October 2022 and organised and facilitated several sessions at the event. The SAMRC SHIP and Grand Challenges programme manager was invited by the African Union Development Agency (AUDA-NEPAD) to participate in technical consultations on establishing national Grand Challenges programmes within AU member states. The first meeting took place in Malawi in January 2023 and provided a platform for knowledge-sharing between existing national Grand Challenges programmes (Botswana, South Africa, Uganda), Grand Challenges Africa and representatives from Malawi, who are driving the mobilisation of local research and innovation funding. The meeting resulted in the development of a roadmap for the establishment of Grand Challenges Malawi and other member states. Further consultation meetings are being planned for the remainder of 2023.

COVID Programme

Although the COVID-19 pandemic has, to some extent, levelled off in the last year, GIPD has sustained its response through the continued management of a portfolio of research and innovation projects initiated in the previous financial year focused on diverse aspects such long COVID, surveillance, epidemiology, diagnostics, immunology, biology, community awareness, responses to and outcomes of vaccination in different populations and ongoing COVID-19 vaccine trials. These projects, led by top South African researchers and consortia, have delivered answers to critical operational and translational research questions on COVID-19 and are guiding national policy and programmes. Other key programmes include the mRNA technology transfer hub and the CSSFF-SAMRC capacity development programmes which are described

under Achievements and Highlights in Part A. GIPD is managing these programs, working closely with the SAMRC's Biomedical Research and Innovation Platform and Research Capacity Development division on the latter.

The Newton Fund

The SAMRC-Newton Fund programs are the result of a co-funding initiative with the UK MRC, established in 2015, that support South African projects that respond to national health priorities while simultaneously contributing to global health advancement for social, economic and health impact. Since 2015, this partnership has funded several programmes focusing on the following areas: Translation Research in Non-communicable Diseases, Mental Health in South Africa, Tuberculosis Implementation Science, and Anti-Microbial Resistance: Drug Discovery and Antibiotic Accelerator, supporting a total of 21 projects across 12 institutions. The success of the programme is a result of a combination of the South African researchers' insight into current health problems, access to health services, patients and unique data and the UK Principal Investigators' expertise, infrastructure and networks. These multidisciplinary international projects also present the opportunity for applied science and discovery that drives innovation. While most of the programmes are now complete, some of the mental health projects as well as the AMR projects will continue into the next financial year.

The SAMRC-UK MRC Newton Fund programmes have been enormously successful in contributing to the advancement of science, publications, capacity development through the support of Masters and doctoral candidates and the creation of employment opportunities for postdoctoral scientists. To celebrate this partnership, the Newton Fund South Africa in-country team profiled a series of projects within the respective Funded programmes, which included the following:

- In conjunction with World Heart Day and Heart Awareness Month, NCDs programme highlighted the project titled "African cardiomyopathy and myocarditis registry programme: the IMHOTEP study" by Professor Ntobeko Ntusi,
- For World Mental Health Day, The Mental Health Programme highlighted the CONNECT study led by Professor John Joska and Dr Sam Nightingale titled "Neuropsychiatric problems related to HIV infection and antiretroviral therapy in Cape Town (the CONNECT study)"
- To raise awareness about the continued fight against TB, TB Implementation Science Programme highlighted the study led by Professor Wendy Stevens titled "Technology supported systems for rapid impact on TB control"
- To mark World Antimicrobial Awareness Week, Anti-Microbial Resistance (AMR): Drug Discovery Programme showcased the study titled "Harnessing natural product diversity to combat multi-drug resistance pathogens" led by Professor Rosemary Dorrington and the anti-microbial resistance screening centre at Holistic Drug Discovery and Development Centre (H3D) led by Professor Kelly Chibale

Further successful projects under the Translation Research in Non-communicable Diseases theme were the development of a rapid ParaDNA test kit for improved clinical management of patients with breast cancer and associated co-morbidities, led by Prof Maritha Kotze of Stellenbosch University, and a project on the precision management of epilepsy in South African children, led by Prof Karen Fieggen from UCT. The latter is a joint collaborative project with Aparito Pty Ltd, funded by the SAMRC and Innovate UK through the Newton fund. This project aimed to determine the value of PM tools to improve the outcome for children with refractory or complex epilepsy in South Africa. The team have developed a mobile application to assist in monitoring and tracking children with erratic epilepsy, for use at the Red Cross Children's Hospital Epilepsy Clinic. The care givers and doctors are currently utilizing the App, which features a video recording function which enables access to doctors who can advise on patient management, particularly for patients living in remote locations. This assists with adherence and meaningful tracking to improve treatment outcomes. Aparito and the Red Cross team will look at refining the App further to improve the epilepsy clinical services at Red Cross Children's Hospital and possible commercialization. This project consolidates a database of epileptic occurrences

which may also be used for further evaluation and a more patient-centric approach to care. The impact is enabling good treatment management and quality of life for these young patients. The team is also currently validating a gene panel with population-specific biomarkers to be potentially used for the diagnosis of pediatric epilepsy at the NHLS.

Project Africa GRADIENT

Project Africa GRADIENT (Genomic Research Approach for Diversity and Optimising Therapeutics) is a collaboration between GSK and Novartis with its primary focus on evaluating genetic diversity as the contributing factor to variability in exposure, efficacy and/or safety of drugs used to treat tuberculosis and malaria in Africa. GSK and Novartis partnered with the SAMRC, through GIPD, to facilitate the administration of Project Africa GRADIENT. In January 2022, the SAMRC launched an Africa-wide GRADIENT request for applications and a total of nine awards were made in 2022, 5 Investigator Sponsored Research and 4 Fellowship awards.

The SAMRC hosted the first Project Africa GRADIENT workshop on 15 November 2022 at the SAMRC's Cape Town Head Office, inviting all the funders and awardees. Dr. Javier Gamo, Director of Global Health Medicines R&D at GSK, hailed the meeting as a great success in establishing a GRADIENT family.

The GRADIENT awards are as follows:

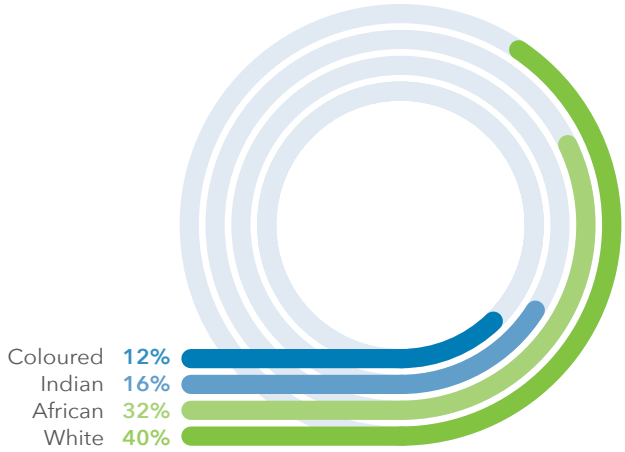
Principal Investigator	Institution	Thematic Area	Project Title
Prof Kelly Chibale	University of Cape Town, SA	TB and Malaria	Stratification of genotypes affecting pharmacokinetics in African patients treated with malaria and tuberculosis drugs
Prof Abdoulaye Djimde	University of Science, Techniques and Technologies of Bamako, Mali	Malaria	Genetic diversity of pharmacogenes and its impact on pharmacokinetics, efficacy, and safety to artemisinin-based combination therapies in Mali, West Africa.
Prof Collen Masimirembwa	University of Witwatersrand, SA	TB	Pharmacogenomics of hepatotoxicity in the treatment of drug sensitive and resistant TB in Africans (Pgx@DILI Study)
Prof Marlo Möller	Stellenbosch University, SA	TB	A population-based study of pharmacogenetics and pharmacokinetics in Southern African patients with tuberculosis (PoPG)
Dr Houcemeddine Othman	University of Witwatersrand, SA	TB and Malaria	An integrative data-driven approach to the genomics of anti-tuberculosis and anti-malarial drug responses in African populations
Prof Jean Bosco Ouedraogo	Institut des Sciences et Techniques, Burkina Faso	Malaria	Outcome of Seasonal Malaria Chemoprevention and Pharmacogenetic variability in West Africa (SMCyp)
Prof Veron Ramsuran	University of KwaZulu-Natal, SA	TB	Influence of genetic variation on TB drug concentrations and treatment outcomes, in TB patients with African ancestry
Prof Özlem Tastan Bishop	Rhodes University, SA	TB and Malaria	Harnessing Afrocentric Genetic Variation Data and Circumventing Population Specific Adverse Drug Response via Integrative Structure-Based Computational Pipelines
Dr Caitlin Uren	Stellenbosch University, SA	TB	The Pharmacogenomic Landscape of Africa

HeLTI

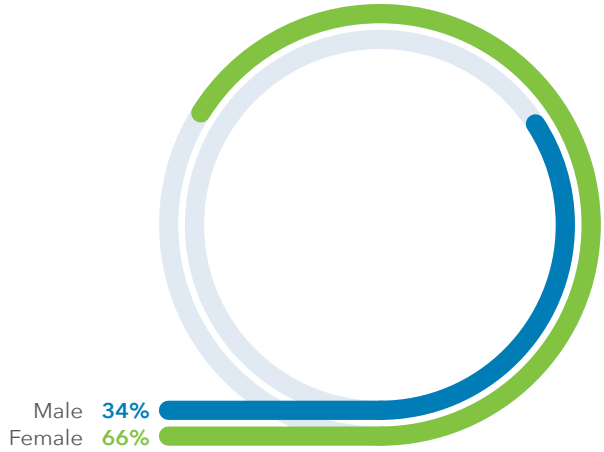
The partnership with the Canadian Institutes of Health Research (CIHR) for the Healthy Life Trajectories Initiative (HeLTI) was renewed for a further 5 years in 2022 to enable the research teams from South Africa and Canada to continue an important pre-conception to early childhood intervention study to prevent obesity and non-communicable diseases. This forms part of a broader international HeLTI collaboration that includes harmonized intervention studies in South Africa, Canada, India and China. The SAMRC has expanded this programme in South Africa by awarding 6 grants to South African institutions to utilize the HeLTI data and samples to address additional priority research questions. The annual HeLTI Council meeting will be held for the first time in-person since 2019 in Cape Town in April 2023.

Self-Initiated Research Grants

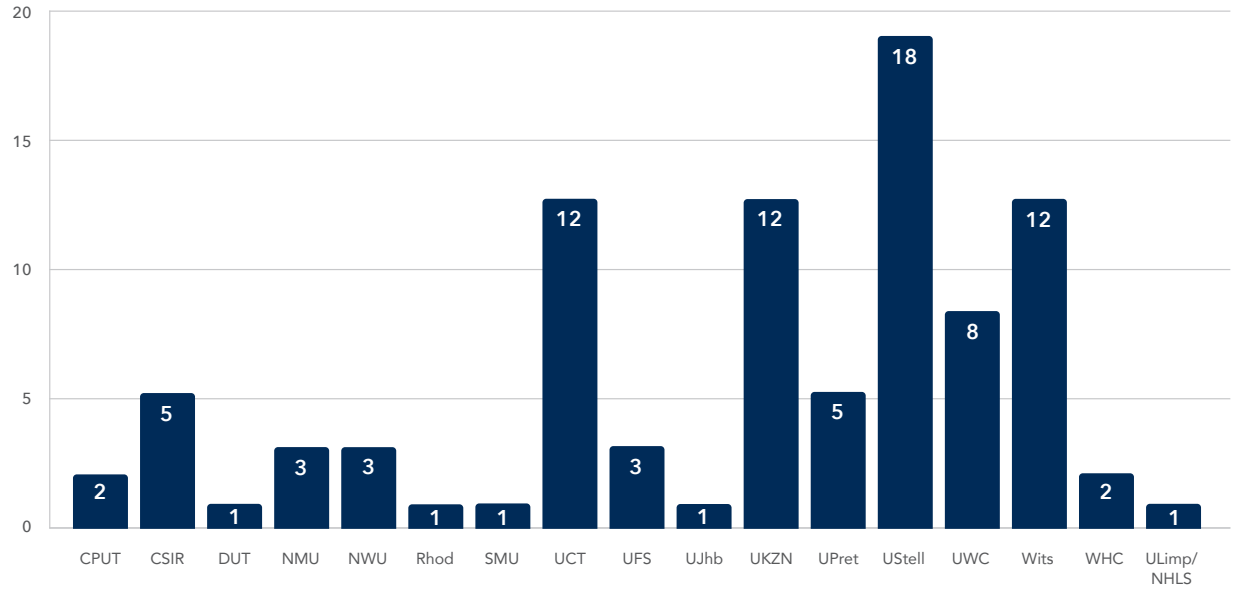
The Self-Initiated Research (SIR) programme provides grants of up to R200,000 per annum for 3 years to early and mid-career researchers in a variety of health disciplines and priority areas. The programme was impacted by COVID-19 in 2020/21 with reallocation of funding to the COVID response and no new call for proposals was run during 2020. The 2021 call focused on COVID-19 only, which resulted in a lower number of qualifying applications (90) but a higher success rate (76.7%) as 68 awards were made. A further 12 SIR grants were awarded for COVID projects in June 2022. The total 2022/23 SIR portfolio comprises 97 grants, of which 90 received a disbursement this financial year, with the distribution of these by ethnic group, gender and institution shown in the figure below. Application of a transformation matrix has resulted in a year-on-year increase in the number of awards to black applicants, with the total proportion of awards to black applicants increasing from 27% in 2012/13 to 60% in 2022/23.



SIR Grant Portfolio by Race: 2022/23



SIR Grant Portfolio by Gender: 2022/23



SIR Grant Portfolio by Institution: 2022/23

A new request for applications for SIR grants was issued in May 2022 with a closing date for submissions in June 2022. Proposals were invited in the following 11 research priority areas: Digital Health, HIV, TB, Pandemic Preparedness, Nutrition in Pregnancy and Early Childhood, Adolescent Health, Climate and Health, Water, Wastewater and Society, Global Surgery, Cancer, Brain, Behaviour and Mental Health. A total of 169 applications were peer-reviewed by national and international reviewers and approximately 60 awards will be made starting in the 2023/24 financial year.

Innovation

The SAMRC's Technology Transfer Office (TTO) is responsible for managing the SAMRC's compliance with the Intellectual Property Rights from Publicly Financed Research and Development Act. It identifies, evaluates, protects and, where possible, commercializes intellectual property (IP) developed by SAMRC researchers and raises awareness of IP issues within the organization. The TTO also advises on IP issues in contracts with external parties. The primary unit within the SAMRC that is developing new innovations is the Biomedical Research and Innovation Platform, which is researching biomarkers for non-communicable diseases and the application of plant-based medicines to treat metabolic disorders. The unit submitted a new invention disclosure to the TTO during the 2022/23 financial year on metformin derivatives for the treatment of diabetes. The technical aspects of the project are being pursued through a seed fund grant in collaboration with UWC, while the TTO will be conducting an IP due diligence to determine novelty and assess options for protection of the IP. A number of other SAMRC-developed technologies, focusing on plant-based medicines, diagnostics and medical devices, are managed by the TTO and are being progressed towards commercialization, together with partners from other science councils and universities.

The Global Health Innovation Accelerator (GHIA) is a partnership between the SAMRC and PATH aimed at facilitating the late-stage development and introduction of affordable and appropriate technologies in South Africa and other LMICs. GHIA combines the local context experience and networks, human and financial resources and research and development project portfolio of the SAMRC with PATH's in-house product development and commercialization expertise, network of international health technology companies,

international footprint in developing countries and global funding and advocacy network. GHIA's value proposition is thus the combination of offerings from two reputable organisations with demonstrated success in utilising resources to drive health impact and commercialization.

GHIA's activities include managing a portfolio of product development projects aimed at developing new solutions for global health as well as broader health innovation ecosystem development. GHIA encompasses the original partnership with PATH, largely funded by a grant from the BMGF, the Medical Device and Diagnostic Innovation Cluster (MeDDIC) programme, funded by TIA with funds from the DSI, and the SAMRC-TIA Seed Fund programme. GHIA is also expanding its network and activities into other countries in sub-Saharan Africa through a second grant received from the BMGF.

www.innovationbridge.info/ibportal/meddic

MeDDIC was established to stimulate and intensify technology innovation and increase the cohesion and competitiveness of the medical devices and diagnostics innovation ecosystem through a cluster-based approach. The cluster's strategic objectives seek to address the main challenges faced by the medical devices and diagnostics sector through:

- Creation of an integrated and cohesive ecosystem that supports and encourages development and growth of the medical devices and diagnostics sector;
- Supporting the localisation and rapid product development of promising medical device and diagnostics opportunities from the South African health innovation ecosystem by establishing a seamless product development and manufacturing pipeline; and
- Development and enhancement of human capital to support the secto.

GHIA/MeDDIC's health innovation ecosystem development mandate has been progressed over the last 2 years through the completion of a landscape analysis on the medical devices sector in South Africa; the development of a dedicated online medical devices portal; the provision of regulatory support to medical device product developers; direct support to SAHPRA to manage data on medical device products; and convening of a Medical Devices Stakeholder Forum several times annually on topics of interest to the sector.

The MeDDIC online platform, launched in February 2023, leverages off the national Innovation Bridge Portal, an initiative of the DSI, developed by

the CSIR and supported by the World Bank Group and the Department of Small Business Development, which is aimed at showcasing technology innovations and opportunities from South Africa and beyond. The dedicated medical devices portal within the Innovation Bridge is aimed at:

- Providing information on the medical devices sector, including manufacturers, products, innovators, development expertise, and support services;
- Increasing awareness of the players, capabilities and expertise in the medical devices and diagnostics sector in South Africa;
- Highlighting funding, partnering and licensing opportunities;
- Showcasing locally manufactured products and new innovations in development; and
- Facilitating stakeholder linkages and promoting increased collaboration in the sector.

While the platform was launched under the auspices of MeDDIC, the development of the portal was funded by a grant from the BMGF to GHIA.

The MeDDIC regulatory support programme is managed by the CSIR Industrial Sensors Impact Area within the manufacturing cluster due to their ISO13485 certification and several active years in medical device and diagnostic development. It is aimed at assisting local companies, entrepreneurs, and higher education institutions to understand and manage the medical device product development process, particularly as it relates to regulations. Over the last 2 years the CSIR has successfully engaged 18 entrants into the regulatory support programme and provided the following support services:

- SAHPRA device classification
- ISO standards classification
- SAHPRA technical file requirements and registration
- Technical support for device testing from both SABS and CSIR

The highlight of this phase was follow-on support equivalent to R1,2 million that the CSIR secured for 3 entrants from other support entities in the ecosystem. The SAMRC additionally received feedback from entrants that this programme has substantial merit in providing guidance through the medical device and diagnostics value chain.

As mentioned, GHIA also includes a project portfolio focusing on product development. These projects are provided with in-kind support as well as direct project funding, through SHIP and a seed fund programme managed under GHIA. The SAMRC is an approved implementing partner for the TIA Seed Fund, manged through the SAMRC's TTO. There are two components to the **SAMRC-TIA Seed Fund**. 1.) The national seed fund calls released by TIA on an annual basis for which TIA determines the priority areas and timelines of the call and makes the final selection of which projects from each institution they are willing to fund. These projects are fully funded by TIA. Three projects submitted by the SAMRC were selected for funding in 2022/23; however, they will only start in the new financial year. 2.) A separate co-funded seed fund programme between the SAMRC and TIA (R2.5M each per year) focuses on medical devices and diagnostics. The first call for this was run in 2021 and 9 projects were funded in 2021/22 and 2022/23. The second call was run in late 2022 and the new awards for this were approved in March 2023. Some will be initiated in 2022/23 and the rest in 2023/24.

During the 2022/23 financial year, one of the SAMRC-TIA Seed Fund projects was successfully completed. This project, undertaken by Kingfisher Medical (Pty) Ltd, was aimed at locally manufacturing consumable orthopaedic and spinal rotating cutting tools, specifically cutting burs, which are currently imported at a cost to the industry of around R72 million per annum. After finalisation of the prototype, material selection and establishment of the manufacturing process, the company was able to validate and test these burs, resulting in a limit run batch production. The company successfully manufactured under SAHPRA and ISO13485 regulations and commercialised the first medical cutting burs in South Africa. The first burs were used in surgery in July 2022 in one of the private hospital groups. As a result of the SAMRC-TIA Seed Funding, this project has opened multiple opportunities for South Africa to export consumable medical cutting products, solving the supply chain risk for hospital groups. The project additionally benefitted 3 local SMEs through the provision of manufacturing opportunities, skills development and equipment acquisition used in the manufacturing of these cutting burs.

In addition to the seed fund, MeDDIC ran a call for localization projects in 2021. Four projects were funded, one of them from the BMGF GHIA grant. The latter was run by Prosthetic Engineering Technologies (PET) Pty Ltd, a spin-off from Nelson

Local production of the cutting burs (left) and image of the sterile bur catalogue.

Mandela University established and run by a black African entrepreneur and amputee. The aim of this project was to establish the capability to manufacture locally highly functional, durable silicone prosthetic liners at a low price, largely for the public sector in LMICs. As a result of current high costs, the government can only import old residuum technology commonly referred to as stump socks for amputees. This sock has several disadvantages for the user such as abrasions, bruises and bad odour. In contrast, the silicone liner protects the residuum skin from these bruises and additionally reduces pressure sores caused by the stump sock. The silicone further seals the skin upon contact and reduces sweating on the residuum thus preventing fungal and bacterial growth associated with the stump sock. The team has successfully produced pre-production liners that are currently being tested by users.

Innovation and 4IR

Over the coming decade it is anticipated that the patient care journey, through improved prevention, diagnosis, treatment and care, for most medical device categories will be fundamentally altered with the introduction of numerous Industry 4.0 innovations, such as the Internet of Things, Big Data, cloud computing, mobile technology, microelectronics, and low-cost sensors, leading this industry to new levels of efficiency and making the production of new, innovative devices a reality. Treatment protocols will significantly evolve, enabled by advances in technologies such as 3D printing and augmented/virtual reality, and the launch of several 'smart' devices. Developments in areas such as AI will result in improved diagnosis and care options, driving down healthcare costs. Ultimately, as time spent in the hospital is reduced, the focus will shift to preventative technologies – an area holding exciting promise for the future.

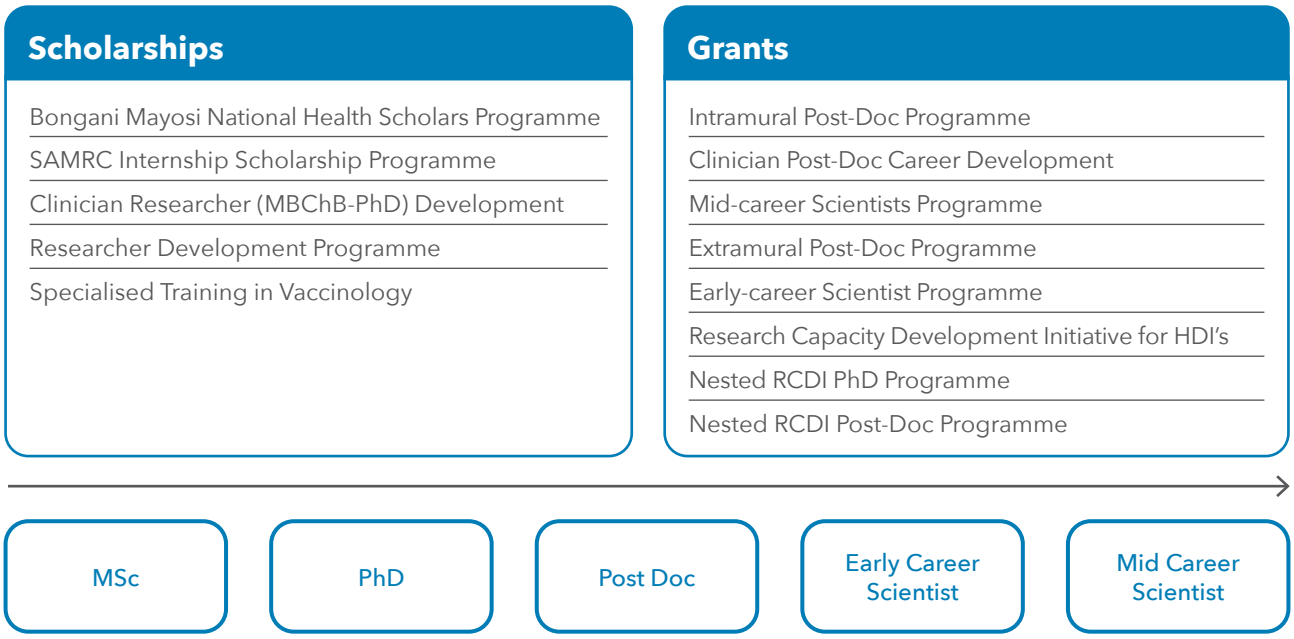
In the next financial year, the SAMRC through SHIP, MeDDIC and other programmes, will focus on identifying, supporting and expanding key technology platform capabilities in the country that are applicable to the health sector as well as individual projects that utilize these technologies to improve health outcomes. These include advanced manufacturing and other technology support with a focus on implementation of Industry 4.0 Technologies, including Product Lifecycle Management, to promote local manufacture. Another key focus will be expanding the national genomics agenda, utilising next generation sequencing technologies and big data capability to better understand the link between genetics and health in African populations and use this to develop more appropriate and relevant health solutions.

RESEARCH CAPACITY DEVELOPMENT

Overview

The overarching objective of the SAMRC's Division of Research Capacity Development (RCD) is to enhance the long-term sustainability of health research in South Africa by providing funding for the next generation of health researchers. The division supports health research capacity development by offering scholarships, fellowships and research grants to post-graduate and postdoctoral students and early and mid-career scientists at South African universities. With most of these awards aimed at individuals from historically disadvantaged backgrounds, the division's activities are also contributing substantially to transformation in health research. In 2022/2023, RCD's programmes have continued to contribute to the SAMRC's strategic objectives of administering health research effectively and efficiently, leading the generation of new knowledge and building human capacity for the long-term sustainability of health research in South Africa.

RCD's programmes are divided into Scholarships and Grants as depicted in the figure below.



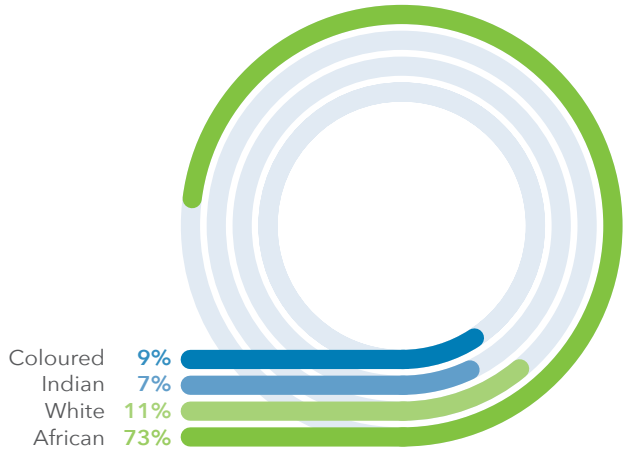
Scholarship and grant programmes managed by the division of Research Capacity Development

The number of beneficiaries and the amount invested in 2022/23 for each programme are listed in the table below. The total number of funded beneficiaries (grants and scholarships), including new intake for the 2022/23 reporting period, exceeded the annual target by 23%.

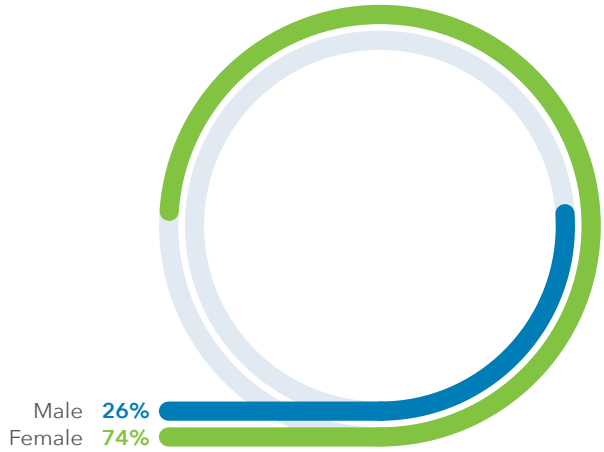
Name of Programme	Number of beneficiaries		Amount invested in ZAR
SAMRC Mid-Career Scientists	9	Scientists (PI)	12,658,000
SAMRC Research Capacity Development Initiative	19	Scientists (PI)	6,605,600
RCDI Nested Post-doctoral Fellowship programme	9	Post-doctoral Fellows	3,150,000
RCDI Nested PhD Scholarship Programme	4	PhD	800,000
SAMRC Extramural Post-doctoral Fellowship Programme	5	Post-doctoral Fellows	1,750,000
SAMRC Intramural Post-doctoral Fellowship Programme	12	Post-doctoral Fellows	2,950,000
SAMRC Clinician Post-doctoral Career Development Award	3	Clinician Post-PhD	1,675,000
SAMRC Early Investigators Programme	12	Scientists (PI)	6,000,000
SAMRC Researcher Development Grant	11	PhD	1,153,318
Bongani Mayosi-National Health Scholars Programme	35	PhD	12,114,654
Biostatistics Capacity Development Programme	3	MSc	480,000
SAMRC Clinician Researcher Development Programme	15	PhD	5,950,000
SAMRC Internship Scholarship Programme	34	PhD	6,339,720
Totals	**171**		**61,626,292**

RCD Scholarships Portfolio

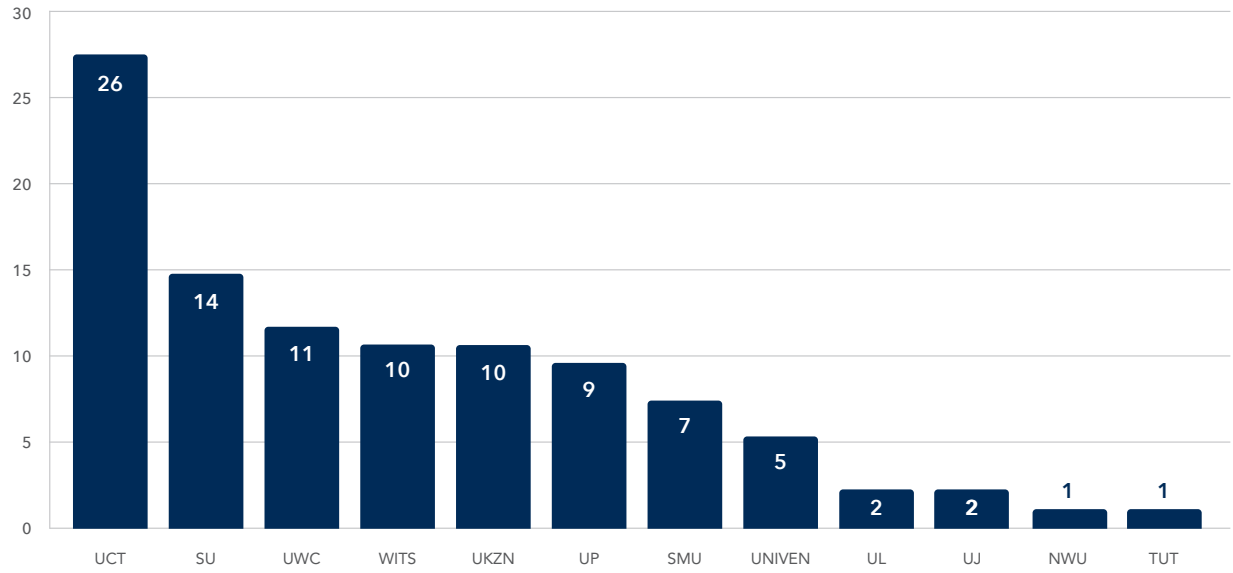
The **scholarships portfolio** at RCD comprises 5 programmes as listed in the figure above. Overall, these programmes have continued to make excellent progress in transformation and strengthening research capacity at the Historically Disadvantaged Institutions (HDIs). In 2022/23, RCD supported 94 PhD and 4 MSc scholarships, of which 74% were awarded to female candidates and 73% to African Black candidates. Over a quarter of the scholarships were awarded to scholars registered in HDIs, which is a substantial improvement over previous years. The distribution of scholarships by gender, ethnic group and institution for 2022/23 are depicted in the figure below.



Scholarship awards by ethnic group: 2022/23



Scholarship awards by gender: 2022/23



Scholarship Awards by Institution: 2022/23

In the last two years, RCD has made a concerted effort to increase the number of funded scholars in HDIs. In this financial year, RCD's Researcher Development Awards (RDA), which is a once-off award made to emerging researchers who are at the late stages of their PhDs and serves to relieve pressure on the candidates in order to speed up the conclusion of their PhDs, was identified as a funding instrument where participation of HDIs could be facilitated and potentially expanded. As a result, 75% of RDA funding this financial year was awarded to researchers in HDIs. Notably, all of the funded researchers are health/allied professionals involved in the training of the next generation of the healthcare workforce.

Due to the increased demand for PhD funding over the years, RCD has predominantly funded PhD candidates and prioritized MSc candidates who are in the strategic or scarce skills such as Demography, Biostatistics and Genomics. However, due to the paucity of statisticians in South Africa, RCD has only been able to recruit a handful of candidates specialising in Biostatistics across RCD scholarship programmes. It has become clear that there is a need to attract other disciplines in health research such as statistics, data science, engineers and computer science for the purpose of solving the most pressing and complex health challenges that require an interdisciplinary approach, such as developing diagnostics and medical devices and epidemiological modelling. Although the importance of biostatistics in conducting and translating health research into clinical benefit has always been known, the paucity of statisticians in South Africa makes it difficult to create and sustain a pool of experts specializing in Biostatistics. In this financial year, RCD ran a targeted RFA to recruit a cohort of Masters candidates in an effort to build capacity in this strategic field and successfully recruited three MSc Biostatistics candidates of whom all are African black candidates and two are registered at HDIs. All three students have a strong foundation in Statistics or Mathematical statistics. It is anticipated that the funded students will in future provide statistical support for health research studies or lead statistical studies.

Collaborative partnerships are important for RCD to meet its strategic objective. RCD continues to work with various Research Units within and outside the SAMRC to attract and support research training of the next generation of health science researchers. In this financial year, half of the recruited SAMRC Internship Scholarship holders were hosted by SAMRC Research Units that have not previously mentored RCD funded interns, namely Risk and Resilience in Mental Disorders; Pan African Centre for Epidemics; Centre for the Study of Antimicrobial Resistance; and Biostatics Research Unit. The purpose of the SAMRC internship scholarship programme is to contribute towards the SAMRC's transformation agenda i.e., to increase the representation of quality postgraduate scientists from designated groups with an emphasis on Black females and to grow the number of PhD candidates from HDIs. This is particularly significant since the participation of various research units is crucial in building the critical mass of a transformed health research workforce with diverse skills. RCD's facilitation of collaboration extends beyond just providing funding and includes identifying areas where SAMRC researchers might be able to provide research support through sharing of facilities and shared supervision of PhD and MSc students. This is important for improving the chances of success of the supported candidates in their studies.

Impact of RCD Scholarship Funding

One of the ways we assess the impact of the SAMRC scholarships on individual recipients is to look at their career progression or further opportunities post award and to assess whether the newly trained researchers can apply their knowledge in new situations. It is particularly important to note that most of the recently graduated medical practitioners (clinician-scientists) have applied their knowledge and meaningfully contributed to areas such as COVID-19 research and continue to do research after they have completed their PhDs. A number of previously supported and current beneficiaries were at the forefront of the pandemic response conducting basic and clinical research and some forming part of ministerial advisory boards. Moreover, a number of graduated scholars were retained by their research institutions after completing their studies, especially the BM-NHSP scholarship recipients. It is also important to note that the funded beneficiaries are globally competitive, able to secure postdoctoral positions overseas and some are invited to speak at prestigious international meetings.

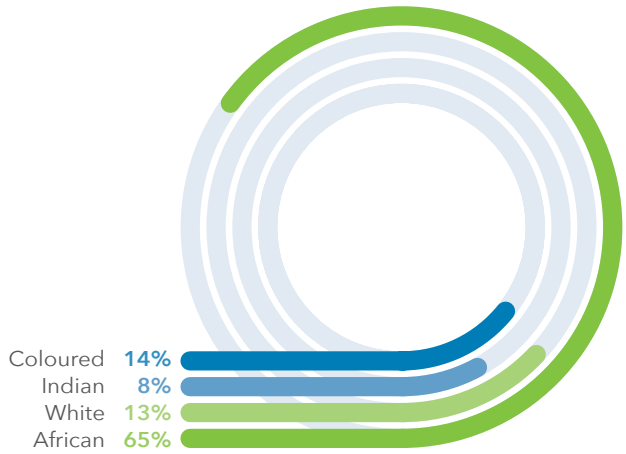
The success of the SAMRC scholarship programmes is also reflected in the investments received. During this reporting period RCD has received R13,5 million (including VAT) from the NDoH and the Public Health Enhancement (PHEF) for the BM-NHSP programme, the most prestigious and nationally competitive health science scholarship programme. Since programme inception, the BM-NHSP has awarded funding to 162 scholars of which 75 PhDs and 12 MSc candidates have graduated to date. Many of the scholars funded in the first three cohorts are now leaders in their fields. For example, Dr Steven Mufamadi is now the Research Chair of

the Nanomedicine Platform of Nelson Mandela University and the founder and managing director of Nabio Consulting. More recently, the focus of the BM-NSHP programme has been on HDIs. We believe that developing health and clinical research capacity in HDIs will broaden and deepen involvement of health and clinical researchers in rural communities, ensure equitable access to quality health care services and consequently improve healthcare delivery and outcomes. Moreover, the programme will assist in developing the next generation of academic and research leaders in HDIs.

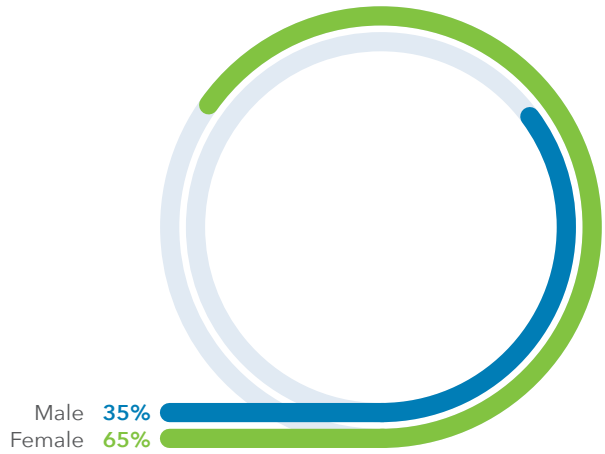
Dr Lerato Rametse (left) was invited as a speaker at the Global Young Scientists Forum (GYSS) in Singapore. Her work is funded under the Clinician Researcher Development Programme.

RCD Grant Portfolio

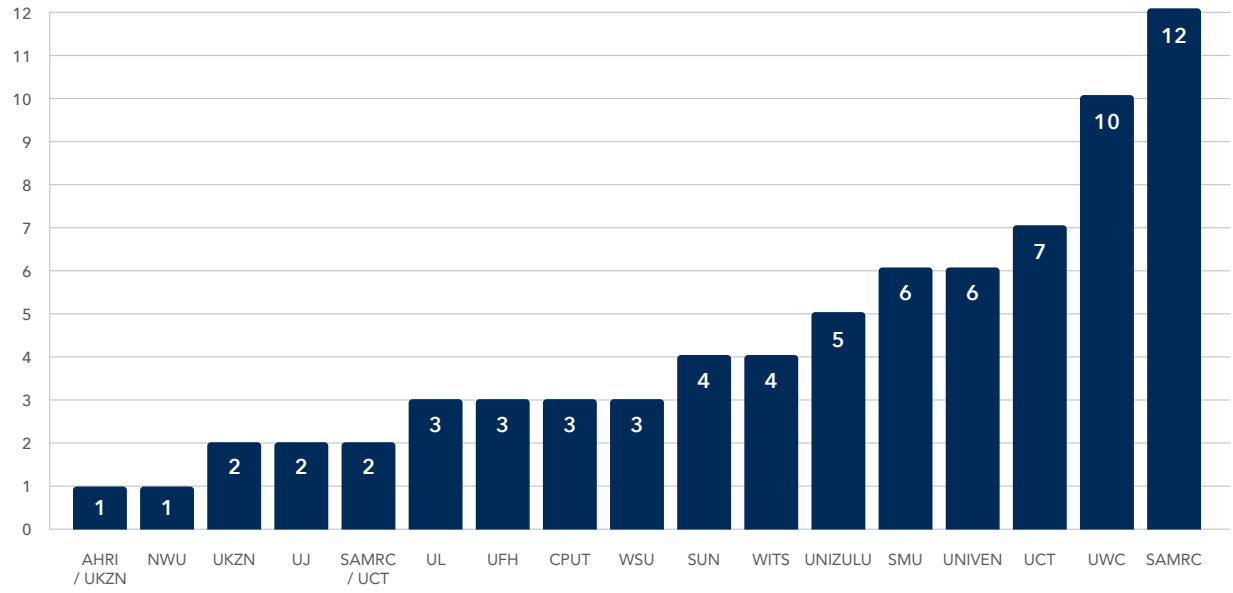
The purpose of the RCD grant programmes is to create an opportunity to fast-track and transition early- and mid-career scientists to independent research leaders. The distribution of grants/career awards by gender, ethnic group and institution for 2022/23 are depicted in the figure below.



RCD Grant Awards by Ethnic Group: 2022/23



RCD Grant Awards by Gender: 2022/23



RCD Grant Awards by Institution: 2022/23

The RCD Grant Portfolio has, overall, continued to increase the number of beneficiaries supported, with 73 in 2022/23 compared to 51 in 2020/21 and 72 in 2021/22. During the financial year, the RCD Grant Portfolio ran six requests for application with an overall intake of 20 new beneficiaries. There has been a renewed focus on transformation and capacity building in HDIs and other under-resourced institutions. Overall, 65% of the RCD Grant beneficiaries in 2022/23 were female, while 88% were black and 65% were African black. The priority research areas funded include, inter alia, HIV, TB and other infectious diseases, non-communicable diseases, COVID-19, health systems, public health, maternal and child health and biomedical research. RCD Grants programmes account for around 60% of the RCD budget, with more than 70% of grant holders being hosted by the previously disadvantaged institutions, including the University of Fort Hare, University of Zululand, University of Limpopo, University of Venda, Mangosuthu University of Technology, Walter Sisulu University, Sefako Makgatho Health Sciences University, and the University of the Western Cape.

In 2022/23 a new programme was introduced in response to an identified need to support post-doctoral career development in Extra-mural Units (EMUs) based at HDIs and other resource-constrained institutions. The EMU Post-doctoral Fellowship pilot programme was designed for this purpose and was run for the first time in 2022/23, with a total of 5 awards made. This is one of a series of interventions aimed at strengthening support for HDIs. The pilot programme will provide a clear indication of the programme's feasibility for future expansion to the other EMUs with the purpose of accelerating research capacity development and scientific leadership within EMUs by retaining high-performing students trained at the HDIs who might otherwise leave for other institutions. The first cohort of awardees will be hosted by the following Units: SAMRC/UFH Microbial Water Quality Monitoring Research Unit, SAMRC/UNIVEN Antimicrobial Resistance and Global Health Research Unit, and the SAMRC/CPUT Cardiometabolic Health Research Unit.

Impact of RCD Grant Funding

It is important to note that the impact of RCD career support extends beyond the lifetime of the award. Former and current RCD beneficiaries are generally successful at raising research funding and obtaining employment. Two former RCD postdocs were appointed as permanent employees at their institutions, one RCDI-PI was promoted to professorship, while another beneficiary received an SAMRC award this year.

- Dr Funanani Mashau (SAMRC Intramural post-doctoral programme) and Dr Daphney Matume (RCDI-nested post-doctoral programme) have secured positions as Lecturers at the University of Fort Hare, and the University of KwaZulu-Natal, respectively.
- Dr Nqobile Mkolo (RCDI/HDI programme) has recently been promoted to Associate Professor at Sefako Makgatho University.
- Prof Lusilda Schutte (Early Investigators Programme) received a bronze award at the SAMRC's prestigious Merit awards in March 2023. Her research interests include public mental health and psychiatric epidemiology.

In 2022/23, RCD beneficiaries contributed 118 Conference papers, journal articles, with 61 of these published by RCD Grant holders. The total number of students who worked on the funded projects was 189, with 143 of these being female. This demonstrates how the RCD Grant programmes are developing the next generation of researchers who are also leading the generation of new knowledge.

Awardee Engagement, Training and Networking

Annually, RCD organises the Early Career Scientific Convention (ECSC). The conference brings together early career researchers (PhD and MSc scholars) who are funded by the SAMRC in different health research areas (such as public health, mental health, non-communicable and communicable diseases) from different academic institutions throughout the country. The ECSC provides an opportunity for scholars to network, share experiences, success stories and challenges, and obtain critical feedback

on their work. RCD held its 16th Annual Early Career Scientist Convention, on the 25th and 26th October 2022 under the theme "Defining Impact and Success in Science". The convention also featured several exciting Master Classes with expert panelists on the following topics: (1) Multisystemic Resources are critical to the well-being and success of early career scholars: Interventions that work, (2) Science communication and public engagement: reflections on health crisis communication during the Covid-19 Pandemic, (3) Career reinvention and retooling: a resilience strategy, and (4) Scientific Career Paths for PhDs: How to increase Your employability. The major aim of the convention was to impart skills and knowledge to our early career scientists that will not only be needed for their career growth and development but also allow them to explore new scientific directions and opportunities.

SAMRC Scholars at the 16th Early Career Scientific Convention.

The SAMRC, through RCD, also hosts a Grant Holder's Annual Meeting (GHAM) every year specifically aimed at beneficiaries in the RCD grant programmes. This year, RCD hosted more than 65 RCD grant holders from 15 universities during its GHAM held on the 8th and 9th of March 2023 under the theme of "*Building Research Leadership for Societal Impact*". This year's meeting was the first in-person GHAM event since the start of COVID and brought together beneficiaries from each of the RCD Grant Programmes, including the SAMRC Intramural Post-doctoral Fellowship Programme, Clinician Post-doctoral Career Development Programme, Early Investigators and Mid-Career Scientists Programmes, and the Research Capacity Development Initiative for HDIs. With a strong focus on science, the meeting provided an opportunity for grant holders to present their research, learn about new topics relevant to their research endeavours, network and seek new collaborations. The meeting was attended by some of the SAMRC Board Members, the SAMRC President and CEO, Prof Glenda Gray, and other members of the SAMRC's Executive Management Committee. The meeting also included esteemed keynote speakers who delivered outstanding lectures on various topics in the context of "Building Research Leadership for Societal Impact", spanning ethics in research, innovation and intellectual property, career development and research, societal impact, research translation and indigenous knowledge systems.

RCD grant holders attending the Grant Holder's Annual Meeting in Cape Town.

RCDI beneficiaries (HDIs) at the meeting.

Early Investigators Programme beneficiaries at the meeting.

As mentioned, RCD promotes collaboration between funded researchers at HDIs and SAMRC research units to strengthen capacity and skills transfer. A recent example is the facilitation of a collaboration between the SAMRC's Burden of Disease unit with the University of Venda. The Burden of Disease unit has a substantial amount of data that can be used to train public health students, whereas the University of Venda is in need of supervisory capacity and projects for students to work on. The RCD team also received a delegation from the University of Venda's TB Research Unit. The unit is led by Professor Afsatou Traore, a grant recipient of the SAMRC Research Capacity Development Initiative since 2020. Professor Traore is a Principal Investigator on the RCDI-funded project "ADME polymorphism in tuberculosis: Pharmacogenetic analysis of samples from patients in Hospitals in the Vhembe District of Limpopo, South Africa". She collaborates with the SAMRC Centre for Tuberculosis Research (CTR) and Genomics Centre.

UNIVEN TB Research Unit team with RCD staff.

RCD also works with academics at various institutions who support the division by supervising SAMRC funded scholars and participate in the peer and panel review processes to strengthen and expand quality research in South Africa.

Research capacity development initiatives targeting researchers in HDIs remain one of the strong focuses of RCD. However, the proportion of RCD funded MSc and PhD students in HDIs remains relatively low, mainly due to low PhD enrolment, lack of alignment with SAMRC priority research areas and lack of supervisory capacity in these institutions. During this financial year, RCD and the GIPD unit visited all eight HDIs to raise awareness of the different funding opportunities at the SAMRC, assess the research capabilities of the institutions and discuss challenges and opportunities. Through these engagements, GIPD and RCD have been able to increase the interest of researchers from HDIs in SAMRC programmes, facilitate collaboration between the SAMRC and HDIs and identify areas where SAMRC researchers might be able to assist through sharing of facilities and skills. The information gathered has also been used for a SWOT analysis of the HDIs which will be used to design additional relevant support programmes for these institutions going forward.

SAMRC STRATEGIC RESEARCH PROGRAMMES

Programme 1

HEALTH PROMOTION & DISEASE PREVENTION

PURPOSE OF THE PROGRAMME

To conduct research using a life course approach to healthy lifestyles, early diagnosis, and cost-effective prevention and management of diseases through health promotion.

UNITS THAT CONSTITUTE THIS PROGRAMME

1. Alcohol, Tobacco and Other Drugs Research Unit (IRU)
2. Non-Communicable Diseases Research Unit (IRU)
3. Environment and Health Research Unit (IRU)
4. Rural Public Health and Health Transition Research Unit (ERU)
5. Masculinity and Health Research Unit (ERU)
6. Hypertension and Cardiovascular Disease Research Unit (ERU)
7. Microbial Water Quality Monitoring Research Unit (ERU)
8. Centre for Health economics and Decision Science-Research Unit (ERU)
9. Risk and Resilience in Mental Disorders Research Unit (ERU)
10. Antimicrobial Resistance and Global Health Research Unit (ERU)

PROGRAMME STRATEGIC OBJECTIVES

- To contribute towards the body of evidence by gaining a better understanding of how factors such as nutrition, physical activity, mental health, healthy behaviours, environment and stress factors affect life expectancy.
- To be a leader in scientific research by contributing to new knowledge in the area of health promotion and disease prevention.
- To train and mentor high-quality postgraduate students and postdoctoral fellows who are able to compete in the science, health and/or education sectors locally and abroad to advance the cause of health promotion and disease prevention.
- To assist the National Cancer Registry in producing cancer surveillance statistics and cancer trend reports.
- To translate research results into health and education policy, the practice of health-care professionals, and the configuration of health and education systems.
- To develop interventions that affect and address poor nutrition, lack of physical activity, excessive alcohol intake, and risky sexual behaviours.
- To add to evidence-based interventions that look into factors affecting life expectancy.
- To train and educate health-care staff and community members to manage, control and reduce the incidence of non-communicable diseases.

RESEARCH HIGHLIGHTS UNDER THIS PROGRAMME

Alcohol, Tobacco and Other Drugs Research Unit

Unit director:

Prof. Charles Parry

Research fit for purpose

Research is aimed at reducing the harmful effects of substance abuse and to promote mental health, including developing innovative technologies to assess, monitor and promote health outcomes.

This has included performing trials on the effectiveness of Community Health Workers (CHWs) to provide treatment for patients with chronic physical diseases; identifying the prevalence of mental health disorders amongst university students; the development of a tool to assess on the ground impact of 4 key alcohol policy domains to create a policy index; and examining tobacco usage from 5 waves of the South African Social Attitudes Survey.

Couples Health CoOp Plus(CHC+) Field Staff Team 2021.

Impactful Research Interventions

Our research highlights for this reporting period include the study on Foetal Alcohol Spectrum Disorders (FASD) as part of a broader project involving the implementation of the multifaceted institute of medicine model of FASD prevention spanning several years, which involve interventions with at-risk pregnant women, their partners and the broader community. A third prevalence study yielded a range of total FASD prevalence of 206–366 per 1000, with 31% having FASD, a rate that has remained steady over 9 years. However, the proportion of children within the FASD group has changed significantly: those with the most severe expression FAS trended downwards, while those with Alcohol-related Birth Defects (ARBD) trended upwards. The diagnosis of a child with FASD was significantly associated with maternal proximal risk factors such as co-morbid prenatal use of alcohol and tobacco, maternal quantity of alcoholic drinks per day; and drinking in the first trimester, first and second trimesters, or throughout pregnancy, with increasing risk over these three periods. Distal maternal risk factors included slight or small physical status, lower body mass index, less formal education, late recognition of pregnancy, higher gravidity, parity, and older age during the index pregnancy.

In the cluster randomised trial adult patients with HIV or types 1 and 2 diabetes were eligible if they were taking antiretroviral therapy for HIV or medication to manage their diabetes had an Alcohol Use

ATODRU adopts an evidence ecosystem approach to inform research, knowledge dissemination and knowledge translation.

Disorders Identification Test (AUDIT) score of ≥8 or a Center for Epidemiologic Studies Depression Scale score of ≥ 16 and were not receiving mental health treatment. In the intervention arms, all participants were offered three sessions of an evidence-based psychological intervention, based on motivational interviewing and problem-solving therapy, delivered by CHWs. Compared with treatment as usual, the dedicated group and designated group showed greater improvement on depression scores at 12 months. In contrast, reductions in AUDIT scores were similar across study groups, with no intervention effects noted. The dedicated and designated approaches to delivering CHW-led psychological interventions were found to be equally effective for reducing depression, but enhancements are required to support alcohol reduction. This trial extends evidence for CHW-delivered psychological interventions, offering insights into how different delivery approaches affect patient outcomes.

Data and evidence-based Responsive Research

ATODRU adopts an evidence ecosystem approach to inform research, knowledge dissemination and knowledge translation. This approach ensures that primary research contributes meaningfully to knowledge translation and is useful for local policy and practice.

Local priorities and policies are shaped by the surveillance data gathered in the South African Community Epidemiology Network on Drug Use (SACENDU) project and articulated in partnership together with stakeholders, including local government and patient/client representatives at 6 monthly meetings held in Cape Town, Pretoria, Durban and Gqeberha. The results of the Global Adult Tobacco Survey administered by ATODRU have helped inform the Tobacco Products and Electronic Delivery Systems Control Bill and provided evidence to motivate the speedy passing of the bill.

Collaborations and Partnerships

ATODRU has a wide network of strong and established collaborative relationships with academic and research institutions, service providers, government departments, and other stakeholders locally and internationally.

It also has several collaborations with other SAMRC internal and external units, including the Gender

and Health Research Unit, the Burden of Disease Research Unit, the Biostatistics Unit, the Centre for TB Research and the MRC/WITS Rural Public Health and Health Transitions Research Unit.

- Several new collaborations established during the reporting period under review are:Stirling University in Scotland, Makerere University in Uganda and the University of Malawi, as part of a study of alcohol policy interventions to ban the use of plastic sachets for the sale of spirits.
- Leibniz Institute for Prevention Research and Epidemiology, Department of Prevention and Evaluation, (Germany);
- Population Health Sciences, Bristol Medical School, University of Bristol, UK for research on epidemiology of suicide,
- University of Basel (Switzerland), University of Zambia (Zambia) and SolidarMed (Zimbabwe) collaborating on a study of adolescent substance use reduction and structural drivers of substance use.

Skills building through Capacity Development

At least four Masters students graduated in this financial year. In total, staff are supervising 23 Masters and 10 PhD students. There are also four research psychologists interns who are completing their training to register with the Health Professions Council of South Africa.

Additionally, ATODRU staff participated in a range of additional capacity development training programmes and courses in areas such as biostatistics, project management, systematic reviews, ethics, protocol development, and knowledge translation. Two staff members received executive coaching while an additional two members of staff completed management development courses (Graduate School of Business, Stellenbosch University) to develop and refine their managerial and leadership skills, as part of the SAMRC accelerated development programme.

Knowledge Translation for an informed society

ATODRU has been actively engaged in using the media to disseminate research findings and knowledge to stakeholders and members of the public. For example, during 2022/23, Prof Charles

Maternal Alcohol Reduction in South Africa (MaRISA study) field Activities.

Prize Peer support training.

TOTAL team at Ukwanda Camp.

Peer advisory board meeting for CHC+ (couples health coop plus) Study.

Prepping TRUST documents.

Centrifuging blood samples.

Prepping TRUST blood samples.

Parry conducted 26 media interviews: 15 with print media (including the *New York Times* and the *Sunday Times*), 9 radio interviews (including *SAFM Sunrise, NPR* and *French Radio Internationale*) and 2 TV interviews (*Newzroom Africa* and *SABC 404*) – most focused on issues related to alcohol use. Following the Enyobeni tavern tragedy, MASTRU staff also wrote an article in The Conversation titled: *"Tavern tragedy reinforces need to give priority to tackling underage drinking in South Africa"*.

Dr Catherine Egbe conducted 24 media interviews (Radio=10; TV=3; Print=11), more than 15 public presentations, and issued at least three press releases on topics related to the harmful effects of tobacco use and the new tobacco bill.

Prof Jason Bantjes published the following editorial commentaries in the *Mail and Guardian: "Large mental health study finds 20-30% of students at risk"* (9 Nov 2022); *"Can students beat depression digitally?"* (26 August 2022); and *"Take action on suicide prevention instead of just talking about it."* (9 September 2022). As well as in the Daily Maverick: *"New study helps us to understand perinatal suicide in South Africa"*, (22 August 2022) and *Health 24 "Retaining humanity in an age of digital psychiatry"*, (4 April 2022).

Furthermore, our staff engaged in the following research translation activities:

Presentations at an African Union meeting on drug epidemiology hosted in Abu Dhabi, Serving on the Scientific Advisory Board of the UN Office on Drugs and Crime's World Drug Report; Supplying drug treatment demand and harm reduction data to the African Union and contributing to The UN Annual Reports Questionnaire., Providing input into the Pan African Community Epidemiology Network on Drug Use (PAENDU), which forms part of the AU Commission, Ongoing involvement with the Western Cape Evidence Advisory Committee on "violence and injury prevention" as well as "youth-at-risk and mental health"; Providing input to DG Murray Trust's report on the impact of imposing minimum pricing on alcohol. Providing feedback to the Vice Chancellors and senior management of South African universities about the mental health of university students at several meetings convened by Universities South Africa (USAf) and the Higher Education Leadership and Management (HELM).

SAMRC/UCT Risk and Resillience In Mental Disorders Research Unit

Unit director:

Prof. Dan Stein

Research fit for purpose

Our work in the SA MRC Unit on Risk & Resilience in Mental Disorders focuses on mental health. There is growing awareness of the high prevalence and costs of mental health conditions, which contribute to a significant proportion of the global and local burden of disease. Furthermore, as we successfully combat infectious diseases, so we can expect that the contribution of non-communicable diseases, including mental disorders, will continue to increase. There is also an important need to transform health services to address mental disorders. Our work contributes to generating new knowledge in this area, to technology development, to building capacity, and to translating research into policy and practice.

Our work ranges from basic neuroscience, on to clinical research, and epidemiological and public mental health studies; that is from bench to bedside, and from the clinic to the community. Our research is diverse, ranging from contributions to nosology and epidemiology, to brain imaging and neurogenetics, including cohort studies and clinical trials. This diverse portfolio is appropriate, given our focus on building knowledge, technology, and capacity, to transform services. To elevate the quality of our work, we also collaborate widely across the country, continent, and globe.

One key project on the Unit is the Drakenstein Child Health Project, a local birth cohort. Our Unit focuses on the psychosocial aspects of the grant, including investigating neurodevelopment. We take a transdisciplinary approach, exploring both neurobiological and social determinants of health, and so integrating developments in contemporary neuroscience (e.g., work on brain imaging) with global health perspectives (e.g., work on task-shifting interventions).

Impactful Research Interventions

We advanced work on a number of projects during 2022. First, we continued our collaborations on psychiatric epidemiology, publishing the country's first national survey of mental health in university students. The problem that this work seeks to address is that prevalence of mental disorders in our local context seems to be increasing but has been poorly studied to date. We therefore undertook a rigorous survey of universities across the country. By bringing the attention of universities to this data, we hope to increase attention to these conditions, and to encourage these institutions to put in place appropriate systems to intervene.

Secondly, we continued our work on a range of risk factors for mental disorders, for example, we contributed to a number of exciting publications on neuroimaging during the reporting period. The problem that this work seeks to address is that the neurocircuitry of mental disorders is poorly understood. Through participating in a large international collaboration that combines data on neuroimaging from multiple centres across the world; with our Units spearheading various aspects of this work, we hope that this research on the neurocircuitry of mental disorders will ultimately provide targets for intervention.

Thirdly, we were participants in a randomised control trial of how best to provide mental health services at a primary care level. There has been debate as to whether at primary care level it is better to use designated personnel (staff who provide a range of interventions, including mental health ones) or dedicated personnel (staff who focused exclusively on providing mental health interventions). This work suggests that both designated and dedicated personnel are effective in reducing depression in the primary care context.

Data and evidence-based Responsive Research

We monitor a range of data both from within the Unit (e.g., grants obtained, papers published, degrees obtained), and from outside the Unit (e.g., data on hospital admissions for mental disorders, highly cited publications in the field, data on global burden of disease), and from our own research (e.g. data on the epidemiology of mental disorders, data from our treatment trials). Perhaps mostly importantly our data on the epidemiology of mental disorders have long influenced our advocacy for mental health; inspiring us to develop novel interventions and ensuring that we are responsive to the needs of the community. Our epidemiological data is consistent with a range of other data that emphasises the high prevalence of mental disorders, and their contribution to burden of disease. We are involved in ongoing analyses of such data, which further inform our decisions, including what interventions to study, and how we can best be responsive.

Collaborations and Partnerships

Our Unit collaborates widely with other SAMRC Units, with colleagues in South Africa, across the continent, and around the globe. Our collaborations include large studies of genetics (e.g., Psychiatric Genetics Consortium), of brain imaging (e.g. the ENIGMA collaboration), and of psychiatric epidemiology (e.g. World Mental Health Surveys). The Psychiatric Genetics Consortium covers a range of mental disorders, and we have participated in work on PTSD and depression. The Enhancing Neuroimaging Genetics Through Metaanalysis (ENIGMA) Collaboration investigates a range of psychiatric and neurological conditions; our Unit helps lead for work on anxiety disorders, obsessive-compulsive disorder and HIV in particular, but also contributes to a range of other conditions. The World Mental Health Surveys now comprises more than 100 000 respondents from more than 20 countries and continues to produce useful work on risk and resilience factors for mental health. Our Unit continues to lead some work, and to contribute to a range of analyses led by others. All these collaborations are ultimately focused on the common goal of understanding mental disorders and improving our interventions.

Skills building through Capacity Development

Our Unit has a strong focus on capacity development, with significant deployment of funds to support student fellowships. We are also keenly aware of the need for diverse researchers, that represent the local population, and strive to reach that profile. Firstly, this is increasingly seen in the profile of our students, postdoctoral fellows, and staff. Secondly, examination of the achievements of past mentees of the Unit indicates that many black researchers who have been members of our Unit are now national and international authorities in their own right (including experts in posttraumatic stress disorder, substance use disorders, neurogenetics, forensic psychiatry, mental health epidemiology).

Knowledge Translation for an informed society

Our Mental Health Information Centre continues to play a key role in translating our work to relevant stakeholders and the public. It does this through continuous liaison with the media, through taking direct calls from members of the public, and via its ongoing focus on increasing mental health literacy and decreasing stigmatization of mental disorders. Also, we work with the Western Cape Department of Health on a number of different projects, attempting to bring research outputs to services. The Director of the Unit plays a key role in mental health services in the Province, as he is Head of UCT's Dept of Psychiatry, which is affiliated with Groote Schuur Hospital, Red Cross Childrens' Hospital, Valkenberg Hospital, and a range of other facilities. This means that he is in constant interaction with managers, administrators, and other stakeholders, and can continuously lobby for improving mental health services. We also work with the National Dept of Health on a number of issues e.g. in recent years we led the development of guidelines for medically assisted therapy for opioid dependence. We are currently in process of planning a national conference together with the National Dept; this will be focused on mental health, will take place later in 2023, and will bringing together a broad range of stakeholders to try and find ways forward in mental health. FInally, we work with the World Health Organization on a number of projects, including classification and assessment of psychiatric disorders. We have been closely involved in various aspects of the revision of the mental health chapter of the 11th edition of the International Classification of Disorders, and we currently working on the development of measures based on the new classification and anticipate that this will be of great interest to a range of stakeholders.

Non-communicable Diseases Research Unit

Unit director:
Prof. Andre Pascal Kengne

Research fit for purpose

The Non-Communicable Disease Research Unit (NCDRU) currently has about 20 active intramural research projects and collaborated on many other projects with other SAMRC research Units and institutions across South Africa and beyond. Thematic areas covered by NCDRU-led research included cardiovascular and metabolic diseases, kidney disease, social and developmental origins and consequences of cardio-metabolic disorders. Conditions covered included, among others, diabetes mellitus, high blood pressure, dyslipidaemia, obesity, chronic kidney diseases, COVID-19 and numerous risk factors for NCDs. These include mostly observational studies addressing various aspects of the epidemiology of chronic diseases, as well as interventional studies, addressing the screening, prevention and control of NCDs.

In the Diabetes Prevention Programmes (DPP) which are running concomitantly in Western Cape and Eastern Cape, the Unit is working on community-based solutions for diabetes risk screening and reduction, using community health workers (CHW) as frontline implementers, which is in alignment with the future orientation of primary health care in the country, positioning CHW as frontline community-based health workers. Should the NCDRU-led DPP be effective, then the strategy could quickly be incorporated in the health system to extend the benefit to a wider population. Other innovations in these projects included using a screening strategy that does not require blood testing to identify individuals at high risk for diabetes, and therefore is easy to implement at a community level, including lay workers. The projects are further exploiting the power of information technology, by using mobile phone text messaging to sustain the intervention, which is primarily delivered through group-based face-to-face sessions. Two other ongoing projects in the Unit are also utilising text messaging to support interventions. One of the projects addresses the uptake and adherence to blood pressure control medications in people with HIV and co-morbid hypertension, while the other focuses on smoking cessation in people living with HIV.

Impactful Research Interventions

The major research project initiated by the NCDRU during this financial year remains the FoodSAMSA (Food environment in Africa: addressing malnutrition using a syndemic approach). This is a collaborative project funded by the German's Federal Ministry of Food and Agricultureand led from the Unit by Associate Professor Zandile Mchiza The project aims to generate the evidence to inform policy and practice related to the double burden of malnutrition in South Africa, and the wider region. Activities within the 8 work packages of the project have been running smoothly and the first in-person meeting of the consortium took place on 10-14 October 2022 in Cape Town.

The MOPHADHIV pilot project (MObile Phone text messages to support Hypertension treatment ADherence in adults attending HIV treatment centres in the Western Cape Province of South Africa) aimed to assess the effect of text messaging on the uptake and adherence to blood pressure lowering medications in people with HIV and co-morbid hypertension. It is based on an adaptation of a similar project conducted in the general population in Cape Town a few years ago. It is funded by the European and Developing Countries Clinical Trials

NCDRU staff members celebrating spring day.

Partnership (EDCTP), and conducted at HIV clinics across Cape Town. The trial successfully enrolled about 300 participants in 2022/23, representing more than 20-fold increase from the COVID-19 era. Successful recruitment of the planned sample and follow-up to completion will afford evidence on the unitality of text-messaging adherence support as a tool to improve the co-management of common NCDs in people living with HIV.

Exploring the status of NCDs care during the COVID-19 pandemic in 13 countries (NCD-COVID-19 study) is a multi-country study in which South Africa (via NCDRU) is a participant alongside Kenya and Morocco as other African countries. The study aims to investigate the perceptions of key stakeholders (public health officials, health policy makers, health workers, and patients with NCDs) on their needs and expectations of NCD care during the COVID 19 pandemic and to determine health system preparedness for NCD care in pandemics. Data collection for the South African chapter was successfully completed during 2022/23.

Data and evidence-based Responsive Research

NCDRU has successfully established the Chronic Kidney Disease in Africa (CKD-Africa). This initiative, led by Dr Cindy George, is a network of investigators representing studies related to kidney function and chronic kidney disease from all over Africa, tasked with compiling and meta-analysing the best available data on kidney measures and clinical outcomes. To date, the network has curated data from studies conducted in 13 African countries, totalling 49,949 participants, with more studies in the process of enrolment. Re-analysis of these combined data is providing robust and unprecedented evidence on the burden and determinants of CKD, to inform policy, and guide action and further research to prevent and control CKD on the African continent.

Within the global NCD Risk factors Collaboration (NCD-RisC), NCDRU leads the African working group,using the abundant data resource of NCD-RisC to generate detailed estimates and trends of major NCD risk factors in Africa overall and by country and major region. In doing so, the group is making available to countries in the region, the much-needed data to inform action on NCDs. The Unit has secured funding from UK Medical Research Council to maintain the activities of this group for at least the next five years.

In line with the established research culture in the Unit, NCDRU scientists have co-authored many systematic reviews during 2022/23. Systematic reviews are the highest source of evidence to inform policy, action and further research. In one of those reviews (with meta-analysis) the Unit has provided the first detailed analysis of the prevalence and

determinants of diabetes and prediabetes in African people living with HIV infection (PLWH). This review shows that diabetes and prediabetes are common in this population, mostly in line with observations in the general African population and, importantly, appear to be driven mostly by the same risk factors that operate in the general population. These findings should accelerate the application in PLWH, of strategies developed in the general population, to prevent and control diabetes as they live longer on antiretrovirals.

Collaborations and Partnerships

Collaboration in research is rather a rule at NCDRU. The network of the collaborators of the Unit spans the globe. NCDRU has continuously collaborated with the Gender and Health Research Unit on the unique Rape Impact Cohort Evaluation (RICE) study. This partnership has allowed the initial focus of the study to be expanded to include cardiometabolic outcomes and increase the richness of the cohort. The Unit has also collaborated with the Burden of Diseases Research Unit (BODRU) on the South African Demographic Health Survey (DHS) and the Second Comparative Risk Assessment for South Africa (SACRA2) study as well as with the Biostatistics Research Unit on the NCDRU-led South African Diabetes Prevention Project (SA-DPP), the Childhood Obesity Study and the Tobacco Cessation Intervention Study. NCDRU also has collaboration with the Cardiometabolic Health Research Unit at Cape Peninsula University of Technology (CPUT), on many research projects including the Cape Town Vascular and Metabolic Health research project which is taking place in the Bellville South suburb. The Unit further collaborates with the Platform for Pharmacogenomics Research and Translation Research Unit of the University of Cape Town, and the Developmental Pathways for Health Research Unit of Wits University.

In South Africa, NCDRU has collaboration in research with the University of Western Cape Around key projects including foodSAMSA and the Prospective Urban and Rural Epidemiological (PURE) study; the University of Limpopo (on the Ellisras Study and the rural DIMAMO Population Health Research Centre), the University of KwaZulu-Natal and Albert Luthuli Hospital (on a study on the comorbidities of obesity in children); Stellenbosch University; Sefako Makgatho

NCDRU Wellness day 2022.

Health Sciences University; Walter Sisulu University (on the Eastern Cape Diabetes Prevention Project). Internationally NCDRU has collaborations with universities across Africa, Europe, Northern America and Australasia. The Unit leads the pan-African CKD-Africa collaboration, the African working group of NCD-RisC, and participates in global initiatives such as the Global Burden of Disease (GBD) project.

Skills building through Capacity Development

During 2022/23, 13 students mentored by NCDRU scientists have completed their degrees and graduated. These include 6 PhDs and 7 Masters, who were registered at University of Cape Town, Stellenbosch University, University of the Western Cape, Cape Peninsula University of Technology, University of Venda, and Kenyatta University. The Unit is further involved in the mentoring of a cohort of over 25 students at various stages of their Masters and doctoral studies and also hosted 4 post-doctoral fellows. NCDRU's approach to students and post-doctoral fellow mentoring and supervision consist of nesting their research project within major ongoing research projects, which allows them to conduct research that is directly relevant to the Unit, while building skills in areas of need. Through hands-on training, students and post-doctoral fellows are systematically equipped with skills in the area of evidence-synthesis, which is now a starting point for any new research project. They also received adequate mentoring to independently conduct common statistical analyses. On top of these standard training skills, students and post-doctoral fellows received further advanced training in research on the NCD focus of their projects. While the Unit has in-house expertise to develop most of these skills, through strategic partnership the Unit is also able to include, in the supervision team of students/post-doctoral fellow, external collaborators who can bring complementary expertise. When appropriate, students are also allowed to spend time with our collaborators to acquire some advanced skills. For instance, three NCDRU students were trained through the laboratory of the Unit's collaborator (Prof Matsha) at Cape Peninsula University of Technology (CPUT) where they have access to the laboratory equipment for their biological sample processing.

Knowledge Translation for an informed society

NCDRU collectively or through individual staff members has participated in many research translation activities. NCDRU scientists have continued to make appearances at local and international conferences and seminars to share their research findings and expertise, which included the annual congress of the European Society of Hypertension, the congress of the International Society of Hypertension, the International Congress of Nutrition, the American College of Cardiology/World Congress of Cardiology and the Ellisras Longitudinal Study conference. The 2022 edition of the Ellisras Conference had a restitution day organised in the Kitty village on 24th November 2022. During this event attended by members of the Ellisras research community, the NCDRU Director (co-investigator on the Ellisras study) gave a public talk on diabetes and NCD prevention and led the discussion on future research agenda on NCDs at the South African National Research for Health Summit held in Johannesburg, November 2022 ; and that same month, he gave a keynote lecture on co-morbid NCD in people with HIV at the research day of the HIV and other Infectious Diseases Research Unit (HIDRU). Prof Nasheeta Peer also presented her research at the 'National Department of Health Indaba on Non-Communicable Diseases: Cardiovascular Disease in South Africa' on 19 November 2022. Her topic was titled "How big is the burden of CVD in South Africa – Does local data accurately capture the problem?" She also gave a presentation to the Desmond Tutu Foundation in June 2022, on risk factors contributing to cardiometabolic diseases in adolescents. Both Prof Peer and the NCDRU Director attended and presented at the multimorbidity workshop in Malawi, and the Unit director further attended the One Health Seminar co-organised by the African Academy of Science and UK academy of science in Kenya. Both seminars focused on contributing to the African agenda in those emerging fields. Prof Zandile Mchiza gave an interview to a Dutch Journalist in March 2023 to share information about the South African nutrition-related policy uptake by South Africans. She further participated in the Meta (FaceBook) Body Image Expert Circle where they are updating the health and wellness policy to regulate advertisements that are detrimental to

human health. With her Swedish collaborators she convened a session on "Life course epidemiology: Methodological issues in life course research for global public health" during the SASUF 2023 – Sustainability Forum (29-31 March). Finally, Prof Mchiza and her collaborators produced a newsletter on FoodSAMSA to share the progress of the project, which was circulated to scientists and stakeholders including the South African Department of Health. This was in keeping with a press release published by the Unit in March 2023 to share the finding on the landmark study on the burden of diabetes and prediabetes in people living with HIV.

Some research translation activities were also conducted in the context of ongoing studies. For instance, in the process of recruiting participants for the NCD-COVID-19 study, Miss Tshephang Mashiane (spoke on various aspects of NCDs in relation with COVID-19 to the benefit of prospective participants in five communities within Western Cape (Mfuleni, Woodlands, Strandfontein, Mitchell's Plain and Bonteheuwel). Participants were people with diabetes, hypertension, heart attack, stroke, cancer, depression, anxiety, asthma or any other NCD. Across all active NCDRU-led research projects that involve data collection from individuals, the Unit has continued to return test results to participants and refer those with abnormal results for further testing and management.

NCDRU hosted the SAMRC Wellness Day on 27 May 2022 at the Cape Town campus of SAMRC under the leadership of Sister Deborah Jonathan with the theme "Take control". SAMRC staffs received health education on various aspects of NCDs and screening for common cardiometabolic diseases risk factors, with referral of those with abnormal profile. This exercise will be repeated on an annual basis. Finally, the World Diabetes Day 2022 was celebrated in November under the theme "Access to Diabetes Care for All". NCDRU participated in this event by taking part in the SAMRC initiative of "Education to Protect Tomorrow", where important information was shared on diabetes care and preventive measures at the Parow Senior Centre in Cape Town. The Unit through Dr Jillian Hill further co-organised the 'Diabetes Day Fun Walk' on Sunday 20th November 2022 at Jack Muller Park in Belville.

SAMRC Annual World Diabetes Day awareness Fun Run.

SAMRC Diabetes experts engaging the elderly at Parow Senior Centre on World Diabetes Day.

Environment & Health Research Unit

Interim unit director:
Dr Renee Street

Research fit for purpose

The Environment & Health Research Unit (EHRU) conducts research towards eliminating or reducing environmental hazards to health, especially in the most vulnerable or marginalised in South Africa. This is achieved by identifying and characterising existing and emerging environmental risks to the health of the South African population in support of evidence-informed decision making in public health. EHRU also strives to design and evaluate interventions aimed at promoting health and preventing diseases of environmental origin. The primary research focus areas are (i) persistent toxic substances, (ii) climate change and human health and (iii) waste, sanitation and society.

Impactful Research Interventions

In affected communities, exposure to mining waste holds many health risks. The dust generated may exacerbate asthma, cardiac and other ill health conditions, while metal particles such as lead, arsenic and uranium have been associated with reductions in intelligence scores, damage to virtually all organs, cancer and an increase in aggressive and violent behaviour. The EHRU has undertaken a series of studies to i) document the levels of exposure to harmful substances in mining communities, ii) assess the health and social impacts and iii) evaluate the impact of interventions aimed at exposure reduction.

In Soweto we have shown how adults and children living in houses close to a large mine dump have significantly higher blood lead levels than those living further away. In the same mining study site, we showed how children have higher levels of uranium in their hair compared to adults. In a study of the blood lead concentrations of children incarcerated

A low-cost air quality monitor that measures levels of air pollution in the air and has been used in houses across South Africa.

Dr Thandi Kapwata and Professor Caradee Wright attended the National Institute for Health Data Science in Africa Initiative in Nairobi, Kenya.

in Gauteng detention centres, the highest blood lead levels were found in children who had previously undertaken informal mining in decommissioned gold mines. Blood lead levels were also higher in children who had been incarcerated for violent relative to non-violent crimes. These findings build on previous evidence of an association between lead exposure and aggression in adolescents in greater Johannesburg. This indicates the need to include cleaner environments in South African efforts to reduce violence and crime.

The tragic collapse of the walls of a large mine tailings dam in the Free State town of Jagersfontein in September 2022 resulted in the release of tons of mine waste which caused death, destruction of homes, widespread contamination, damage to the downstream ecology and the destruction of local infrastructure, including the Jagersfontein wastewater treatment plant. An EHRU team visited the site shortly after the tragic event and recommended an environmental and public health monitoring programme in Jagersfontein to identify and address risks to the health of the local and downstream communities. These risks described above, at least in part, may be attributable to poor planning practices, which causes communities living in the shadow of mine dumps to be chronically exposed to elevated concentrations of toxic substances. We recommend healthier planning practices that consider the health risks of major industrial and other developments. Following a pilot study with promising results, and to potentially give a small measure of retroactive relief to communities unfortunately located close to mining waste sites, EHRU is currently involved in a study on the impact of improved domestic hygiene measures on the blood lead levels of children. Should the results prove positive, the intervention has the potential to be scaled up for the benefit of other communities located on the doorstep of mining and other industrial operations.

Data and evidence-based Responsive Research

Air pollution is a major environmental health challenge in South Africa. There are insufficient permanent monitoring stations across the country therefore, alternate solutions are needed. In partnership with the University of Leicester, University of the Witwatersrand, and North-West University, we are testing and implementing low-cost air quality sensors in urban and rural settings in South Africa. Working with the developer of the sensors, we have tested them in an instrument inter-comparison campaign against high-grade instruments and found the low-cost sensors to be accurate at measuring particulate air pollutants. The low-costs sensors are South African-made by a local company in Cape Town. The aim of the study is to understand how low-cost sensors are accepted by indigent, local communities for their potential use in air pollution exposure and health epidemiological studies in Africa. During the first phase of the project that ran in Soweto, Gauteng 10 low-cost sensors were installed in ten low-income houses. Data were collected and perceptions from the household members were gathered, suggesting that the low-cost sensors were well received. The low-cost sensors were then deployed in Agincourt, Limpopo to understand their uptake and acceptance in a rural setting.

Congenital birth anomalies are under-researched in South Africa yet place a substantial burden on the healthcare system and communities. Orofacial cleft lip/palate (CLP) is in the top five of South Africa's most common congenital birth anomaly and maternal air pollution exposure has been shown to be a risk factor, although evidence mostly exists for high-income countries. South Africa has high air pollution levels due to domestic burning practices, coal-fired power plants, mining, industry, and traffic pollution, among other sources. We used air pollution data (PM2.5 and PM10) and records of patients treated for CLP to assess associations between air quality and CLP prevalence. We also investigated the occurrence of CLP clusters. We found correlations between PM2.5, PM10 and CLP birth prevalence. Significant clusters of CLP prevalence were identified in Gauteng and parts of Limpopo, North-West, Mpumalanga and Free State provinces. One of the statistically significant hot spots, the Gert Sibande district in Mpumalanga province, had the second highest CLP birth prevalence rate documented (0.40 per 1,000 live births), although it only had the seventh highest number of CLP cases. Working together with Operation Smile, surgeons and researchers, EHRU is leading the evidence-gathering on CLP and environmental risk factors in the country to help inform policy and practice.

Collaborations and Partnerships

EHRU collaborates extensively with internal and external stakeholders including ward councillors,

community organisations, local universities and international organisations. The health burden posed by air pollution is considered to be substantial but accurate estimates of this burden were required. Working with the SAMRC Burden of Disease Research Unit (BODRU) and the Biostatistics Unit as well as the University of Stellenbosch, University of Greenwich and University of Cape Town, we estimated the burden of disease attributable to household air pollution from cooking with solid fuels in South Africa. BODRU led on the project and used a comparative risk assessment methodology to assess the proportion of South Africans exposed to household air pollution, specifically particulate matter.

In response to the National Climate Change and Health Adaptation Plan, we co-developed a heat-health vulnerability assessment tool for towns in South Africa. This multi stakeholder response also resulted in a publication in the International Journal of Environmental Research and Public Health.

Skills building through Capacity Development

EHRU has various capacity development initiatives including hosting postdoctoral research fellows and interns. Participating in local and international committees is important to identify and prioritise key issues for science and society. In November, Prof Angela Mathee attended a workshop that comprised of G7 countries, discussing lead as a major threat for human health and the environment. This supported an integrated approach and strengthening cooperation toward solutions. A further example is where research team leads mentor emerging/mid-level researchers by involving them in international, multidisciplinary working groups. These includes an NIH backed project to develop a collection of scientific papers on the State of Data Science for Health in Africa to be published as a Nature journal portfolio and the Future of Health and Economic Resilience in Africa (FHERA) project that is led by Harvard University to produce reviews to help inform a Lancet Commission report. Skills gained include building and maintaining collaborations that could lead to successful grants that generate income for the Unit and experience in contributing to international policies, reports and guidelines. Through a SA-Brazil collaboration, Dr Street visited the University of São Paulo and gave a guest lecture on heavy metal exposure in South Africa and related health risks, with particular emphasis on the informal industry. A highlight of the trip was a visit to Limeira City to understand risks for the outsourced, home-based jewellery makers and discuss issues around evidence gaps relating to exposure to toxic metals in local settings as well as to identify ways to prevent such exposure.

Aerial view of the taxi rank in which Professor Caradee Wright carried out a study to assess heat-health risks for commuters and drivers in the taxi industry.

In South Africa, the minibus taxi industry transports around 15 million people daily and employs about 1 million people as drivers, marshalls, car washes and street sellers.

Knowledge Translation for an informed society

Working hand-in-hand with the City of Tshwane and the Taxi Associations of South Africa, we have implemented a project that seeks to climate-proof minibus taxi ranks. Heat is a major climate change health threat to the health and well-being of South

There is a risk of the birth anomaly, orofacial cleft lip and palate, for the foetus of a mother exposed to air pollution in parts of South Africa.

Africans. Thousands of commuters and taxi drivers are exposed to high temperatures in minibus taxis and taxi ranks. We interviewed 384 participants to find out about their heat experiences in these settings; majority of people said they feel hot in a taxi and experience sweating, headaches, fatigue, dizziness and an increased heart rate. Participants suggested several ways to reduce heat exposure in taxis/taxi ranks: more and larger shelters, more trees, water for drinking, and using an umbrella in a rank. These findings were shared in a research brief with our stakeholders. In the next phase of the project, we will implement two of these suggestions, with advice from the city and taxi representatives in a taxi rank in the city and then assess their update and perceived benefits.

Human activities such as mining, smelting, and burning of fossil fuels have resulted in the contamination of the environment with toxic metals. Exposure to toxic metals can have serious health effects on children, particularly during critical developmental periods. The major exposure pathways for children include eating with unwashed hands, consumption of contaminated crops or produce from residential food gardens, putting contaminated fingers, toys, and other objects into the mouth and a condition called pica, in which children eat non-food items such as soil or paint. Following public complaints of adverse health outcomes in Kuils River, Cape Town, EHRU conducted a study in preschool facilities situated in that area. The findings of our study provide evidence of soil contamination in, and around preschool institutions situated in KuilsRiver. To address the lack of information on toxic metal exposure, EHRU developed a brochure that explains ways in which children may be exposed to toxic metals, the potential health effects in children, and ways in which parents, guardians, and caregivers may help reduce exposure of children to toxic metals.

SAMRC/WITS Rural Public Health And Health Transition Research Unit

Unit director:

Prof. Stephen Tollman

Research fit for purpose

The SAMRC/Wits Rural Public Health and Health Transitions Research Unit (Agincourt) – in South Africa's North East close to the Kruger Park and Mozambique border – covers a 'whole population cohort' of 120,000 people living in 31 villages. Through effective community engagement, there is ongoing enumeration of residents with rigorous follow-up, capturing all deaths, births, and migrations. The resulting longitudinal research platform is uniquely able to support community-oriented research, innovation, and translation along the life-course, generating evidence on rapid health, population and social transitions underway, while providing a robust intervention and policy evaluation platform.

Life course research focused on adolescents and youth, younger and older adults provides fertile ground for African and international partnerships that foreground interdisciplinary research, innovation in methods, capacity development and translation tackling critical health and development challenges. Examples include: Excess mortality in Africa and South Asia across COVID-19 years 2020–2021, compared with 2015–2019, understanding the morbidity, mortality, and development impacts of chronic kidney disease in South Africa and regionally. Additionally the Unit also opened a new Data Sciences and Innovation Hub.

Impactful Research Interventions

i) Population ageing is not well understood in South Africa and regionally. Yet older South Africans, women especially, play critical roles supporting rural households and serving in parental capacity when parents work elsewhere or, tragically, have died (notably from HIV/AIDS). Supporting healthy ageing along the life course, and extending healthy years of life, is thus vital to SA society and the wellbeing of future generations. Ongoing evaluations based on the Agincourt research platform are providing acute insights on ageing dynamics and potentially effective interventions:

ii) During COVID-19 years, attendance at chronic disease clinics (for hypertension, diabetes, HIV) declined and has yet to return to pre-COVID levels. While the DOH-CCMDD initiative compensates, prolonged reliance on this system, raises a concern about inappropriate continuation of therapeutic regimes. In contrast, we document clear evidence of improved hypertension management and control among middle-aged and older adults 40+ over the past ~10 years (used as the cover story of Hypertension). Unexpectedly high levels of sexual activity including multiple partners is evident among older adults. In response we successfully trialled home-based HIV testing which emerges as the clear approach of choice with outcomes including linkage to care comparable to clinic-based counselling and testing.

iii) The Unit completed a thorough assessment of cognitive change among older adults (N=600) with efforts ongoing to establish 'norms' appropriate to SA. The protective effects of both education and literacy have been demonstrated; along with the importance of active work in preserving cognitive function. These studies are the basis for a major programme to understand and respond to emerging dementias.

iv) Access to effective chronic healthcare remains problematic in SA and is a global challenge. A partnership between SAMRC intramural units and Agincourt, concerned with cardiovascular risk and stroke in elders, is testing a novel approach to hypertension screening and management. Termed Know Your Numbers, pensioners in grant queues are screened monthly by local field staff and advised on possible risk, with referral to neighbouring clinics where indicated. An evaluation is underway with high feasibility and acceptability already evident. The approach offers a novel and potentially effective way to access at-risk patients and holds promise for an integrated approach to chronic disease.

The MADIVA team, Paul Harris from Vanderbilt University Medical Centre and Brad Newsome from the National Institutes of Health attend a training event hosted at Wits Rural, Mpumalanga, November 2022.

The MADIVA team at the project launch event, December 2021 at Wits Rural, Mpumalanga.

v) Accurate and available cause-of-death profiles are essential to PHC development. The Unit has long contributed to verbal autopsy (VA) to estimate cause-of-death in poorly resourced communities. A recent innovation seeks to strengthen VA-based diagnoses. Minimally invasive tissue sampling (MITS) to complement VA-based COD ascertainment is being introduced and will be evaluated to assess its added benefit. This requires careful community engagement and discussion on the justification and feasibility of the approach.

Data and evidence-based Responsive Research

Longitudinal cohorts, trials and evaluation data are at the heart of Unit's efforts which rest on a high-functioning health and socio-demographic surveillance platform covering a rural, rapidly transitioning population of 120,000 persons in NE South Africa. Ongoing work responds to priorities identified through community-oriented research and sustained community engagement in innovative ways, as follows:

Verbal Autopsy with Participatory Action Research (VAPAR) involves a community-based 'learning platform' to address exclusion from health system processes and decisions by connecting users, providers and managers to act on evidence of practical, local relevance. The platform links overlooked evidence as expressed by communities, with its limited uptake by planners, managers, policy makers and providers, creating space for mutually supportive learning-and-action engagement. Longitudinal data is combined with narratives and visual images to generate analyses and interpretations of direct relevance. Through reflection–action cycles, the community-service partnership generates information on disease burden and determinants rooted in lived experience, as well as prevailing norms and practices, from the perspective of disadvantaged groups thereby priming action-implementation-evaluation.

The DoBAT Study – Digital Delivery of Behavioural Activation Therapy – is a response to the high burden of depression and unmet need for treatment amongst adolescents, which results in adverse consequences with respect to risk behaviours, interpersonal relationships, school attainment and economic opportunities. The Team used multiple

participatory and user-centred design methods to develop a novel digital mental health intervention to treat depression amongst adolescents. The intervention is designed to optimise the engagement of adolescents whilst delivering an evidence-based psychotherapy (Behavioural Activation); it consists of a gamified story app delivered on a low-end smart phone and is supported by weekly phone calls to the adolescent from a trained peer mentor. A large pilot randomised control trial of 200 participants has been conducted to assess the feasibility, acceptability, and initial efficacy of the intervention in addressing mild to moderately severe depression amongst adolescents. Findings address a major evidence gap and will drive further innovation regarding the role of digital interventions in bridging the gap in mental health and social care services.

The MADIVA project – Multimorbidity in Africa: Digital innovation, visualisation and application – aims to capacitate health care providers on the applications of clinical data routinely collected in primary care facilities and hospitals in the Agincourt sub-district (and a sister sub-district in Nairobi). This new approach to applying available clinical data aims to simplify the provision of chronic care and follow-up of patients with multimorbidity. Providers, managers, and service leaders are being supported to improve healthcare and operational decisions, informed by clinical data derived from patient records. The data is being used to design dashboards that can provide health workers with better and visually innovative ways of displaying trends in the services they provide. The dashboards have been co-developed with district healthcare providers and managers during a well-attended series of guided workshops. Altogether this will help ensure the dashboards are well understood and user-friendly to enable clinic and health centre primary care practitioners to make effective use of patient histories, attendee profiles and the patient case-mix as part of day-to-day quality improvements in primary clinical care.

Collaborations and Partnerships

The unit has collaborations with SAMRC intramural and extramural units produce productive and innovative work. The Know Your Numbers study screening for hypertension in older adults in grant queues brings together our Unit with intramural research units (Non-Communicable Diseases; Alcohol, Tobacco and Other Drugs; Biostatistics). Work on opportunity costs during the COVID-19 pandemic was conducted with the extramural SAMRC/WITS Centre for Health Economics and Decision Science Unit, and the Ntshembo trial to reduce risk for metabolic disease in adolescent girls is ongoing with the MRC/Wits Developmental Pathways for Health Research Unit. The Unit is a founding node of SAPRIN (DSI/SAMRC South African Population Research Infrastructure Network) that harmonises the country's health and socio-demographic surveillance systems (HDSS). These include established HDSS in Mpumalanga, KZN and Limpopo; a new urban HDSS in Gauteng; further urban sites starting in Western Cape and KZN; and a seventh to be established in the Eastern Cape. Additionally, collaborations with other departments at Wits University that widen disciplinary expertise, extend skillsets, and introduce new technologies: Southern Centre for Inequality Studies (economics); Sydney Brenner Institute for Medical Bioscience (genomics, bioinformatics), UCT/SALDRU (pending national survey); Limpopo University (adolescent depression; SAPRIN); HSRC (app development for mental health interventions).

Our International collaborations include: Longstanding cohorts are supported through collaborations with the Centre for Population and Development Studies, Harvard University (ageing studies), and Brown University (migration and health), partners at Oxford, Exeter and Cambridge Universities, UK; UCLA, USA; BRAC, Uganda (and University of Limpopo and HSRC, SA), Vanderbilt University; with work on secondary prevention of stroke planned to include the Barrow Neurological Institute, USA, Partnership with Variant Bio (Seattle) is enabling an SA-oriented search for genomic variants better suited to African-ancestry populations.

Skills building through Capacity Development

Twice a year the Unit recruits 3-4 local people with appropriate basic degrees for a 6-month data internship. They join the data team, are allocated specific projects, and trained/mentored 'on-the-job'. Depending on performance, their internship may be extended for a further 6 months. Thereafter they can apply for a position in the data section and continue along a career trajectory in either data management or data science depending on their interests and aptitude.

Given increasing qualitative research in the Unit, the need for a stable base of field staff skilled in collecting qualitative data was identified. A postdoctoral fellow with experience teaching qualitative research methods has been contracted part-time to train staff in qualitative data collection as well as train research staff in coding and qualitative data analysis.

The Unit established an academic writing programme which provides peer support and mentorship, and arranges weekly writing sessions for project managers, data analysts and early career researchers to enhance their scientific output as well as an analytics team aimed at supporting post-docs and analysts to use existing data and newly generated primary data to consolidate and extend skills. The Unit plays a leadership role in the Wits Interdisciplinary PhD Programme in Public and Population Health, also in the Wits Public Health Career Development programme, the programme provides institutional support for the career progression of academic staff.

The Unit runs workshops and provides individualised support for health and demographic surveillance system sites to strengthen their capacity in field-based methods, and in data extraction, transformation, standardisation, quality assurance and harmonisation.

Knowledge Translation for an informed society

By design, VAPAR consists of iterative cycles where connection between local communities, civic leaders, health system stakeholders and other community and government entities is fostered. These stakeholders are thus not only knowledgeable about the research but contribute as participants across all stages of research. Health system stakeholders at sub-district, district and provincial level are engaged individually and through existing planning and reporting structures including the province's Health Research and Ethics Committee. Technical agencies such as WHO's Alliance for Health Policy and Systems Research and Verbal Autopsy Reference Group are also engaged and contribute to communities of practice. Regular engagement with researcher groups includes panel discussions and webinars. Both academic and general audiences have access to an extensive collection of tools, project updates, research briefs and other resources available through the VAPAR website (www.vapar.org).

Engaging community and public sector stakeholders is integral to the DoBAt Study to maximise the likelihood of an intervention that can translate into real-world impact for adolescents with depression. Over 150 adolescents, parents, educators, and other stakeholders have been iteratively consulted and involved in the design process of the digital intervention. Public sector stakeholders from the Departments of Health, Education, and Social Development were critical partners in evaluating feasible and sustainable methods for responding to adolescents with severe depression, high-risk suicidal ideation, and serious social concerns. The DoBAt Team deepened relationships with local schools and responded to requests to address learners and teachers on mental health, depression, and suicide. In March 2023, the team will host a multi-stakeholder workshop using Theory of Change to feedback findings of the pilot trial and engage stakeholders in a collaborative process of mapping how the intervention works, and how the intervention could be further adapted to achieve greater reach and sustainability.

To date the MADIVA project organised four extended workshops with key participants from the Bushbuckridge and Ehlanzeni District, and Mpumalanga Department of Health. In these workshops, MADIVA researchers put forward the idea of using dashboards to present trends in data to healthcare providers. Design of the dashboards was discussed in detail with nurses, managers, policy makers and data staff from the Department of Health. In successive workshops, the dashboard design has been modified to ensure future users can easily grasp and interpret the information displayed. Dashboards include simple counts, for example numbers of newly diagnosed patients with a specific condition; and more complex tabulations like the change in number of patients with various conditions, and multimorbid combinations presenting by sex/gender and age. Going forward, we intend the dashboards to be interactive and responsive to the needs of healthcare providers to treat and follow-up chronic patients.

SAMRC/UNISA Masculinity and Health Research Unit

Unit director:

Prof. Ashley van Niekerk

Research fit for purpose

The Masculinity and Health Research Unit (MaHRU) is an EMU located at the University of South Africa. It has the mission of engaging men and boys toward positive health and safety outcomes for themselves and others. MaHRU's overall objective is to host research that contributes towards understandings of the contribution of boys, men, and masculinities in health, and how best to engage them toward improved health outcomes. While MaHRU's research portfolio is underpinned by the masculinities theme, its research recognises several intersecting material, such as social, and psychological drivers of the country's high rates of injury and violence. In 2022, MaHRU was organised around three main research groups:

i) Violence Research;
ii) Injuries Research; and
iii) Injury Information, and Monitoring and Evaluation Systems.

These research groups are focused on the development of understandings of multiple violence and injury typologies, key determinants of violence and injury, the development of community prevention innovations, and generating priorities for policy and social development. In 2022, priority research projects included the Everyday Violence Project; Burns, Energy Justice and Community Safety; and Traffic Safety and Alcohol Nexus Research. These projects all highlight the complex interconnections between human vulnerability within immediate and more distal social and physical environments.

Impactful Research Interventions

MaHRU's Burns, Energy Justice and Community Safety is focused on the development and evaluation of safe, healthy and cost-effective energy, especially in energy impoverished communities. This work is directed at the provision of socially appropriate energy solutions to meet the energy and safety needs of the 600 000 households (about 2 million people) reported to be in extreme energy deprivation. These households are still primarily reliant on paraffin for their energy needs and face disproportionate health threats that include burns due to accidental fires, paraffin ingestion, and toxic fume inhalation. The impact of energy impoverishment cuts across gender, although previous research has highlighted a preponderance of adult male burn mortality in South Africa.

Burns, Energy Justice and Community Safety thus includes a portfolio of studies focused on innovative urban energy solutions e.g., on biogas, a promising renewable energy source produced from the anaerobic breakdown of wet biomass waste in a biodigester. The technology that generates biogas is simple, robust and has been adopted in different countries. MaHRU was in 2022 studying user experiences, acceptability and safe use of biogas energy, through a demonstration biodigester unit at its Lenasia campus. The study will contribute to work on the feasibility of this technology for small scale domestic use.

During the reporting period, MaHRU also continued a No Paraffin! Campaign, in recognition of the ongoing dependence on paraffin, despite the known

dangers in informal, minimally protected settings. The campaign is focused upon i) the phasing out of paraffin as a domestic fuel, ii) greater protections for paraffin users during phase-out, and iii) a scaled-up implementation of electricity and LPG, or other proven, feasible and safe energy alternatives. In 2022, the Campaign built upon previous MaHRU research and expedited its call to the South African government to implement policy and regulatory measures to protect the public while paraffin is still in use. MaHRU submitted a proposal to the South African Bureau of Standards (SABS) to review the current paraffin stove standard (SANS1906) to improve appliance safety. The review was initiated through SABS Committee SABS/TC 1054, chaired by Dr David Kimemia. A second proposal for the inclusion of a denaturant (bitterant) and a colourant to paraffin to reduce poisoning incidents was also submitted to another SABS committee on paraffin fuels (SABS/TC 0028/SC 03).

Data and evidence-based Responsive Research

MaHRU places an emphasis on research that may be mobilised by communities, social advocates and policy makers to enhance community safety. For example, MaHRU's Traffic Safety and Alcohol Nexus Research Group published "Zero tolerance drink driving and road safety in South Africa: What are the options?" in the South African Journal of Science. The article is in recognition of the severe consequences of alcohol intoxication on the road and examined global research on the adoption of zero tolerance approaches to drink driving. This publication noted the significant evidence for the adoption of zero tolerance legislation and recommended a blood alcohol concentration threshold limit in South Africa of 0.02 g/ 100 mL, rather than the zero BAC limit proposed in 2022 by the Road Traffic Amendment Bill. This allows for the challenges involved with BAC testing. The article recommended that the proposed Bill incorporates a gradualist strategy within a zero-tolerance approach and that it includes supportive interventions to enable implementation. The Portfolio Committee on Transport, on 16 September 2022, however rejected a clause that sought to revise the section of the Road Traffic Amendment Bill dealing with the proposed zero tolerance legislation (clause 46 and amendment of section 65 of the National Road Traffic Act 93 of 1996). MaHRU had since published a number of media-based publications and submitted a written request to the Portfolio Committee to reconsider the Bill and further review its provisions related to BAC limits.

Collaborations and Partnerships

A key strategic goal of MaHRU and its host the UNISA Institute for Social and Health Sciences (ISHS) is to grow, build and strengthen partnerships and collaborations for research, training, and community/public engagement around violence and injury prevention.

This is achieved through the following strategic objectives:

(i) establishing partnerships with local, African, and global partners (government, NGOs, corporates, academic institutions, and communities);
(ii) establishing Fellowship and Academic Associate Programmes; and
(iii) securing resources to support South African and African partnerships.

In 2022, national partnerships included: the Academy of Science of South Africa (ASSAf); Bureau of Market Research; Department of Psychology, University of the Western Cape; Provincial Department of Social Development, Western Cape; Department of Health, Forensic Pathology Services in Gauteng, Mpumalanga, Limpopo, and North-West Provinces; North-West University; Psychological Society of South Africa; and the Road Traffic Management Corporation.

Local, community partnerships included: Building Bridges NPO; Lehae Sports Development Organisation; Local Network of Care (LNOC) Helderberg; NETCAP; Thembelihle Football Organisation; and Ubumbano Gender Network (UGN). International partnerships included: McMaster University, Canada; Eduardo Mondlale University, Mozambique; and the Ahmed Dahlan University, Indonesia. These partnerships bring together a range of skillssets and complementary experiences that enhance MaHRU's approach to violence and injury prevention research and action.

Skills building through Capacity Development

Training and capacitation of MaHRU staff, affiliates and post graduate students are integral to the vision, mission, principles, and objectives of the MaHRU and its hosting Unisa Institute. We integrate training and capacity building into each staff members' personal development plan (at the ISHS we have a dedicated portfolio driven on identifying the training needs of staff, in alignment with the five training foci namely research, general writing and publication, research ethics, project management and postgraduate training). The key aim of this portfolio is to support and provide staff members with access to specialised training and capacity building tailored to their training needs and goals. Each year, workshops, seminars, colloquia, etc are planned systematically in accordance with the five training foci stated above, taking staff's personal development plans into account. Furthermore, a continuous review and assessment of the needs and opportunities of staff occurs throughout the year with the aim to accommodate individual needs. In addition to these foci, junior and senior staff are encouraged to be proactive by attending other training workshops, seminars and webinars, conferences, etc as determined by their training needs and CPD requirements. In 2022 many training sessions were offered both online and in person to allow staff to select between this hybrid option. MaHRU staffattended Introductory and Intermediate Quantitate Research Methods Courses in August 2022. Interns and new emerging researchers attended an Introductory Statistics workshop facilitated by Professor Rajen Govender. Over the course of a week, participants were introduced to the basics of quantitative statistical analysis where theoretical constructs were discussed and accompanied by critical reflection as well as practical real-world examples. MaHRU senior and junior staff also attended the Research Ethics Committee Association of Southern Africa Bootcamp and AREASA Workshop, a 3 day in person workshop from 26 October to 28 October 2022, which included an interactive practical session, lectures, and panel discussions. The Bootcamp included introductory lectures on ethics in research and mainly focused on reviewing data protocols.

Knowledge Translation for an informed society

ISHS and MaHRU staff attended several national and international conferences in 2022. Staff had an especially strong presence at the 26th South African Psychology Congress, held in Johannesburg South Africa, where a MaHRU staff member, Prof Shahnaaz Suffla, served as the President of Psychological Society of South Africa. Presentations delivered by ISHS and MaHRU staff at the conference, especially emerging scholars, were very well received. Prof van Niekerk also presented on Violence and Injury in South Africa at the National Research for Health Summit, hosted by the National Department of Health and the National Health Research Committee (NHRC) in Johannesburg. This Summit is held every 5 years and, as per the NHRC mandate, contributes to the formulation or implementation of NDOH policy and strategy. A number of ISHS staff also attended the 9th International Conference on Community Psychology in Naples, Italy. Staff attended this conference in person and online, with several Introductory Statistics academic networks formed. Finally, staff attended the online congress hosted by the Pan African Psychology Union and offered presentations on community engaged prevention scholarship directed at contemporary social drivers of violence and injury. MaHRU also published a range of Technical Research Reports (e.g., on its National Injury Mortality Surveillance System), hosted or attended various Colloquia, Symposia or Public Lectures (e.g., at the Centre for Sexualities, AIDS and Gender, University of Pretoria, University of Johannesburg, and the Ahmad Dahlan University, Indonesia). MaHRU also published several Newsletters and Information Sheets to complement its community-based research and advocacy activities (including 'Healing as Care Work' and 'Healing in communities: Thembelihle and Jackson talk about healing' by Prof Suffla and colleagues).

SAMRC/NWU Hypertension and Cardiovascular Disease

Unit director:

Prof. Marlien Pieters

Research fit for purpose

The overall aim of the Extramural Unit for Hypertension and CVD is to directly contribute to new clinical and epidemiological knowledge within the field of CVD risk in different population groups in South Africa to alleviate the CVD burden by facilitating more effective awareness, treatment, and prevention programmes in the future. This EMU is in a constant state of transformation to ensure that it always best addresses CVD research in the South African context.

With our research, using the latest technology such as polyomics and advanced cardiovascular phenotyping, we contribute to original cardiovascular profiling of all South Africans. With a shift from addressing mainly CVD in the elderly, the Unit has initiated strategies to focus on preventive cardiology, namely, to focus on the early development of CVD risk factors such as raised blood pressure in children and young adults, to focus on the unique disease profile of a large proportion of South Africans affected by co-morbidities in terms of HIV and CVD and to address the health implications of the high burden of CVD due to poor awareness and late diagnosis. Aligned with sharpening our research focus, our staff complement has shifted towards a young generation of researchers, including more women and more staff members from previously disadvantaged groups – empowered to lead these initiatives going forward. Our contributions of novel data and analyses in research publications aim to contribute towards better population-based CVD prevention, as well as better treatment and better care for South Africans.

Impactful Research Interventions

i) Prof Tertia van Zyl took part in the 2022 National Dietary Intake Survey (NDIS2022), which was initiated by the NDOH. The NDIS2022 aimed to investigate the nutritional status of South Africans through dietary intake and anthropometry data collection, analyses, and evaluation. The NWU was one of the 11 HEI responsible for data collection in the nine provinces. Prof Van Zyl was responsible for the dietary intake training of all 14 fieldworker teams at national level. Training material was developed, and online training was provided. Data collection took place from March to September 2022, with dietary data for children under 5 years, adolescents, adults, and the elderly being collected at the household level. Dietary data were also collected at schools to determine much-needed data from adolescents and is currently at the quality assessment phase before analysis, with report writing to follow to complete the project and the results regarding South Africans' nutritional status made available.

ii) In the absence of an internationally accepted standardised method for determining fibrin fibre diameter from scanning electron microscopy (SEM) analysis, a large discrepancy in fibre diameter has been reported in the literature for healthy individuals. This precludes inter-laboratory comparison and prevents the establishment of normal and disease ranges, as are available for other CVD risk factors. We have therefore planned an international collaborative study to standardise fibrin fibre diameter measurement using SEM analysis. This entails identifying collaborators and the development of a standardised protocol and

Prof Tertia van Zyl working on African-PREDICT study data collection using retinal vessel measurement.

African-PREDICT study data collection – retinal vessel measurement.

subsequent experimental analysis comparing data obtained using both the standardised and respective in-house methods. The proposed standardised protocol should aid in diminishing discrepancies in fibrin fibre diameter determination via SEM analysis. This will facilitate interpretation of results, allow direct comparison of data between laboratories and aid in the development of ranges for healthy, prothrombotic and haemophilic individuals.

iii) The Exercise, Arterial Modulation and Nutrition in Youth South Africa (ExAMIN-Youth SA) study is an observational cohort study that includes 1065 primary school children aged 5-9 years. The study addresses the critical areas in which lifestyle behaviours (obesity, physical fitness/activity, dietary intake, and psychosocial factors) contribute to unfavourable arterial modulation and hypertension development among South African children. In the study, 37% of the children had abnormal blood pressure levels and almost 20% of the children were overweight or obese. With an average follow-up time of 3.6 years, we completed follow-up data collection in 796 children (follow-up rate of 74.7%). Several advanced measurements (echocardiography, intima media thickness and static retinal vessel analysis) were analysed. Work from this project enabled the establishment of the Childhood Hypertension Consortium of South Africa (CHCSA), a non-profit organisation that addresses the current lack of normative blood pressure values and clinical practice guidelines for the management of childhood hypertension in South Africa.

Data and evidence-based Responsive Research

We use data to make informed decisions, drive innovation, and ensure that the research conducted is responsive in a number of ways.

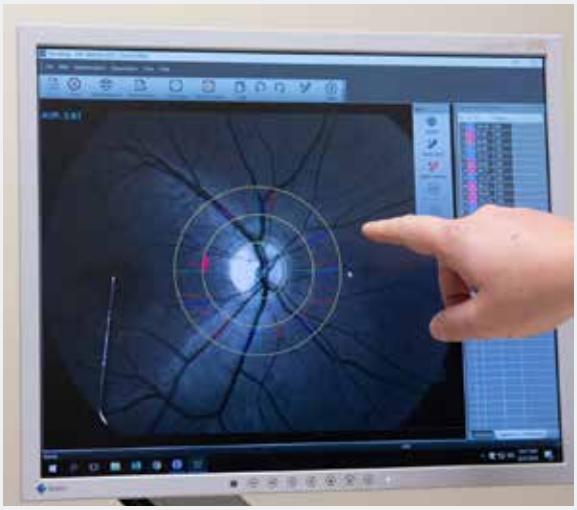
Relevant, high-quality data using, for example, surveys, experiments, observational, intervention or translational studies are collected. Data analysis is used to extract meaningful insights. This can involve statistical analysis, data visualisation, or machine learning techniques. We use data analysis to identify patterns, relationships, and trends to inform research decisions and drive innovation. Based on these insights we plan future research activities. This might involve refining research questions, developing hypotheses, or (re)designing experiments. By identifying trends or patterns that are not yet well understood, we use data to explore new areas of research or develop new research methods, leading to the discovery of new insights or the development of new technologies in the field of CVD. We also

collect feedback (data) from stakeholders such as post-graduate students, collaborators, government, funding agencies, and the community to ensure that our research is responsive to the needs of these stakeholders. In so doing, we identify areas where research can be improved on or modified to better meet the needs of our stakeholders.

Collaborations and Partnerships

This EMU is by design and example of inter-departmental collaboration as its members are made up of researchers from two separate research entities at the NWU; the Centre of Excellence for Hypertension in Africa Research Team and the Centre of Excellence for Nutrition. The research scope and aims of these two entities are well aligned and the entities have complementary skills and expertise, which contributes to the strength of the unit. All our research projects include national and international researchers either as collaborators or in an advisory capacity. In addition to partnering with other scientists, we also collaborate with individuals in the clinical environment such as clinicians, diabetologists, cardiologists, nurses, and community health care workers to ensure rigor, scientific excellence, novelty, and relevance of our work.

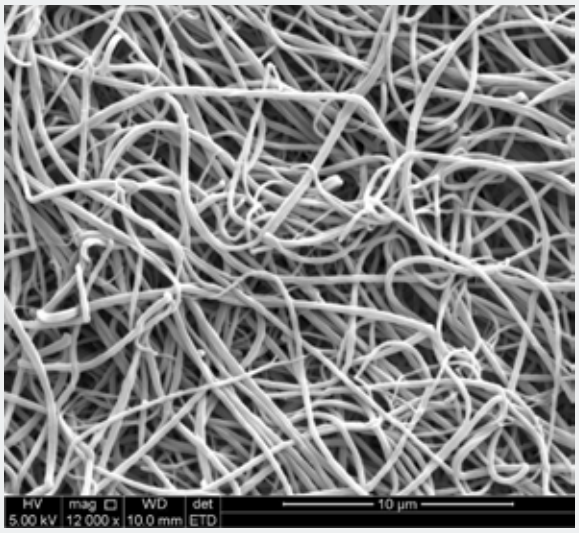
Studies such as the ExAMIN Youth SA study and the African-PREDICT study (African Prospective study on the Early Detection and Identification of Cardiovascular disease and Hypertension) require collaboration and partnering with different community leaders and schools as well as the Departments of Health and Basic Education. An example of another collaborative effort is the Desktop Review that was performed regarding the nutrition status of South African infants and children to provide background information to guide the National Food and Beverage Consumption Survey of 2021/2022. Members of this EMU are involved in this Survey together with collaborators from the Department of Health, the SAMRC, UWC, SUN, UFS, UP, UKZN and University of Limpopo. An example of a collaboration opportunity with a clinical focus is the establishment of the Childhood Hypertension Consortium of South Africa (CHCSA), of which Prof. Ruan Kruger (an EMU member) is the founding Director. The mission of the CHCSA is to include all relevant stakeholders to develop clinical practice guidelines for the management of hypertension in South African children and to guide health education on primary prevention at community level. CHCSA members currently include prominent researchers and clinicians at medical schools, universities, and hospitals throughout SA.



African-PREDICT study data collection – retinal vessel measurement.

ExAMIN Youth SA study data collection.

The mission of the CHCSA is to include relevant stakeholders to develop clinical practice guidelines for the management of hypertension in South African children and to guide health education on primary prevention at community level.



Scanning electron microscopy image of a fibrin clot.

Skills building through Capacity Development

Our staff complement has shifted towards a young generation of researchers, including more women and more staff members from previously disadvantaged groups. These individuals are empowered to lead research projects within the EMU by support provided for research visits to leading international research laboratories to further their training and to gain the necessary skills to become experts in their research fields.

The NWU furthermore has a Grow-Our-Own-Timber initiative that provides funding to previously disadvantaged students to complete their post-graduate studies while receiving mentoring to fast-track them for permanent appointment, particularly in cases where current staff members retire. An example of such an appointment is Dr Gontse Mokwatsi who was appointed after the retirement of another senior staff member and who is already project leader of the UPRIGHT-HTM study within the EMU. Lastly, a concerted effort is made pertaining to succession planning for individuals from previously disadvantaged groups within the EMU. This includes such members forming part of the management team meetings of the EMU, PI positions in EMU research projects, attendance of management and leadership courses, development of national and international networks and access to research funding. The goal is to have a researcher from the previously disadvantaged groups appointed as the new UD after the term of the current UD comes to an end.

Knowledge Translation for an informed society

Interactions of EMU members with the media (online, print, radio, television) are made on a continuous basis to both inform the public regarding general aspects of raised blood pressure/hypertension and CVD, and to translate our research findings to the public and other stakeholders. Members of the EMU are senior authors on authoritative guideline documents of relevant international societies, which guide the practical treatment of hypertension by clinicians and health care workers, with a special focus on application in developing countries.

The EMU further strives to connect with the community whilst transforming the cardiovascular health scene within South Africa through direct interaction by visiting community members at their homes and workplaces, by visiting young research

participants in schools and staying connected via social media. Not only did the EMU transform its staff complement, research approaches, projects, and funding over the past years, it also transformed its outreach towards the community. For example, a cartoon-type booklet has been developed to teach children on how a healthy lifestyle can protect against cardiovascular disease. These were handed out to schools and clinics in the region. Another example is a comic strip that has been designed to teach the public on the importance of salt reduction for blood pressure regulation. In addition, many unit members and post-graduate students are closely involved in the global project on raising awareness of hypertension (May Measurement Month), resulting in the largest ever global campaign for any risk factor.

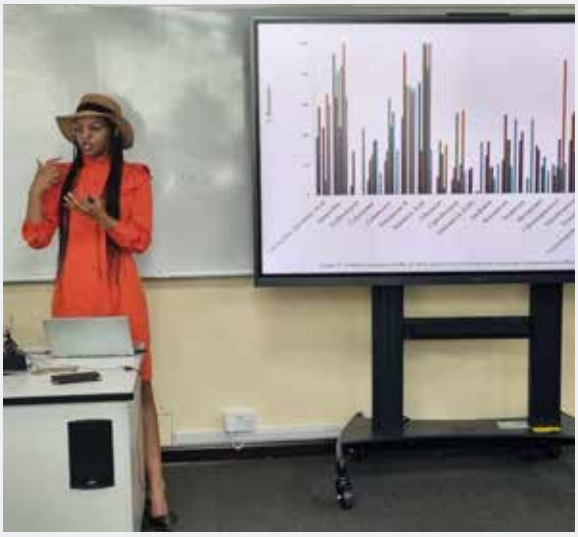
National Dietary Intake Survey fieldworker training.

SAMRC/UFH Microbial Water Quality Monitoring Research Unit

Unit director:
Prof. AI Okoh

Research fit for purpose

The Microbial Water Quality EMU strives to be a highly profitable Centre of Excellence for the development of the next generation of microbial water resource specialists and to be primus inter pares in offering solutions to the myriad of water quality challenges in South Africa and beyond. This mandate is driven by the serious problem of shortage of skilled manpower in the water and sanitation sectors especially amongst previously disadvantaged demographic groups in South Africa, and our research is mainly directed at finding solutions to this reality through primarily addressing the myriad of challenges in the water and sanitation sector in the Eastern Cape Province (ECP) within the overarching aim of our research initiatives which is "evaluating some key emerging challenges in microbial water quality and safety as a vehicle for skills and capacity development in water science especially amongst the previously disadvantages demographic groups in the Province."



Our environmental pollutants project involves developing innovative technologies including nanotechnology for the removal of nucleic acids.

Impactful Research Interventions

i) As a member of the SAMRC Wastewater Coronavirus surveillance team and we're responsible for monitoring the wastewater treatment plants in Buffalo City Metropolitan Municipality and the Amathole District Municipality. Five Masters and Doctoral students and 2 postdoc are involved in the project. The project entails weekly sampling of the wastewater treatment plants and screening for the presence of SARS-CoV2 genomes. Our data is reported weekly to the coordinating centre at the SAMRC and forms part of the national wastewater Coronavirus database. Manuscripts are in preparation for publication from this study and the five students are currently writing up their dissertations and theses to be graduating in 2023.

ii) Another research highlight during the reporting period is our Antimicrobial resistance (AMR) in the food-water-agricultural products interphase project. The upsurge in the prevalence of AMR has become a global public health challenge and one of the main research focuses is rigorous studies on antibiotic resistant bacteria (ARB), and ways of effectively controlling or eliminating

Dr. L Msolo and Dr. K Ebomah processing and analyzing samples in the Coronavirus Surveillance Laboratory for the Wastewater Coronavirus Surveillance and Research Programme.

Doctoral Students (Ms. O Mayoyo and Ms. V Qongwe) collecting wastewater samples from one of the wastewater treatment sites in the Eastern Cape Province for the Wastewater Coronavirus Surveillance and Research Programme.

Our researcher extracting sample for testing at one of the wastewater treatment sites.

AMR determinants in the various environmental niches. We evaluated the antibiogram fingerprints and risk assessments of several bacterial isolates recovered from different environmental niches within the food-water-agricultural products interphase within and outside of South Africa. We also evaluated the benefit of combination antimicrobial therapy options for the treatment of infections caused by multidrug resistant isolates. Several articles were published from these studies in high impact journals.

iii) A further highlight is our environmental pollutants project. During the reporting period, we continued studies into environmental pollutants including development of innovative technologies including nanotechnology for the removal of nucleic acids (and consequently antimicrobial resistance genes) and endocrine destructing chemicals (herbicides and dyes) from wastewater. Also, we embarked upon several studies bordering on the occurrence and spatiotemporal distribution of several persistent organic pollutants in the environment including soil and aquatic niches. Amongst the list of our contaminants of concern are organochlorine, organophosphate and carbamate pesticides, polybrominated diphenyl ethers (PBDEs), polychlorinated naphthalenes (PCNs), BPA (bisphenol A), organophosphate flame retardants (OPFRs), some pharmaceutical and personal care products (PPCPs). Several articles were published from these studies in very high impact journals for which we're very excited. Several Doctoral and Master's degree students were involved in this study, some of who will be graduating in 2023.

Collaborations and Partnerships

One such collaboration is the Wastewater Coronavirus Surveillance Project which involves the SAMRC and several other Universities in South Africa. We're also collaborating with the Buffalo City Municipality and the Amathole District Municipalities and they receive copies of our weekly findings. Our Antimicrobial, bioactive compounds, water chemistry and road duct projects involve collaborators in South Africa, Lesotho, USA, United Arad Emirates, Nigeria, Cote d'Ivoire and the United Kingdom.

Skills building through Capacity Development

Our EMU has been a veritable hub for capacity development especially amongst previously disadvantaged demographic groups in the country. Indeed, during the reporting period, we have trained 25 doctoral and 18 Master's students. Of the doctoral students 16 are females while 9 are males; and of the Master's students 11 are females while 7 are males which is consistent with the national agenda of empowerment of the female gender. Twenty-four Honours students made up of 16 females and 8 males all of which are South Africans and about 70% of all these students are black South Africans.

Knowledge Translation for an informed society

Our Unit publishes its research findings in reputable journals as well as at national and international conferences during the reporting period. Indeed, this has earned our EMU as the most productive research entity at the University of Fort Hare during a review conducted by the University in 2022 on all centres, Units and Institutes in the University. I am pleased to remark that we have maintained this record since the creation of our EMU. Also, in appreciation of the quality of our research, our EMU was invited during the reporting period, to present a workshop on wastewater Coronavirus surveillance by the University of Sharjah in the United Arab Emirates. Seven members of our team, made up of four staff, one postdoc and two doctoral students attended the workshop, which was very successful.

Members of the SAMRC Wastewater coronavirus surveillance team, responsible for monitoring the wastewater treatment plants in Buffalo City Metropolitan Municipality and the Amathole District Municipality.

Our Antimicrobial resistance (AMR) in the foodwater-agricultural products interphase project.

SAMRC/WITS Centre for Health Economics and Decision Science – PRICELESS SA

Unit director:

Prof. Karen Hofman

Research fit for purpose

The SAMRC Centre for Health Economics and Decision Science – PRICELESS SA aligns closely with the SAMRC's strategic objectives to build a healthy nation through research, innovation, and transformation. We believe that inter-connectedness, is key to achieving these objectives and strive to promote this concept in all our projects and initiatives, using a multidisciplinary team.

One of our key areas of focus is research translation, and we have been working on this through media interviews with, for example, the *Daily Maverick* and *The Conversation* to and through global publications, including *The Lancet*, *The Lancet Global Health*, *Global Health Action*, and *International Journal of Technology Assessment in Health Care*, to ensure that our research findings are accessible to everyone, including policymakers, practitioners, and the general public. We are also committed to capacity development and knowledge sharing in LMICs including but not limited to Kenya, Uganda, Nigeria, Brazil, and Tanzania.

We understand the importance of balancing academic and social impact in research. For this reason, we have performed a series of research outputs which shows the impact of the health promotion levy, which aims to decrease consumption of excess sugar, reduce obesity and thus reduce the burden of non-communicable diseases (NCDs). We have also shown what obesity is costing South Africa. Additionally, we are committed to promoting maternal and child health. Our evidence shows the return on investment that would follow by extending the financial support from the child health grant during pregnancy improving physical and mental health outcomes for both mother and child.

Our unit is also contributing to the National Health Insurance (NHI) and Universal Health Coverage (UHC) agenda through our work on priority setting in healthcare. We have developed the SAVE-UHC framework, which aims to improve the process of priority setting by including 8 principles that are ethically and morally relevant to the public – a critical component of the NHI plan.

Impactful Research Interventions

i) Micronutrient deficiency in pregnant women in South Africa exists due to poor diets due to high levels of poverty. The health consequences of adverse health outcomes resulting from micronutrient deficiencies in pregnancy are lifelong and affect a child's learning capabilities and, ultimately their adult earning potential. We conducted a cost-effectiveness analysis to determine if switching from iron and folate supplementation to multiple micronutrient supplementation would represent value for money for the South African government. We found that introducing micronutrient supplements into the public health care system provided more benefits at a cheaper cost than current practice.

ii) School Food Environments: School food environments play a vital role in shaping learners' nutritional health, while promoting environment-friendly and sustainable food choices. Despite available nutrition and food policies, South African school food environments are recognized as obesity-promoting. To address gaps between policy and practice, we engaged a broad array of stakeholders in designing and prioritising interventions to improve school

food environments. We identified seven priority interventions that call for multi-sectoral actions at the intersection of the physical environment, educational space, and health. The seven priority interventions could harness technological innovations along with human engagement to improve the quality and accessibility of school nutrition. Research findings have informed the Department of Education and UNICEF in the development of South Africa's Blueprint to improve nutrition in schools.

iii) Priority Setting in Healthcare: Our research involved the participatory development of a framework for priority setting in healthcare. The study aimed to provide and enhance the usual economic approach to priority setting by adding South African values and ethics into a structured framework. The SAVE-UHC Framework makes for a more just and equitable priority setting approach for universal health coverage in South Africa.

Data and evidence-based Responsive Research

PRICELESS leverages data to make informed decisions, drive innovation, and ensure that our research is responsive to the needs of the population, as such, it promotes inter-connectedness in the 5th industrial revolution Health Space. To achieve this, we have implemented various initiatives that harness the power of data in our work. Examining and mining existing databases such as the Kantar data, we have been able to track advertising expenditure in relation to the promulgation of the Health Promotion Levy (HPL) and examine in detail the consumption of sugary beverages over time. We used a time interrupted series to analyse the impact of the HPL on the consumption of sugary beverages. We extended the analysis to look at different socio-economic strata, finding that in the poorest stratum there has been a 30% reduction in sugary beverage consumption, highlighting its potential to reduce obesity and related diseases and the critically important additional benefit to poorer people.

The South African Values and Ethical Framework.

Other data enabled us to model the economic cost of hypertension to South Africa, it was estimated to be $1.1 billion in 2016, underscoring the desperate need for preventive strategies to reduce this massive burden on the healthcare system. An important study explored the cost of obesity to the South African health system. The total cost of overweight and obesity is estimated to be ZAR33,194 million in 2020. This represents 15.38% of government health expenditure and is equivalent to 0.67% of GDP. Analysing social media data produced interesting results in what is called "COVID Washing". Big food brands who produce unhealthy foods or sugary beverages promoting themselves through social media ostensibly as supporting the community.

Collaborations and Partnerships

One of our ongoing collaborations involves partnering with teams in Kenya, Uganda, and Tanzania. The project is reviewing local nutrition policy while also evaluating the economic impact of NCDs. By collaborating and supporting teams in these countries, we can better understand the unique challenges they face, build their capacity in our areas of expertise, and tailor interventions to suit their needs.

We also collaborating with partners from Brazil, Nigeria, Jamaica, Cameroon, Kenya, and the United Kingdom, and colleagues from Cape Town on the Global Diet and Activity Research (GDAR SPACES) project, which is part of the emerging field of planetary health that recognises the interconnectivity between human health and the health of the environment, including the natural systems that sustain us.

Skills building through Capacity Development

In the past year, two of our staff members graduated from the MPH health economics programme, one of them with distinction. Our unit also coordinates and teaches the MPH Health Economics programme aimed at building capacity in the scarce skill of health economics. The programme consists of 13 blocks over two years and the completion of a research thesis in the third year. The MPH Health Economics is oversubscribed with ten times more applicants than available spaces.

Sugar consumption has decreased since the introduction of the Health Promotion Levy.

The adapted Choosing All Together (CHAT) tool used for public participation in priority setting for nutrition in a low income setting.

We have developed an online course in priority setting, which specifically targets policy and decision-makers in the health sector and also provide technical support to other sub-Saharan African countries in the field of law and policy evaluation as well as economic evaluation. This support involves working closely with policymakers and researchers to develop evidence-based policies that promote health and equity in their respective countries.

Knowledge Translation for an informed society

Translating research findings to relevant stakeholders and the public is essential to ensure that our work has

a meaningful impact on health outcomes. Our Unit has prioritised research translation through various means, including media engagements, publications, and presentations to policy makers and the public.

Our work on the Health Promotion Levy (HPL) has received the attention of policymakers and the media. Attention acquired through interviews published on various platforms, such as the Daily Maverick and The Conversation, often followed by radio and or television interviews. One such example is in a Daily Maverick article where the research from PRICELESS directly contradicts the sugar industry's bid to remove the Sugary Beverage Tax (HPL).

After a written submission, members of the PRICELESS team, Petronell Kruger and Mikateko Mafuyeka, were summoned before the Human Rights Commission in March 2022 to provide expert testimony on the issues of discrimination in marketing and concerns with adequate implementation of marketing restrictions as revealed through prior PRICELESS studies. The link between NCDs and indirect discrimination based on sex, disability and socio-economic status was explored. The testimony was televised and covered by national media. The Commission also requested follow-up written submissions on issues it identified.

Presenting our findings and framework of the South African Values and Ethics for Universal Coverage to the National department of health and other stakeholders assists in the incorporation of the framework into priority setting for NHI. Presenting the cost of obesity and hypertension studies to stakeholders in the NDOH contributed to the new obesity strategy, which we then assisted the NDOH to cost. A panel discussion at the Public Health Association of South Africa (PHASA) 2022 conference brought together experts in the field of commercial determinants of health to discuss and raise awareness of the impact of commerce on health, and the issue of conflict of interest in health research.

Our research has been presented at several international conferences and global working groups contributing to the global body of health economics, nutrition policy and commercial determinants of health.

Petronell Kruger and Mikateko Mafuyeka giving evidence to the Human Rights Commission on discrimination in marketing.

SAMRC-UNIVEN Antimicrobial Resistance and Global Health Research Unit

Unit director:

Prof. Pascal O. Bessong

Research fit for purpose

Communities in low- and middle-income countries, including South Africa, disproportionately bear a high burden of morbidity and mortality due to antimicrobial resistance (AMR). The Antimicrobial Research and Global Health Research Unit seeks to understand, in a holistic way, the dynamics of AMR acquisition and transmission. Innovations in our research approaches include understanding the dynamics of antimicrobial resistance at the community level; application of genomics to reveal introduction and transmission patterns; and involving our communities in the design and development of educational packages on the prevention and control of AMR.

Impactful Research Interventions

The Unit is investigating the following hypotheses: (i) that acquisition and carriage of antibiotic resistance begins early in life; and that colonisation with resistant organisms is influenced by the background microbiota composition. ii) A significant proportion

Our unit members engaging with communities to raise awareness about Antimicrobial Resistance (AMR).

of individuals initiating HIV treatment are not naïve to ARV and this impacts attainment of sustained viral suppression. iii) Communities can participate in the co-production of educational packages, on AMR prevention and control, relevant and fit for purpose for our communities.

The potential innovations, impact on policy and procedure, include:

i) Antimicrobial stewardship programmes will have to include protocols for communities, and not only for clinical settings.

ii) A change in the parameters used to estimated and present data on transmitted drug resistance may be required.

iii) Pre-exposure to ARV will have to be objectively ruled out before treatment initiation.

iv) The establishment of a national electronic database for all individuals on ARV may be required to support efforts in attaining viral suppression nationally.

Data and evidence-based Responsive Research

The research of the Unit is guided by the National Development Plan; the health research priorities of South Africa; UN Sustainable Development Goals, and AU Agenda 2063. Our projects are aimed at obtaining large data sets, through longitudinal cohorts, across several provinces for a better representation of evidence towards national policy development. The Unit keeps abreast with relevant findings from other investigators, nationally and internationally, to refine our approaches and analytical methods for high resolution datasets.

Collaborations and Partnerships

The core team at the University of Venda comprises investigators from seven departments namely Biochemistry and Microbiology, Applied Mathematics and Computational Sciences, Psychology, Public health, Nutrition, and Education. Our external partners include investigators from the Faculty of Health Sciences, Walter Sisulu University; Department of Medical Virology, Sefako Makgatho Health Sciences University. Collaborators include investigators at the Genomics Centre, SAMRC; Antibiotic Resistance and Phage Bio Control Group, North West University; Center for Global Health Equity, University of Virginia, USA; Department of Epidemiology and Public Health, Emory University, USA; and Nigerian Institute of Medical Research.

Training of personnel of the AIDS Virus Laboratory on biosafety and biosecurity procedures. This training takes place quarterly for all personnel. Above images show doctoral students Mr Phindulo Mathobo and Ms Lisa Tambe respectively simulating good practice in biosafety.

Skills building through Capacity Development

The Unit's core team and collaborators presents a multidisciplinary pool of experts for an improved holistic search for solutions to the challenge of AMR. This also provides and supports the training, in science and leadership, of a diverse group of masters and doctoral students, and postdoctoral fellows in AMR. The core domains include microbiology, molecular biology and biotechnology, biomathematics, clinical psychology, and public health. Cross-domain training are in the areas of genomics, applied ethics, scientific writing, data management and data quality, and entrepreneurship.

Knowledge Translation for an informed society

Specific data was not translated to relevant stakeholders in the reporting period. However, study questions and objectives have been shared with the Infection Prevention and Control and the Research Committees of the Limpopo Department of Health. The purpose was to begin to work with stakeholders on a process of coproduction of knowledge and gather evidence required for improvement of antimicrobial resistance stewardship programmes for communities. We are expanding these consultations, through symposiums, with relevant national bodies, professional societies, and non-governmental organisations. A policy brief on HIV drug resistance in the untreated population is being prepared.

Lab personnel and postgraduate students after training on laboratory quality assurance procedures in November 2022.

Programme 2

MATERNAL, CHILD AND WOMENS' HEALTH

PURPOSE OF THE PROGRAMME

To improve the health status and quality of life of women and children through high-quality scientific research that informs policy and practice, improves health services and promotes health.

UNITS THAT CONSTITUTE THIS PROGRAMME

1. Gender and Health Research Unit (IRU).
2. Maternal and Infant Health Care Strategies Research Unit (ERU).
3. Development Pathways Research Unit (ERU)
4. Child and Adolescent Lung Health (ERU).

PROGRAMME STRATEGIC OBJECTIVES

- To conduct and promote research for the improvement of maternal, child and women's health, while also making an impact on gender inequity and gender-based violence (GBV).
- To train and mentor high calibre postgraduate students in the field of maternal, child and women's health.
- To synthesise evidence, optimise information and knowledge flow, influence policy and practice within the health sector and other sectors of government in relation to issues affecting maternal, child and women's health.
- To develop interventions for prevention of gender-based violence for testing and evaluation of effectiveness in affected communities.
- To test or evaluate interventions (programmes) to prevent GBV and reduce maternal and neonatal deaths in primary and secondary levels of care.

RESEARCH HIGHLIGHTS UNDER THIS PROGRAMME

Gender and Health Research Unit

Unit director:

Prof. Naeemah Abrahams

Research fit for purpose

The Gender and Health Research Unit's (GHRU) aims to improve the health status and quality of life of women, through high-quality scientific research that informs the development of policy, health services, and health promotion. Our research focuses on gender-based violence (GBV) and we recognise that gender inequality is a central driver of GBV. The Unit's objectives are to describe the prevalence, drivers, and social context of GBV; the health impact of GBV and gender inequity; and strengthen responses to GBV across sectors. To this end, we focus on generating knowledge, developing, and evaluating interventions, and contributing to policy on the prevention of GBV that will lead to the reduction of violence against women.

Over the last year, the Unit completed the 3rd National Femicide Study, the results of which showed that the femicide rate has decreased since 1999 with the greatest decline seen in intimate-partner femicide. We also showed that there was a decrease in child deaths related to abuse.

The Unit continues to prioritise the development of prevention interventions which is responsive to the South African National Strategic Plan on Gender-based Violence and Femicide. In the past year, we have continued to use evidence to inform and design the development of different VAW prevention interventions. Our "*Ntombi Vimbela!*" SAMRC Flagship project piloted their sexual violence risk reduction intervention and has shown promising results with female students showing a reduction in individual-level risk factors.

Impactful Research Interventions

During the reporting period, we further build the knowledge base on the intersections of violence against women, mental ill health and food insecurity from different research projects and settings. These point to the need for economic empowerment, integration of alcohol reduction and mental health elements in prevention programming. The first among these mental health papers is based on data using pooled analysis from South Africa, Ghana, Rwanda and the occupied Palestinian Territories (oPT), showing higher posttraumatic disorder (PTSD) and depressive symptoms increased risks for intimate partner violence and non-partner sexual violence perpetration by men. Women who experienced IPV were more likely to report depressive symptoms compared to those who had not experienced IPV. Women who experienced non-partner sexual violence also had increased odds of experiencing PTSD symptoms.

The second set of published papers come from *Ntombi Vimbela!* – a project with young people in Higher Education settings, where it was shown that risky sexual behaviours including having multiple partners and engaging in transactional sex, gender

inequitable relationship dynamics, mental ill-health and food insecurity were inter-related but amenable factors associated with sexual violence experiences among young women studying in South African higher education institutions. These findings have informed the development of Ntombi Vimbela! sexual violence risk reduction intervention which has now been piloted amongst first year female students in eight campuses. A paper from the piloting of Ntombi Vimbela!'s intervention indicated promising findings for female student's empowerment, gender transformation and sexual assault risk reduction, as well as being relevant and appropriate for South African campus settings.

The third area of work on mental health is related to the impacts of COVID-19 on mental health among frontline health care workers. Our published paper showed that many frontline health workers in South Africa experienced poor mental health during the first wave of the COVID-19 pandemic. Many reported negative impacts including depression, stress, anxiety, fear of infection and anticipated death, which impaired day-to-day functioning. The workplace psychosocial support provided was variable and, in some instances, ineffective. We recommended the prioritisation of workplace psychosocial and managerial support interventions to address both the immediate and possible long-term mental health impacts of the COVID-19 pandemic amongst frontline health workers.

Data and evidence-based Responsive Research

Our pioneering work in advancing disability inclusive research in the past year has involved advocating for the development of disability inclusion indicators and monitor disability inclusion and inequalities. We have supported the Disability Data Initiative (DDI) with the collection of national data sets for the sub-Sahara African region. We have compiled the information and mapped the region in terms of inclusion of disability questions and utilised the existing evidence from the DDI to prepare our first webinar focusing on *"Advancing the Lives of Persons with Disability through Disability Data Analysis in sub-Saharan Africa"* 23 March 2023. This work is expected to inform not only how researchers utilise data and conduct research but also statistical offices in individual countries. Further, our team members funded by the CDC have developed the Disability Awareness Checklist (DAC), a simple tool for improving access for people with disabilities to clinical facilities in South Africa. This tool is innovative in that it can be implemented by lay people without special training to create action plans for improving facilities' accessibility.

Our Siyaphambili project works with young adults in rural and urban townships around Durban using innovative co-development approaches to intervention development. Our co-development interventions engages more directly with young people who are typically 'targeted' by an intervention to create an intervention that reflects and resonates with young people's lives. Over the last year, the team has involved 'Youth Peer Research Associates' (YPRAs) who are young people living in rural KZN to support them to develop contextually relevant understandings of their lives through a range of participatory activities such as artefacts captured on photographs and videos and shared with the research team via WhatsApp. The team have worked with the YPRAs to articulate how they would like to see their lives change, how this may be possible to change their circumstances and develop their theory of change. The iterative co-development process has also facilitated the application of the YPRA theory of change in the identification of gaps in the evaluated model of the Stepping Stones and Creating Futures intervention. After adapting sessions, the team 'pre-tested' the intervention with the YPRAs to see if the new sessions resonated with what they had in mind and the theory of change they created.

The GHRU has also used data from both the forensic services and police services in the national Femicide studies and has demonstrated how South Africa continues to have the largest problem in the world and needs to make substantially more progress to stop all forms of femicide. Our femicide studies combined two separate administrative data systems (Police and Forensics) and over the last 20 years, we have seen no improvement in the synchronisation of information management systems for femicide tracking in the country. This is despite huge advancements in data science in health and all other sectors.

Collaborations and Partnerships

In the past year, the GHRU has formed new interdepartmental research partnerships within the organisation, demonstrated through the SAMRC-funded flagship project *Ntombi Vimbela*! between GHRU and ATODRU. In addition, our researchers and statisticians are collaborating with BODRU where we use the same study design, research team and data for the Injury Mortality study, the femicide and child homicide studies and the male homicide study. We are also strengthening our understanding of alcohol diagnostics in relation to injury-related trauma cases through the participation of our statisticians' collaboration with BODRU and ATODRU. Staff working on disability are supporting BODRU on the integration of disability measures for older persons research and we are working together on the Comparative Risk Assessment No. 2 (SACRA 2) analyses and publications. GHRU statisticians are also partnered with the Biostatistics Unit delivering statistics training across the organisation and co-supervising PhD students.

Our research Unit is also collaborating with UKZN on the Ntombi Vimbela flagship project and the GCRF/ Siyaphambili project; Stellenbosch University on the NV! Flagship project, the RICE 1 project on the genetic components of the study; the University of the Witwatersrand (Wits) on the HeLTI Methylation study and the Wits Perinatal HIV Research Unit on the sex worker research.

Our researchers are collaborating with UK researchers, for instance, the Siyaphambili project is a partnership with Exeter University and the University College London, while our researchers working on the COVID-19 Services Impact study are collaborating with the London School of Hygiene and Tropical Medicine (LHSTM) researchers.

Government departments are important for building consensus on key policy issues, strengthening our research translation and ensuring uptake and impact of our research. GHRU has also partnered with government departments on various research and policy work, namely, the Department of Justice and Constitutional Development(DOJCD) on the development of the Femicide Prevention Strategy; the DOH on the CDC funded GBV Quality Assurance tool adaptation; the Department of Higher Education and Training (DHET) and Department of Basic Education (DBE) on the NV! Flagship project: the Department of Women, Youth and Persons with Disability (DWYPD) on disability inclusion projects Our relationship with DOJCD has culminated in the government-commissioned development of a national femicide prevention strategy. It is being accessed and used by key stakeholders in government structures to inform femicide prevention in South Africa.

Recruiting participants – using Peer Network Recruitment

GCRF Pilot study explained to young men during recruitment of facilitators.

Skills building through Capacity Development

In the last year staff have supervised PhD students and it is expected that some of the PhD students will submit their theses for examination in 2023. We host three Post-Docs, who have all developed their own research portfolios and have been successful in securing grants for their research. They are funded by the Wellcome Trust, National Research Foundation and SAMRC. We are involved in teaching

at Universities (Wits, UCT, UWC, Stellenbosch, UP). We have also contributed to capacity development through our role as examiners of PhD and master's theses and dissertations. We continue to develop junior researchers in our area of work and trained several research assistants employed in projects in the Unit, some of whom are enrolled, and some graduated at Universities for Honours and Diploma courses to continue their postgraduate education.

The Unit recognises the need for training of staff for continuous improvement and productivity and these include our research assistants. We purposefully focussed on training the Nqoba Sibindi study research assistants to do research activities and to develop competencies beyond data collection. They were trained to unpack difficult concepts and notions of constructs that they have dealt with daily during the RICE study, concepts such as post-rape shame, self-blame and self-stigma as part of a qualitative research approach. We used life histories and narrative research methods to unpack these difficult concepts and to make meaning of it. In the same process, we supported junior staff to write publications from existing data, trained them to search and use national data sets such as household surveys and censuses. We have continued with a programme of bi-monthly 2 hour-long Academic Day meetings for all staff which provides an opportunity for in-house capacity development and support for emerging researchers in the unit on different areas including scientific writing, presentation through sharing of research ideas and findings. We have supported and created space for senior staff to write publications through setting-up inhouse and out of office writing retreats at-least once every quarter. Some of our staff members participated in the Bridges programme, a collaboration between UCT and Brown University, where they received training over six months period on NIH grant writing. Spin-offs are evident in the many grant applications staff in our Unit have submitted, some being awarded in the past year.

Knowledge Translation for an informed society

The GHRU participated in several research translation activities, including developing South Africa's first National Femicide prevention strategy, international and national conference presentations, webinars, and presentation of research findings to key stakeholders such as the National Prosecuting Authority (NPA), local health facilities (Thuthuzela Care Centres), and non-governmental organisations. The Femicide prevention strategy has been endorsed by the bilateral NSP-GBVF collaboration between government and NGOs and is awaiting approval by the Minister of Justice and Constitutional Development and the Cabinet. GHRU staff also delivered several national and regional training sessions on disability inclusion in the context of comprehensive sexuality education supporting UNESCO in the past year.

The GHRU plays a significant role in multisectoral collaborations to influence national policy. Key among these is Prof Naeemah Abrahams's presentation of the 2017 Femicide study results in the plenary session of the 2nd Presidential GBVF Summit 2022 where she addressed the State President of South Africa, government ministers, diplomats, development partners, policymakers, researchers, and non-governmental organisations working on GBV and Femicide. Her work highlighted that the overall femicide rate had reduced by half over 18 years since in South Africa, despite the decline, 3 women continue to be murdered by intimate partners daily in 2017.

The staff working on Disability have played a key role in the integration of disability inclusion in the latest national policy such as the South African National Strategic Plan on HIV, TB and STIs 2023-2028, Harmonising of Disability Rights project. Colleagues also attended multisectoral meetings and contributed to the writing up of disability sectoral policy documents and briefs by the United Nation's Convention on the Rights of Persons with Disabilities (CRPD), South African National AIDS Council, and the national DWYPD.

Through our participation in the national Violence Prevention Forum, a multisectoral collaboration promoting evidence based violence prevention, this has contributed to the develop of a Violence Prevention definition that has gained consensus from researchers, government officials, community organisations, development partners and policymakers in South Africa and internationally. Using various methods such as open space to engage stakeholders to declare how they are contributing to violence prevention in their own areas of work.

SAMRC/UP Maternal and Infant Health Care Strategies Research Unit

Unit director:

Prof. Ute. Feuch

Research fit for purpose

The Maternal and Infant Healthcare Strategies Research Unit comprises a multidisciplinary team that has continued to direct its focus toward reducing maternal and child morbidity and mortality. Research studies include the use of a Doppler ultrasound device (Umbiflow™) in primary healthcare settings, observing the impact and effects of the COVID-19 pandemic on maternal and child health and service provision and evaluating the long-term effects of perinatal exposure to HIV in the growth and development of foetuses, neonates, and infants, in addition to running maternal, perinatal and child audit programmes.

National and internationally based studies focussed on the use of the Umbiflow™ device to detect placental insufficiency in women classified as low-risk in pregnancy within the primary healthcare setting. The Umbiflow™ device's ability to reduce stillbirth occurrence emphasised the importance of its implementation in primary healthcare facilities, particularly in low- and middle-income countries (LMICs), which are greatly affected by high stillbirth numbers. The aetiology of many of these is still unknown, the elucidation thereof will therefore be of great importance for future prevention and reduction of stillbirths. It is for this reason that the Unit has participated in collaborative discussions and plans to investigate the possible parameters linked to the cause of stillbirths and adverse perinatal outcomes associated with placental insufficiency.

The Unit currently runs two audit programmes; the Maternal Morbidity and Mortality Audit System and the Perinatal Problem Identification Programme. These are important in identifying trends and highlighting issues that contribute to maternal and perinatal deaths in South Africa.

Impactful Research Interventions

i) The ability of the Umbiflow™ device to identify placental insufficiency in low-risk pregnant women will allow women currently receiving antenatal care at primary healthcare level to receive appropriate interventions and reduce the risk of adverse perinatal outcomes, especially stillbirths. The Unit conducted follow-up studies and is in the process of an implementation study of Umbiflow™, these include:

   UmbiBaby, a follow-up study of the participants from the Umbiflow International study, has shown that infants with placental insufficiency in utero showed continued impaired growth postnatally from birth to 24 months. Growth in this study was assessed using anthropometric measurements and body composition. The identification of placental insufficiency using the Umbiflow™ device has in addition to the prevention of stillbirths, highlighted the postnatal effect of placental insufficiency.

   The UmbiGodisa study also recruited infants from the Umbiflow International study at a single time point of infant age 18 months. The study showed that HIV-exposed and uninfected (HEU) infants experienced a dual insult of maternal HIV exposure and placental insufficiency and as a result had a potentiated risk of stunting compared to the infants with a single or no insult.

The Non-pneumatic Anti-shock Garment (NASG) fit-for-purpose device that can save women's lives by reducing blood loss and stabilizing the women with obstetric hemorrhage, until treatment is available.

The Umbi-Tshwane project is underway and focusses on the implementation of Umbiflow™ screening at the primary healthcare level in the Tshwane District. This implementation research is expected to have a great impact on the reduction of stillbirths and identifying placental insufficiency.

ii) The Siyakhula study spans the period from the second trimester of pregnancy to 24 months postpartum and aims to identify immunological, nutritional, placental and developmental differences between HIV-infected and uninfected mothers/HIV-exposed and uninfected and HIV-unexposed and uninfected infants.

iii) Artificial Neural Network (ANN) in predicting Severe Acute Malnutrition. Similar to adverse perinatal outcomes, severe acute malnutrition (SAM) greatly affects many infants in LMICs . However, previous methods used to detect SAM children have been ineffective. ANN, which is a computing system, was trained using growth curve inputs and outputs to enable children who are SAM and at risk of SAM to be identified and therefore receive the appropriate treatment and interventions.

Data and evidence-based Responsive Research

The positive outcomes observed from the use of the Umbiflow™ device, have advocated the need for its routine implementation in antenatal care at primary healthcare level. The Umbi-Tshwane study aims to implement the device in Tshwane District's primary healthcare facilities for routine antenatal care. It is expected that its use in the Tshwane District will further highlight its usefulness in low- and middle-income countries, like South Africa, that experience high stillbirth rates and adverse perinatal outcomes even in an apparently low-risk pregnant population. Future research studies aimed at determining the aetiology of placental insufficiency will assist in discovering methods of prevention and remedies to prevent not only stillbirths, but the long-term postnatal adverse effects associated with placental insufficiency.

COVID-19 had an impact on the provision to and attendance of routine healthcare services

by pregnant women and infants, increasing the risk of maternal, perinatal, and infant morbidity and mortality. The Mphatlatsane project was implemented before and during the COVID-19 pandemic in South Africa, to improve maternal and child healthcare services across all levels of care. The study sites chosen were areas shown to have had below-average maternal and neonatal health care services. Upon the disruption created by the pandemic, the study design's agility allowed the healthcare workers to continue the provision of quality healthcare to mothers and children.

Collaborations and Partnerships

The Unit's multidisciplinary team comprises of researchers in the field of obstetrics and gynaecology, paediatrics, nutrition, immunology and statistics. The Unit's external collaborators are associated with specific projects which are already being conducted and those awaiting a response from funding applications.

HeLTi Study: The HeLTi (Healthy Life Trajectories Initiative) study, conducted by the University of the Witwatersrand, aims to study pregnancy and infant outcomes considering pre-conception, pregnancy and postnatal factors.

Aetiology of placental insufficiency:
A Wellcome Trust Discovery award application was submitted in December 2022. The study aims to determine the aetiology of placental insufficiency in healthy South African women to discover the cause of high stillbirth rates. Together with the Unit's team, the proposed study will include the collaboration of various experts: Prof Clive Gray (Department of Immunology, Stellenbosch University) and Prof Mushi Matjila (Department of Obstetrics and Gynaecology, University of Cape Town).

Siyakubona Project:The proposed study will include a collaboration with the South African Academy of Family Physicians (SAAFP), with whom a joint proposal was sent to the Bill & Melinda Gates Foundation (BMGF) in February 2023. The study will form part of a Butterfly 1000 probe partnership, which will focus on the implementation of routine antenatal POCUS examinations at the district level in South Africa.

Skills building through Capacity Development

An invitation to submit an expression of interest for a WHO-coordinated multi-country trial to evaluate the efficacy of probiotics formulations in improving mortality, morbidity and growth of vulnerable infants, was presented to the Unit, and the required documentation was subsequently submitted to the WHO. The senior researchers will be responsible for the overall co-ordination and oversight, planning and preparatory work, day-to-day on-site support, and mentoring. The project will be used as an opportunity to build the capacity of more junior researchers in the team so that they can independently conduct trials in the future. The same is true for the two other proposed studies (the placental insufficiency aetiology study and the Siyakubona study), which will actively be utilised to provide scientific projects for postgraduate students as well as to provide more junior members of the research group to actively become mentored into the running and oversight of such large clinical research projects.

Knowledge Translation for an informed society

The Research Unit has published an extensive number of articles in peer-reviewed journals, with these research outputs representing the various disciplines the unit is comprised of. In addition, the Unit has partaken in media engagements, which include articles and on-screen interviews. The media engagement between 2022/2023 includes articles published in the University of Pretoria's 'Research Matters', The Conversation Africa as well as preparing the 'Hands-On Anthropometry: A South African handbook for large-scale nutrition studies'. Training and standardisation manual. Furthermore, Prof Feucht was a guest in a live interview onNewzroom Afrika 405 with Mpho Sithole, DSTV, to discuss the 'Impact of COVID-19 on maternal and child health in South Africa' on the 13th of May 2022. In response to the current Lancet series on Breastfeeding, Dr Mulol has been asked to contribute to an article in the online publication Spotlight on the composition of breastmilk, its importance in child health, growth and development and her research on breastfeeding in South Africa. Upcoming in March 2023.

SAMRC/WITS Developmental Pathways for Health Research Unit

Unit director:

Prof. Shane Norris

Research fit for purpose

The Developmental Origins of Health and Disease Unit focuses on basic science, epidemiology, formative and intervention research in the area of Developmental Origins Health and Disease. This research is needed to address current research gaps and the complex burden of disease in South Africa. Importantly, our research model frames DPHRU's increasing focus on interventions contextualised by an understanding that all human development involves agency (i.e., *life choices, behaviours and actions*) and that carefully developed, sensitively-timed interventions which target common pathways and modifiable mechanisms have the potential to disrupt the consequences of current and past adversities on the health of both contemporary and future generations of South Africans.

Impactful Research Interventions

Several large studies were completed last year including the study entitled "Determinants of type 2 diabetes mellitus (T2DM) risk in middle-aged black South African (SA) men and women: dissecting the role of sex hormones, inflammation and glucocorticoids', funded by the SAMRC/Newton/GSK (co-PI: Micklesfield).

The identification of sex-specific relationships between adiposity and diabetes risk, with the association being stronger in men than women. This suggests that with increasing adiposity men will be at higher risk of developing diabetes than women.

In the first longitudinal study in Africans we showed that current Europid waist circumference cut points to predict dysglycemia and diabetes do not perform well in black South Africans, particularly women. We have proposed alternative cut points but these need to be verified in other cohorts.

Another study that was completed last year entitled 'Understanding the impact of HIV infection and its treatment on the effect menopause has on the musculoskeletal health of African women' had several key outputs including a paper published in the Journal of Bone and Mineral Research reported a 19.4% prevalence of osteoporosis of the femoral neck in women, and more than double the prevalence in HIV positive compared to negative women. This raises concerns about future fracture risk in South Africa, particularly in those infected with HIV.

Data and evidence-based Responsive Research

DPHRU actively drives publications from data collected and produced over 140 papers in the reporting period. The results from these publications are driving new projects in implementation science to address the NCD burden in South Africa.

Collaborations and Partnerships

We actively collaborate with both intra- and extra-mural SAMRC units, and extensively with colleagues in SA and internationally.

Skills building through Capacity Development

DPHRU continues to focus on building senior scientific staff capacity, as a team of scientists to lead scientific programmes within the Unit, as well as its data science team. Professor Shane Norris is a member of the Great Leap Forward programme at Wits Health Consortium, which aims to mentor academics through a 12-month programme of coaching to activate their entrepreneurship in developing their research programmes/Units. Over 40 emerging scientists have completed the programmed and Shane is supervising 3 PhDs linked to this initiative.

Professor Norris also initiated an Accelerated Postdoctoral Training Programme in 2021 with the first cohort of 4 South African postdoctoral fellows. The aim of this 2-year programme is to equip them to be at the senior researcher level in terms of NRF-rating, publications and academic CV within 2 years.

Knowledge Translation for an informed society

A collaboration project between Variant Bio and the Sydney Brenner Institute for Molecular Bioscience included the enrolment of participants from three AWI-Gen sites including Soweto. Samples were collected from 250 participants and in addition we worked with Variant Bio to engage with local community advisory boards to distribute benefits (approximately 10% of the project budget) to the participating communities. The process included compiling a list of organisations (NPO's) who were involved in the communities, selected by AWI-Gen participants. Three organisations were selected and will receive funding for various priorities that they have outlined.

Supplementary funding was received from a GCRF Impact development award (PI: Dr Sarah Drew, University of Bristol, co-investigator: Lisa Micklesfield) to develop information resources for women to improve their experience of menopause. We co-produced contextually relevant resources – booklets and poster – for women in Zimbabwe and South Africa (SA) to improve health literacy

Staff from the Healthy Life Trajectories Initiative Bukhali trial in Soweto.

Health Helpers from the Healthy Life Trajectories Initiative Bukhali trial in Soweto.

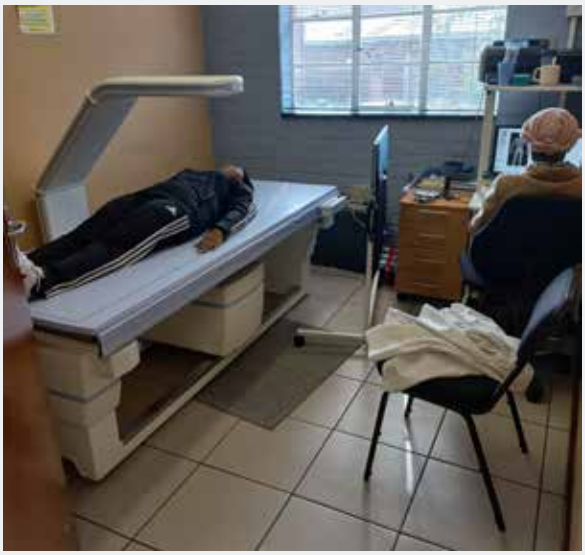
about menopause and health. Resources have been translated into several African languages and endorsed by the South African Menopause Society. Discussions have started with the AWI-Gen consortium (SA, Ghana, Burkina Faso, Kenya) to translate these resources into local languages and disseminate them across these African countries.

Finally, a piece in 'The Conversation' based on the publication by Dr Siphiwe Dhlamini entitled 'Why South Africa should introduce mandatory labelling for fast foods'. This paper was published in the South African Journal of Clinical Nutrition and has received extensive coverage both nationally and internationally.

The Lab Technician is currently analyzing HbA1c from whole blood samples.

The RX Daytona is used for analyzing glucose, lipids, creatinine and various other tests.

The DiaSorin analyser primarily used for Vitamin D analysis, also for other tests like insulin, Hep B and C-Peptide.



Technician preparing a participant and DXA machine to perform the whole body scan. The DXA scan is an imaging test that measures bone density (strength).

SAMRC/UCT Unit on Child and Adolescent Health Research Unit

Unit director:

Prof. Heather Zar

Research fit for purpose

The SAMRC Unit on Child and Adolescent Health focuses on some of the key issues affecting child and adolescent health in South Africa, Africa, and globally. The Unit conducts research on childhood pneumonia, tuberculosis (TB), HIV-associated illness, asthma and the developmental origins of child health including respiratory disease, neurodevelopment, growth, and non-communicable diseases. The overall aim of the Unit has been to develop better diagnostic, preventive, and treatment strategies to strengthen child health. To meet this aim, the Unit conducts studies that investigate epidemiology, aetiology, risk factors and mechanisms for development of health or disease and the long-term impact on health. The Unit promotes interdisciplinary work through many national and international collaborations to improve health of children. Capacity development is a core aim with training of staff and clinician scientists especially African and woman, infrastructure development and technology transfer.

Impactful Research Interventions

i) The Drakenstein Child Health Study (DCHS) has provided novel data on the causes, risk factors and burden of childhood illness and the long-term impact of early infectious exposures to inform child health interventions and policy. Key findings over this reporting period include: Klebsiella pneumoniae, which was associated with a substantial proportion of Lower Respiratory Tract Infection (LRTI), particularly in premature or HIV-exposed infants; 4 wheezing phenotypes were identified from birth to 5 years; LRTI and respiratory syncytial virus-LRTI, were associated

Child & adolescent Health study.

Blood drawn on infant/young child.

with increased risk of recurrent wheeze; recurrent wheezing was associated with lung function impairment; LRTI and recurrent LRTI were associated with lung function reductions at 5yrs highlighting the impact of early life LRTI on long term health; different thresholds of antibody protection for specific SARS CoV2 variants were identified in mothers and children; hybrid immunity (immunisation and natural immunity) was found to provide the highest protection; neurodevelopmental impairment and was common in children at 2yrs and associated with several exposures including: HIV, prenatal indoor air pollution, and tobacco smoke; maternal anaemia in pregnancy was associated with altered brain structure.

ii) TB diagnostics studies have contributed to further knowledge and efficacy of novel TB tests strengthening TB diagnosis enabling quicker effective therapy and contributing data that changed national and international guidelines. This includes participation in multi-country cohorts. Transcriptomic analysis has found that there are 6 genes that distinguish TB from other diseases with a high sensitivity (80%) and specificity (92.2%). These findings meet the minimum WHO Target Product Profile criteria for a non-sputum-based test that can be used in the later development of a rapid point-of-care test for children. Lung function data has shown that TB disease reduces lung function causing long term impairment.

iii) In the Cape Town Antiretroviral Adolescent Cohort (CTAAC), several key findings during this period include: a high prevalence of mental health impairment associated with food insecurity, alcohol use, childhood trauma, stressful life events and HIV stigma. Adolescents perinatally infected with HIV have accelerated aging as measured by epigenetic changes and evidenced by structural differences on Magnetic Resonance Imaging (MRI) neuroimaging, providing a possible mechanism for development of impairment. These highlight the importance of providing interventions, resources, and social support to caregivers and adolescents with HIV to improve their mental health.

Buccal swab of infant.

Drakenstein Child Health Study.

Drakenstein literacy programme.

Data and evidence-based Responsive Research

During the 2022/23 reporting period, data has been used to support the publication of 64 articles in peer-reviewed journals and >30 presentations at international conferences. High impact publications and dissemination of findings through international sharing platforms such as conferences ensure data can be used to inform policy decisions and considerations related to child health with a particular focus on diagnostics and prevention. Further, data has been provided to national or international databases contributing to national or international policies and guidelines.

Collaborations and Partnerships

The Unit facilitates collaboration with local, regional, and international Universities and institutions to ensure technology transfer, skills and capacity development. State of the art laboratory technologies and sophisticated data science skills have been built through collaborations with Imperial College London, UK, Harvard University, Boston University, University of California, USA, University of Chicago, Ann & Robert H. Lurie Children's Hospital (Chicago), University of Munich and the Borstel Laboratory, Germany, FIND Innovative Diagnostics, and the National Institutes of Health.

The opportunity to upskill staff and students in data science has continued through our collaboration with the Bill and Melinda Gates Foundation, the Knowledge Integration team and our partners at University of Western Australia to support the longitudinal analysis of nasopharyngeal colonisation and pneumonia from birth to 2 years of age, providing much needed insights into the nasopharyngeal carriage of organisms, the dynamics of carriage and the relationship of these with pneumonia incidence and aetiology. Additionally, capacity will be developed within a diverse set of Unit staff and students through an MRC-UK funded project with Imperial College, London in the Drakenstein Child Health Study data – enhancing and extending use of data. Collaborations through the COVID-19 pandemic continue with our collaborators at Imperial College, UK and Harvard, USA with immunological testing of COVID-19 specimens and modeling of data to develop thresholds of protection. Collaborations also included providing clinical diagnostics training of staff from the Mbeya Medical Research Centre, Tanzania, Instituto Nacional de Saude, Mozambique, University of Malawi, Makerere University, Uganda, the Christian Medical College Hospital, India, and local collaborations with the Western Cape Department of Health, Desmond Tutu Foundation and Stellenbosch University.

Lung function CTAAC study.

Lung Function TB study Red Cross Hospita.

Skills building through Capacity Development

The Unit continues to support capacity development in clinical translational science, supporting satellite sites and collaborating with international and local partners. A research site has been established in the Eastern Cape with much building of capacity. The core SAMRC unit has supported trained and skills development in multiple African sites including Malawi, Mozambique, Tanzania, as well as in > 20 sites in Brazil for childhood TB. Research has involved technology transfer, building of skills and training of many post-graduate students (47 postgraduate students currently enrolled, with a throughput of 74 postgraduate students over the past 5 years, mostly female (n=57)), with a focus on women and historically disadvantaged students. Transformation is also evident in the breadth and scope of work (encompassing diverse disciplines such as paediatrics and child health, microbiology, mental health, maternal health, public health, radiology, genetics, laboratory science) and the multi-disciplinary diverse composition of investigators, collaborators, and study teams. A large biorepository of samples with linked metadata has been established, strengthening capacity for translational, transformative research. Several staff members have advanced their careers through skill acquisition and collaborations including technologists, field workers, nurses, and doctors. An intern programme to upskill historically disadvantaged students after matric has been successfully piloted.

Knowledge Translation for an informed society

During the reporting period, findings have been disseminated through the publication of research in peer-reviewed journals (64 articles) , as well as through >30 presentations at international and local conferences. New information from studies has informed revision of national and international guidelines for child health and contributed to different policies on child health including TB management, HIV strategies, pneumonia guidelines. Educational webinars for health care professionals have included talks on RSV, COVID-19 in children and immunisation. Several interactions with media and the public have been held, with webinars and popular articles on childhood pneumonia, TB, RSV etc. Strong community engagement has been done in the Drakenstein Child Health Study, with a focus on COVID-19 literacy and immunisation.

A number of invites were received by the Unit to speak at national and international meetings; in this period the Unit Director gave 7 international and 4 national plenary talks, and chaired two plenary sessions, including one for the World Health Organisation with a focus on respiratory diseases in the COVID-19 era. The Unit Director serves on the South African committee think childhood TB to revise existing guidelines and chairs the WHO technical advisory committee on new RSV interventions.

Programme 3

HIV, AIDS, TB AND OTHER COMMUNICABLE DISEASES

PURPOSE OF THE PROGRAMME

To conduct research on preventing HIV and related co-morbidities including TB and other infectious diseases, such as malaria. It seeks to contribute to the national and international science system by testing TB drugs and malaria insecticides, carry out the AIDS Vaccine project through coordinating development and test HIV vaccines in South Africa, in partnership with our funders and our regional counterparts.

UNITS THAT CONSTITUTE THIS PROGRAMME

1. HIV and other Infectious Diseases Research Unit (IRU).
2. Centre for Tuberculosis Research Unit (IRU).
3. HIV-CAPRISA TB Pathogenesis and Treatment Research Unit (ERU).
4. Vaccine and Infectious Diseases Analytics Research Unit (ERU).
5. Centre for the Study of Antimicrobial Resistance Research Unit (ERU).
6. Antibody Immunity Research Unit (ERU).
7. Intersection of Communicable Disease and Infectious Disease Research Unit (ERU).
8. Office of AIDS and TB Research (IRU).
9. TB Platform (IRU).
10. Malaria Research Group (IRU).
11. Molecular Mycobacteriology Research Unit (ERU).

PROGRAMME STRATEGIC OBJECTIVES

- To increase the body of knowledge informing the development of the response to prevention and curative interventions for HIV, AIDS, TB and other communicable diseases.
- To increase the contribution to the national health system by maintaining national health research facilities that provide services for the prevention of HIV and related co-morbidities, including TB.
- To provide research grants to principal investigators responsible for HIV research in line with European and Developing Countries Clinical Trials Partnership (EDCTP) TESA mandate, provide financial support to researchers within neighbouring countries for training in laboratory and research techniques, utilising funds from sponsors and Unit savings.
- To provide leadership and coordinate activities for training and development of young scientists and employees at different levels and to work towards retention of critical skills and talent management thereof.
- To ensure appropriate training of clinical, laboratory and other research staff, and communities in and around the research sites.
- To increase the body of scientific knowledge through research translation into products, patents, papers, policy practice and health promotion (including to the general public) by organising meetings, seminars, workshops and conferences.
- To design and construct the most appropriate and promising HIV candidate vaccines for southern Africa and to increase the number of interventions developed for TB and HIV.
- To increase the body of scientific evidence that relates to testing and evaluating medical equipment and devices that are developed for the prevention of HIV and related co-morbidities.

RESEARCH HIGHLIGHTS UNDER THIS PROGRAMME

HIV and Other Infectious Diseases Research Unit

Unit director:

Prof. Charles Wiysonge

Research fit for purpose

The HIV and other Infectious Diseases Research Unit (HIDRU) contributes to reducing the burden of key infectious diseases, particularly HIV, COVID-19 and TB, in South Africa and globally. HIDRU engages in translational research, and study methodologies include clinical trials (phase 1-3), effectiveness studies, epidemiological studies, implementation science and socio-behavioural science. HIDRU's research accelerates the development of new or improved prevention and treatment strategies. These include testing the safety, pharmacokinetics and efficacy of chemotherapeutic agents, vaccines and antibodies, testing interventions that strengthen services for specific populations affected by HIV, TB, COVID-19 and STIs. HIDRU has three disease-specific research focal areas (HIV, TB and COVID-19) and 2 cross-cutting areas (socio-behavioural science; and maternal, family, child health and nutrition – MFCHN). The key research priorities in each area are: (i) Safety and efficacy of novel HIV vaccines – PrEPVac, HVTN 139, HVTN 142; (ii) What combination and formulation of pre-exposure prophylaxis will prevent HIV acquisition amongst young women? – HPTN 084, Gilead Purpose-1; (iii) Describing the epidemiology of the TB burden in our setting in preparation for the Phase 3 – M72 TB vaccine study – Gates MRI TB Epi; (iv) Treatment outcomes of pregnant women and infants with multi-drug resistant TB (MDR-TB); (v) Treatment outcomes and patient journeys in people with MDR-TB and HIV; (vi) Safety, efficacy and effectiveness of COVID-19 vaccines – SHERPA, Ensemble, CoVPN 3008; (vii) How can breastmilk transmission of HIV be eliminated? – PedMab; (viii) Effectiveness of interventions to improve the quality of maternal and new born health care, reduce maternal and child mortality and improve nutritional status – Mphatlalatsane.

Impactful Research Interventions

During the reporting period, HIDRU staff published over 50 articles in peer-reviewed ISI journals. HIDRU continues to conduct studies in partnership with the HVTN (HIV Vaccine Trials Network), HPTN (HIV Prevention Trials Network) and CoVPN (COVID-19 Prevention Network) networks, as well as EDCTP and Gates MRI. Of the clinical trials, CoVPN 3008/UBUNTU exploring the Moderna vaccine in HIV positive individuals completed enrolment at the Tongaat and Isipingo sites, exceeding their enrolment targets and then giving the bivalent booster to a subset of participants. This study will provide valuable insights into COVID-19 immunity in this immunocompromised population. HPTN 084/Life PrEP study of long acting Cabotegravir moved into the Open Label extension phase at 3 sites after cabotegravir was found to be highly effective and superior to Truvada as pre-exposure prophylaxis (PrEP) for young women leading to the licensure of Cabotegravir LA with SAHPRA in Dec 2022. Enrolment commenced into the Gilead Purpose-1 long-acting injectable Lenacapavir PrEP study at the Botha's Hill site in August 2022 and is expanding to 4 more clinical research sites at HIDRU – part of the 30 sites in sub-Saharan Africa. Long-acting PrEP is currently showing the most promise in turning the

Prof Wiysonge with Dr Spooner presenting Hlengiwe Cele, a Community Working Group member from the Tongaat Clinical Research Site, with a certificate of appreciation at the Annual Full Group Meeting.

Clifford Gcwensa, Botha's Hill Community Liaison Officer presenting at the Meeting to discuss the 2023-2028 NSP revitalization.

tide of HIV while work towards the discovery of an effective HIV vaccine continues. The Sisonke 4/ SHERPA study offered Moderna COVID boosters to health care workers, and enrolled 1130 participants across the 5 SAMRC sites, (8289 participants enrolled nationally). The conduct of the SHERPA study showed ongoing commitment to protecting the countries healthcare workers with this highly effective vaccine as well as contributing to collect ongoing data as COVID-19 transitions out of the emergency phase of the pandemic.

Data and evidence-based Responsive Research

Many COVID-19 studies contributed to the knowledge generation of vaccine effectiveness and the epidemiology of the disease and the Unit's focus is now shifting towards research with novel vaccine candidates and vaccines generated in the South African mRNA technology transfer Hub. Three Unit-initiated studies are underway to address gaps in knowledge of COVID-19 in school children, COVID-19 immunity in pregnant women, and COVID-19 immunity in immunocompromised patients without HIV. During 2022-2023 HIDRU continued generating new knowledge about COVID-19, through 24 peer-reviewed papers in high impact journals.

The Gilead Purpose-1 study is an important response to the HIV prevention challenge, offering 6 monthly injectable PrEP to potentially offer another option in sub-Saharan Africa where oral Truvada uptake has been suboptimal. We continue to partner with HVTN in exploring new HIV vaccine candidates for Phase-1 trials (HVTN 139 and HVTN 142).

In response to the global setback to TB control, our partnership with HVTN also includes TB vaccine studies in pre-adolescents, adolescents, and adults (HVTN 604 and HVTN 605) and we are in preparation for the Gates MRI Phase-3 M72 multi-country TB vaccine study in people living with and without HIV.

Collaborations and Partnerships

During 2022-2023, HIDRU worked closely with CAPRISA to complete the second year of the joint KZN Clinical Trials Unit (KZN CTU).

With a shared senior director of HIDRU and Cochrane South Africa, a socio-behavioural community of practice has been started between the 2 Units to strengthen this focal area.

The ongoing Sisonke study had its 4th study, SHERPA, implemented across 30 clinical research sites nationally (5 from HIDRU), where healthcare workers across the country were offered a Moderna vaccine booster. The Sisonke studies continue

to network across the public and private sectors, including the NDoH, Provincial Departments of Health (PDoH), public hospitals, CAPRISA, Right to Care, Discovery Health, MedScheme, Netcare, Life Health Care, Mediclinic, independent private hospitals, and other clinical research sites. These large-scale unprecedented partnerships continue to mine the data from this landmark implementation study, that vaccinated ~500 000 healthcare workers and explored boosting in subsequent Sisonke studies.

Additionally, HIDRU continues to collaborate on grant applications with the Global Antibiotic Research & Development Partnership (GARDP), Setshaba Research Centre (SRC), Gender and Health Research Unit (SAMRC), Institute of Infectious Disease and Molecular Medicine (University of Cape Town), National Institute for Communicable Diseases, and National Health Laboratory Services.

With regards to TB, the partnership with UCT and Médecins Sans Frontières (MSF) continues to investigate mortality and morbidity after successful TB and Rifampicin-resistant-TB. In partnership with the Department of Clinical Pharmacology of UCT and Liverpool University we continue to explore the pharmacokinetics of novel second-line anti-TB drugs in pregnant women and their infants. HIDRU continues its partnership with the SAMRC Centre for Tuberculosis Research, based at Stellenbosch University, to investigate the microbiome of pregnant women infected with RR-TB and their infants.

Cross training of community engagement stakeholders and staff occurred through the KZN CTU grant.

The Isipingo CRS is collaborating with AHRI on an HIV cure study in women offering BNAbs post seroconversion.

The HIDRU Botha's Hill Community Liaison Officer and the Community Manager continue to serve as chairperson and secretary of the KZN Research Sector, respectively.

Skills building through Capacity Development

HIDRU has a capacity development committee to review all staff applications for study support or seed funding to support Unit-initiated research. Four staff members were supported to attend a conference, 25 supported towards degrees/diplomas, and 12 registered for short courses. Furthermore, the Unit has an active mentorship programme that has been running for the past 18 months, coupled with a fortnightly research development programme where staff can receive feedback and support for self-initiated research. Approximately 45 staff have been matched with a mentor to learn a specific skill or plan for their personal career development. The remaining staff are mentored by their line managers and 15 staff were successful in interviews for promotions in the Unit. An additional 8 staff were successful in career progression and advancement. Additionally, all Unit staff participated in a communication masterclass and 2 communication workshops with a leadership coach.

Knowledge Translation for an informed society

As part of the HIDRU communication and results dissemination plan, participants, stakeholders, and community working groups received updates on key results of HIV, TB and COVID-19 research quarterly with the resumption of face-to-face meetings at site level and jointly for the annual Community Working Group event. Participant events were held per site for study updates and result dissemination. In addition, dissemination of research to collaborating stakeholders were also conducted, including the South African Department of Health (district, provincial & national levels), regulatory bodies, research organisations and trial participants. Senior Unit personnel are also active on various advisory committees and working groups at provincial, national international levels.

The annual update and MOA meeting with the KZN PDoH continued online and Ethekwini Health Unit was engaged and updated on HIDRU studies and upcoming studies. Symposia on the following topics were hosted by HIDRU: i) Interactions between COVID-19, HIV and TB; and ii) Children living with or exposed to HIV. The Unit also participated in webinars, press releases, policy briefs. Finally, multiple scientific presentations were conducted by scientists and non-scientists in the reporting period.

Centre for Tuberculosis Research Unit

Unit director:
Prof. Rob Warren

Research fit for purpose

The Centre for Tuberculosis Research (CTR) is a global partner in TB research. The CTR is now housed within the world-class Biomedical Research Institute (BMRI) at Stellenbosch University. The BMRI complex includes a Bioinformatics Hub, Electron Microscopy laboratory, Proteomics and FACS (Fluorescence-activated cell sorting) laboratories, Biosafety level 3 laboratory (BSL3) Laboratory, Biorepository, Clinical Research Unit, lecture and meeting facilities and modern office spaces. During the reporting period the CTR published 85 papers, 33 postgraduate degrees were conferred at the level of MSc and PhD, 17 projects were registered with national and international partners, and the societal impact teams managed four large community projects with ongoing research spanning the spectrum from basic to clinical often in collaboration with other SAMRC intramural units.

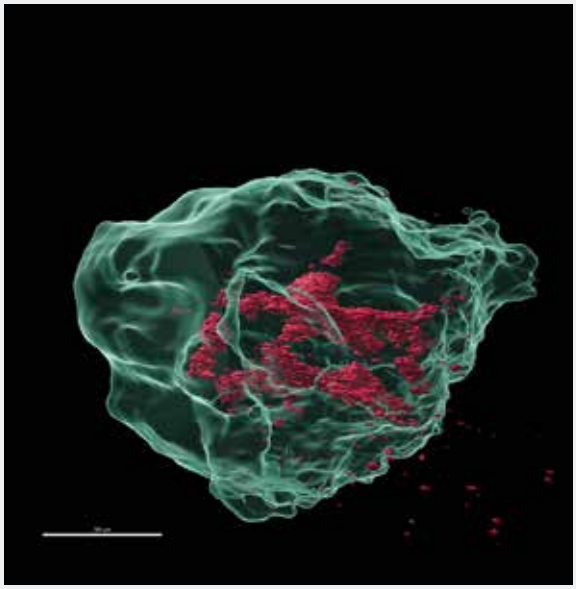
Stellenbosch University's new state-of-the-art Biomedical Research Institute is based on its Tygerberg Campus in Cape Town.

Impactful Research intervention

A key research focus area of the CTR is understanding the complex relationship between tuberculosis (TB) and the microbiome, as it could potentially lead to the development of novel methods for preventing and treating TB. Our recent findings demonstrate that prior to treatment, patients with pulmonary TB have a gut microbiome dominated by anaerobes that predict proinflammatory immune responses. First-line treatment induces long-term disruptions in airway and gut microbiomes, and TB lymphadenitis patients have distinct site-of-disease lymphotypes that correspond with unique clinical features. The

CTR is continuing to enhance its microbiome and multiomics expertise through ongoing collaborations (including the African Microbiome Institute – located alongside the CTR) and competitive international funding.

International Centre for Genetic Engineering and Biotechnology (ICGEB) colleagues at the 2nd African Microbiome Institute (AMI) Symposium held in Stellenbosch. L to R: Valter Nuailava; Ruvarashe Mhuruyengwe and Arielle Rowe.



3D volume render of a granuloma (cyan) including render of the infecting Mtb cells (red) imaged using light sheet fluorescent microscopy from H37Rv WT-infected group of C3HeB/FeJ mice at day 42 post-infection.

CAGE-TB (https://www.cagetb.org/) is led by scientists in the CTR with partners in South Africa, Uganda, Netherlands and Germany. This partnership works to develop a TB cough smartphone app that is trained using machine learning to identify unique TB cough sound signature. This technology is being developed by an all-African team using data from SA and Ugandan patients with the aim of making the eventual app free and especially applicable to African settings. This project aims to present a pilot version of this app with evidence to support use to large policy bodies like the World Health Organization and local TB programmes to inform further validation and uptake.

A study funded by the SAMRC entitled "CREDO – for CartRidge Extractor DiagnOsis" aims to develop a device that enables researchers to recover extracted material from various types of used GeneXpert cartridges for subsequent molecular testing, such as comprehensive drug susceptibility testing by whole genome sequencing, without having to collect additional specimens. This approach would be simple to implement in a routine diagnostic pathway as it is agnostic of downstream tests. In addition to patient benefits, this approach would save resources such as laboratory equipment, reagents and time by easily taking advantage of existing infrastructure already set-up for downstream testing.

Data and evidence-based Responsive Research

Large, multi-omics datasets are very expensive to generate, but, correctly managed and curated, may be used to answer numerous scientific questions and can form the basis of multiple post-graduate projects. Arising from past clinical studies, we have, together with our collaborators, accumulated a variety of such datasets including both human and pathogen whole genome sequences, high-dimensional flow and mass cytometry, multiplexed ELISA (Luminex) and metabolomics. These contain a wealth of information which is being used to interrogate biological mechanisms underlying aspects of disease susceptibility, pathology, and epidemiology, as well as develop predictive models for diagnostic and prognostic biomarkers. A relatively new and highly challenging approach in which we are currently engaged is to integrate these diverse datasets in systems biology studies such as expression quantitative trait loci (EQTL) to maximise the return on the investment that created them.

The results of these studies are subsequently used to formulate new scientific questions, leading to new studies, often with international collaborators, which ensure that we remain at the forefront of current scientific endeavour. Examples of current, large-data, studies are the PredictTB, TriageTB and ResistTB.

Collaborations and Partnerships

To maximise a diverse skillset, the CTR has created a network of national and international collaborators. During the reporting period, members of the SAMRC's CTR formed new collaborations with researcher and partners at: Walter Sisulu University of Technology, Institute Pasteur Madagascar, Centre for Epidemic Response and Innovation (CERI), Boston Medical Centre, CIRAD (France), University of Sao Paulo (Brazil), University of Venda, Biomedical Research and Innovation Platform (SAMRC), ProteinLogic(UK) Lifeassay Diagnostics Pty Ltd, DTTC, Imperial college, Center for International Health Research; Alpert Medical School of Brown University, Precision Biomarker Laboratories (California, USA), Sapient-bio (San Diego, USA): Harvard: collaboration, N1 City Hospital, Thembani Khayelitsha Surgical Centre and the University of California, San Francisco (UCSF).

M. bovis has been cultured from envirnomental samples taken from the banks of the river.

The COVID-19 Host Genetics Study investigators engaged with participants at the Annual General Practitioners Conference at stall sponsored by DIPLOMICS. L to R; Prof Desiree Petersen, Prof Marlo Möller and Dr Caitlin Viljoen.

Skills Building through Capacity Development

During this reporting period, CTR participated in 117 activities such as the CTR in workshops, conferences, webinars and training courses. These included 12 Keynote addresses, 31 oral presentations and 22 poster presentations.

Additionally, several CTR members attended various courses to build skills relevant to the needs of the Unit and its research.

The CTR has created a competitive funding programme where early career researchers (< 7 years after obtaining PhD degree) are encouraged to apply for funding to to provide researchers with an opportunity to generate baseline results for application to larger funding bodies. The calls are structured to enable the early career researchers to bring together researchers from different fields and aspects of research that are relevant to TB disease while also proposing applications that are achievable within the set timeframe. The aim is to help the early career researchers to foster collaboration, manage a small team, but also take responsibility for the timeline and output of the consortium formed. Every year, the CTR aims to make funds available to sponsor 2-3 projects.

In terms of graduations, during 2022 CTR had 45 students graduating with postgraduate qualifications, these included 12 BSc Hons, 18 MSc and 15 PhD students, with 34 of this cohort being females.

December 2022 Graduation. Front row L to R; Ms Jessica Cormick, Ms Monique Moldenhoff, Ms Fatima Kerven, Ms Sesethu Ketse, Dr Leanie Kleynhans, Dr Tariq Webber, Dr Carine Kunsevi-Kikola and Prof Andre Loxton. Back row from L to R; Dr Vuyo Mavumengwana, Dr Kudzanai Tapfuma, Mr Ludick Bezuidenhout, Ms Leka Sinegugu Mhlophe, Ms Nenekazi Masikantsi, Dr Yolandi Swart, Prof Marlo Möller, Dr Caitlin Viljoen and Mr Armin O'Connor.

Knowledge Translation for an informed society

The CTR members were involved in numerous societal impact activities countrywide in 2022. These included Community Engagement Initiatives such as the Philippi Village Science Open Day where the CTR was invited to participate in the first ever Science and Robotics Expo at Philippi Village as exhibitors. This community outreach project was geared towards engaging South African youth around the career opportunities in STEM, wherein 100 primary school learners (grade 5-7) from 10 different schools within the Philippi Village surrounding areas were invited to attend. The CTR involvement focused on general TB awareness, including transmission and signs and symptoms of TB, the role of research in management and eradication of TB, as well as the importance of early diagnosis and treatment adherence.

The CREDO device was designed by CTR members to extract useful material from used GeneXpert cartridges for downstream molecular tests, obviating the need for additional specimens, saving both the patient and healthcare system time and resources.

BMRI Clinical Unit team performing a bronchoalveolar lavage enabling innovative site-of-disease research. L to R: Prof Stephanus Malherbe and Dr Jane Shaw.

Malaria Research Group

Platform director:
Prof. Rajendra Maharaj

Research fit for purpose

The Malaria Research Group (MRG) aims to further the malaria elimination agenda set by the National Department of Health through appropriate research to fill in the gaps in our knowledge and to provide evidence in instances where the policy needs to be changed. The MRG is looking beyond the elimination to the eradication of malaria as a public health problem through collaboration, research, and innovation. The MRG works towards ensuring that all South Africans have access to quality, safe, effective, and affordable malaria interventions through timely and sustainable initiatives that reinforce the elimination agenda. As the country transitions from control to elimination, the role of the MRG is: (i) to generate new knowledge and tools to further the malaria elimination agenda and, (ii) to develop a platform for malaria scientists in the country and sub-region to share research information that contributes to the National Department of Health's elimination agenda. By getting students involved in malaria research, the MRG hopes to develop the next cadre of malaria researchers who over the coming years will take South Africa to the point where malaria has been eradicated.

Impactful Research Interventions

The following projects were undertaken by the MRG:

Insecticide Evaluations: The MRG is often approached by insecticide manufacturing companies to test the efficacy and validity of their products. During the 2022-2023 reporting period, the MRG conducted 3 such evaluations under laboratory conditions. Further evaluations of the insecticides were conducted under field conditions, to determine how effective these insecticides were in real life situations. Mosquitoes reared in the MRG insectary are exposed to a chemical product as per WHO protocols to determine the longevity of the active ingredients. The efficacy of the product is then determined over different time frames, but usually includes a full calendar year. The results and impact of these tests inform the Registrar of Insecticides on the suitability of the new active ingredients for effective malaria control in the country. This results in the registration of the insecticides for malaria control purposes if it satisfies the registration criteria.

Profiling the resistance and susceptibility status of the malaria vectors in the malaria endemic provinces of South Africa: A sentinel-site based study: Insecticides used by malaria control programmes in South Africa are no longer as effective as they used to be, due to malaria vectors becoming increasingly resistant to the chemicals used in insecticides. The study aimed to establish the insecticide resistance profile of vectors in the KwaZulu-Natal, Limpopo, and Mpumalanga provinces. The study was conducted at sentinel sites in endemic districts within each province. Adult mosquitoes were collected using various methods to obtain mosquito specimens that could be bred into the populations tested in the laboratory. This would occur once morphological examination classified the mosquito as a vector or non-vector. WHO resistance assays were conducted to determine how susceptible/resistant mosquitoes were to the insecticides currently used or planned for use in the country. These studies thus produced the evidence for decisions on choice of insecticide for use in the indoor spray programmes of the malaria control programmes.

Monitoring and evaluation in Mozambique. This project aimed to monitor and evaluate the quality

and impact of the implementation of indoor residual spraying (IRS) in three districts in Inhambane Province and a single district in Gaza Province, to determine the impact of IRS intervention on malaria transmission in the study area. Pre-spray (baseline) epidemiological and entomological variables were compared with post-spray variables. Baseline entomological and prevalence surveys were conducted at 24 sentinel sites across 4 districts. The potential impact of the project is the elimination of residual malaria transmission in KwaZulu-Natal, by controlling malaria transmission across borders, in source districts especially from Inhambane and Gaza provinces into KwaZulu-Natal.

Data and evidence-based Responsive Research

The MRG's work is data driven. All testing, monitoring and evaluations is based on data that is collected, collated, and analysed. The data of all projects determine whether an insecticide is good enough to be firstly registered and thereafter used as a prospective tool in malaria control programmes in South Africa. Considering that malaria vectors have become resistant to current insecticides being employed in the country, it is vital that new insecticides or new formulation of insecticides are available for use in indoor residual spraying which is the predominant tool in vector control in SA.

Responsive research must consider the views, ideas and needs of affected communities. The MRG undertook such an analysis by conducting Knowledge, Attitude and Practice (KAP) surveys in each endemic province in 2022. It was determined that there is a need for a more vibrant advocacy programme within the provinces.

The KAP survey also highlighted the number of people who travel back and forth across SA's borders. The MRG together with partners and provincial Departments of Health is exploring ideas as to how cross border transmission can be stopped. A main criterion for the elimination of malaria is zero indigenous cases whereas, eradication calls for the termination of both local and imported cases. The work on novel saliva-based diagnostics would greatly assist testing and treating at border crossings.

Collecting laboratory bred mosquitoes to continue with the mosquito colony.

Collecting adult mosquitoes using a mouth aspirator.

Collaborations and Partnerships

Interdepartmentally, the Group works closely with staff of the Biostatistics Unit for the interpretation and analysis of data from its various projects. The MRG collaborates and partners externally with several academic institutions such as the Universities of Pretoria, KwaZulu Natal, Zululand, Cape Town, and Western Cape. The partnership with the National Department of Health and especially the KwaZulu Natal (KZN) provincial department of Health is a jointly beneficial one where the KZN Malaria Control programme (MCP) assists with project field work and in return gains expertise and knowledge from MRG via capacity building and skills transfer. The knowledge that the KZN MCP have of the malaria endemic districts contributes to successful completion of projects of the MRG. Together the KZN MCP and the MRG work towards furthering the elimination agenda in KwaZulu Natal.

The MRG also works with Humana People to People in the three endemic provinces. The MRG's collaboration with CISM in Mozambique is assisting to decrease and eventually stop cross border malaria transmission. The relationship with CISM has been built over many years by the director of the MRG whose extensive knowledge and skills compliments in-country skills in Mozambique.

Skills building through Capacity Development

The four member MRG team has a diverse skillset. Regardless of each individual's specific abilities their responsibilities change continuously as per the needs of the Group and the projects being undertaken. Staff are mentored to build on their existing strengths and develop new skills to support the needs of the Group. In-house training and external training are provided as the need arises.

Using traps to collect wild mosquitoes.

Conducting WHO tests for insecticide resistance in mosquitoes

Mosquito larvae collection from pond.

Knowledge Translation for an informed society

Most of the MRG's work over the past year focussed on i) profiling the resistance and susceptibility status of the malaria vectors in the malaria endemic provinces of South Africa and ii) the monitoring and evaluation of indoor residual spraying in Mozambique. The results of these studies will be shared with funders, SA National and Provincial Departments of Health and relevant stakeholders. Since malaria vectors are becoming increasingly resistant to current insecticides being used in the country the results of this study will influence national malaria control policies and provide vital information on the susceptibility status of mosquitoes in each endemic province.

Initial results of the projects were presented at the virtual 7th Southern Africa Malaria Research Conference in August 2022.

Technician identifying mosquito species.

Introduction of new pumps for mosquito control.

The main insectary at the SAMRC offices in Durban.

SAMRC/CAPRISA/UKZN HIV-TB Pathogenesis and Treatment Research Unit

Unit director:

Prof. Salim S. Abdool Karim

Research fit for purpose

The CAPRISA-MRC HIV-TB Pathogenesis and Treatment Research Unit undertakes globally impactful research to reduce morbidity and mortality from HIV-TB co-infection. The Unit's research agenda is supported through external competitive grant funding and is upheld by research outputs.

Clearly aligned to the SAMRC Strategic goals, the five focus areas of the CAPRISA-MRC HIV and TB Pathogenesis and Treatment Unit are: Implementation science research to enhance translation of clinical trial evidence into effective integrated HIV-TB services to improve survival of HIV-TB co-infected patients, improving survival of HIV-TB co-infected patients through treatment optimisation, generating new knowledge on immunological mechanisms that correlate with the high risk of TB, as well with treatment outcomes in HIV-infected patients, impacting policies and practices aimed at reducing burden of the dual TB HIV epidemics and towards building research capacity and sustainability of health research in South Africa.

Impactful Research Interventions

i) TB associated morbidity and mortality in PLWHA. Recurrent subclinical tuberculosis among ART accessing participants: Incidence, clinical course, and outcomes demonstrates high incidence rates of subclinical TB in PLWHA and highlights the inadequacies of symptom-based TB screening in high TB-HIV burden settings. Data from this paper underscores the need for reconsideration of current TB screening and testing guidelines, i.e., use of TB symptoms alone for finding and treating TB cases vs targeted universal TB screening and testing for high-risk vulnerable groups.

ii) The rising incidence rates and mortality in drug resistant TB patients. Bedaquiline Adherence Measured by Electronic Dose Monitoring Predicts Clinical Outcomes in the Treatment of Patients With Multidrug-Resistant Tuberculosis and HIV/AIDS: demonstrated that high bedaquiline adherence (≥90%) compared to lower adherence was associated with improved rates of successful treatment outcome (83.4% vs. 46.3%, $p<0.001$), decreased mortality (11.0% vs. 29.6% $p=0.004$), improved retention-in-care (94.5% vs. 79.6% $p=0.002$), underscoring the urgent need for interventions to optimize bedaquiline adherence in order to maximally gain from the introduction of this new drug to the DR TB toolkit.

iii) High mortality in hospitilised TB patients, especially those in high care and ICU settings. The impact of enteral feeding and therapeutic monitoring of rifampicin with dose escalation in critically ill patients with tuberculosis study finding low rifampicin concentrations in all patients receiving continuous enteral feeding, median (µg/ml) rifampicin C-max fasted vs fed states: 5.1 vs 3.3, $P<0.0001$, with more patients achieving suggested target rifampicin concentration with TDM-guided dose escalation vs standard dosing:

83% vs 0%, P=0.004. Furthermore, the proportion of patients with low rifampicin concentrations in the fasted vs fed states was 80 vs100%, P=0.1336. TDM-guided dose escalation offers and effective strategy to achieve target drug exposure for improved outcomes in very ill TB patients receiving enteral feeding.

Data and evidence-based Responsive Research

The Unit adapts the latest published evidence, including cutting edge technologies, for public health research to address the critical problem of high TB morbidity and mortality among PLWHA in sub-Saharan Africa. Our recently funded NIH RO1 grants are examples of how the Unit uses data to make informed decisions on suitable health interventions, drive innovation and ensure that the research conducted is responsive to local public health priorities. Examples include:

i) TARGET-TB Study: Targeting TB transmission hotspots to find undiagnosed TB in South Africa: A genomic, geospatial, and modelling study.

ii) ADAP-TIV Study: Advanced Genotypic and Phenotypic Monitoring of Drug-Resistant MTB to Improve TB Treatment Outcomes.

iii) INSIGHT Study: INSTI's for the management of HIV-associated TB is a phase 2b study to evaluate the efficacy, safety & pharmacokinetics of twice daily Bictegravir/emtricitabine and tenofovir alafenamide (BIC/FTC/TAF) in ART-naïve PLWHA co-infected with TB, receiving rifampicin-based TB therapy.

iv) TRiAD study: Triage Test for All Oral DR-TB Regimen, A Phase 4 operational study funded by the EDCTP aims to evaluate the effectiveness, operational feasibility, acceptability, and cost-effectiveness of implementing the Xpert MTB/XDR for rapid triage and selection of all-oral regimens for DR-TB. This new technology for diagnosing drug resistant TB, reduces time to DR TB results from 20-30 days to 80 minutes, and promises to fill an existing DR TB diagnostic gap, and simply help treatment selection.

Prof Salim Abdool Karim represented the International Science Council in joining 10 eminent speakers at the opening session of the 10th edition of the EuroScience Open Forum (ESOF) 2022 in a discussion of the theme "Crossing Borders, Engaged Science, Resilient Societies", held in Leiden, Netherlands.

Prof Salim Abdool Karim was the keynote speaker at the University of Botswana's 20th Annual Foundation Fundraising Dinner.

Left to right: Prof Salim Abdool Karim, CAPRISA Director; First Lady of Botswana Neo Masisi; Prof Quarraisha Abdool Karim, Associate Scientific Director and Dr Mokgweetsi Masisi, President of Botswana.

Prof Lenine Liebenberg discusses soluble protein concentrations in genital fluid with Ms Nonsikelelo Ndlela in the CAPRISA Mucosal Immunology laboratory.

Prof Kogie Naidoo delivered a plenary titled: "State of the art: New TB regimen for Treatment and Prevention", at the opening session of the 7th SA TB conference in Durban.

Collaborations and Partnerships

The Unit has collaborations with the Division of Clinical Pharmacology, University of Cape Town and Department of Paediatrics and Child Health, King Edward VIII Hospital, University of KwaZulu-Natal, Durban, South Africa for the clinical study. Pharmacokinetics of twice or once daily DTG (50mg) in children with HIV and TB – AHRI – Consequences of HIV and TB Co-Infection on COVID-19 Disease Dynamics, Severity, and Immune Responses, COMMIT-KZN consortium in Collaboration with Dr Alex Sigal, and CERI/KRISP – Collaborative Publications with Prof S Karim and Prof T de Oliveira.

Global Virus Network added CAPRISA as a Center of Excellence. The GVN represents 68 Centers of Excellence and 10 Affiliates in 36 countries comprising foremost experts in every class of virus causing disease in humans. Rollins School of Public Health, Emory University to understand the role of geospatial, genomic and social networks in casual contact and migration in XDR transmission.

Sisonke/SHERPA: CAPRISA provided scientific leadership through contributions by CAPRISA scientists. Dr Nigel Garrett and Dr Nonhlanhla Yende Zuma in the Sisonke/Sherpa study design, implementation oversight and analysis and publications.

Skills building through Capacity Development

Professor S Abdool Karim previous chair of the SA MAC on COVID-19, provided leadership, guidance, epidemiologic and scientific updates to the SA cabinet, governments in several countries and the people of SA. Professor S Abdool Karim provides weekly epidemic intelligence reports that summarises the SA pandemic from the view of policy makers, scientists and implementers.

In terms of capacity development, during the reporting period, 2 MSc degrees were completed, with 2 PhD candidates submitting their theses, whilst 7 PhD studies are still ongoing. The Unit also hosts 2 post-doctoral fellows and 3 Post-doctoral trainees, respectively.

Knowledge Translation for an informed society

CAPRISA has been impacting science through policy, guideline development and practice to relevant stakeholders and the public community. In this reporting period Prof Salim S Abdool Karim participated in the WHO science council meeting in Geneva, represented the International Science Forum in EuroScience Open Forum, presented at the Gairdner Science Week at the University of Montreal, was keynote guest speaker at the University of Botswana's Foundation Gala.

Dr Nonhlanhla Yende Zuma was invited to serve of the scientific advisory board of the Vaccine and Immunology statistical Centre, and Prof Kogie Naidoo delivered a plenary at the 7TH South African TB conference, the 5th 9th FIDSSA Congress, the 2022 McGill Summer Institute in Infectious Diseases and Global Health conference, INTEREST conference 2022, and the African Society for Laboratory Medicine 2022.

With regards to Science Citizenship, Professor Salim Abdool Karim: UNAIDS Advisory Group (to the Executive Director of UNAIDS), International Science Council, WHO Science Council, WHO HIV, TB Task Force, Human Reproduction Programme Advisory Group, Global Solidarity Covid19 Treatment and Vaccine Trial Executive Committee, Gates' Foundation Scientific Advisory Board for Global Health, PEPFAR Scientific Advisory Board, African CDC Consortium for COVID 19 Vaccine Clinical Trials (CONCVACT), Africa Union Commission on COVID-19.

Prof Kogieleum Naidoo: WHO Clinical guideline committee, SA TB Recovery Plan Working Group, National TB Think Tank, National Strategic Plan for TB, HIV, STI's TB Technical working group, South African National Drug Resistance TB Advisory Committee, Board member of SA HIV Clinicians Society, Chair Data Safety Monitoring Board of the Kharituwe study and Dolphin 1-3 study, Data Safety Monitoring Board member of the Triage TB and End TB Studies, Elected member of the Academy of Sciences of South Africa.

Dr Rubeshan Perumal: WHO Working Group on Care Pathways for Long COVID, National Discovery COVID-19 Expert Panel, NIOSH Long-COVID consultant, National position statement for Long-COVID, Developed NICD website for Long-COVID, City of Cape Town ICU Lead for Intensive COVID-19 care support, Technical Guidance for SA Society for Occupational Medicine for Occupational Long COVID.

Dr Nesri Padayatchi serves on the Ethics Advisory Group of the International Union Against TB and Lung Disease (IUATLD), South African National Drug Resistance TB Advisory Committee.

In terms of Stakeholder Engagement, Mr Patrick Mdletshe Head of CAPRISA's Community Programme chairs the SANAC Undetectable = Untransmittable National Dialogue Session, the KwaZulu-Natal Provincial Council on AIDS (KZN PCA) and the KZN Civil Society serves on the National Strategic Plan for TB, HIV, STI's Technical working group. Mr Mdletshe facilitates regular and rich engagements between scientists and relevant stakeholders, civil society and community leaders.

WITSVaccines and Infectious Diseases Analytics Research Unit (VIDA)

Unit director:

Prof. Shabir Madhi

Research fit for purpose

Wits Vaccine & Infectious Diseases Analytics Research Unit of the University of the Witwatersrand, or 'Wits VIDA' is focused on the: i) clinical and molecular epidemiology of vaccine preventable disease, ii) clinical development and evaluation of vaccines, iii) study of the immunology of vaccines including in people living with HIV, iv) and basic science research aimed at discovering vaccine candidates. Since 2017, the Unit has also established a health and demographic surveillance (HDSS) platform to understand the context in which infections occur, and how population dynamics are affected by disease trends, both in children and pregnant women. The HDSS platform also provided an integral platform to understand COVID-19 epidemiology, and the direct and indirect effects of COVID-19 across all age groups, including excess mortality; we explored social-behavioural science research around motivations and barriers to vaccination.

Over the past two years, VIDA has been at the forefront of COVID-19 vaccine research in Africa, having spearheaded the first two COVID-19 vaccine studies undertaken on the continent, and more recently driving next-generation vaccine research. Wits VIDA also has a sequencing facility that has provided new opportunities for research and surveillance of drug-resistant bacteria with a specific focus on Klebsiella pneumoniae and Acinetobacter baumannii.

Impactful Research Interventions

i) New generation COVID vaccines – Wits VIDA has done extensive work on evaluating the safety, immunogenicity, efficacy and effectiveness of COVID-19 vaccines. These include,

- A Phase 1 SARS-CoV-2 vaccine study to assess the safety and tolerability of a vaccine candidate administered in healthy adult participants and people living with HIV
- A phase 1/2 open-label study assessing the safety, reactogenicity, and immunogenicity of saRNA COVID-19 boost vaccines in participants that have been previously vaccinated against or previously infected with COVID-19
- A phase 1/2 study to evaluate the safety, reactogenicity and immunogenicity of three investigational vaccines developed to address the SARS-CoV-2 virus and all developed on the same RNA manufacturing platform

ii) Maternal immunisation (GBS and RSV):

- GBS: Investigating for immunological correlates of protection against invasive Group B streptococcal disease in infants less than 90 days of age. Neonatal deaths contribute around 46% of all deaths in children under 5 years of age, and GBS is the leading cause of sepsis and meningitis in neonates. The data collected from this study can help contribute towards the licensure of a maternal GBS vaccine.

- RSV: a phase 3, randomised, double-blinded, placebo-controlled trial to evaluate the efficacy and safety of a respiratory syncytial virus (RSV) prefusion f-subunit vaccine in infants born to women vaccinated during pregnancy. If approved, this RSV vaccine candidate could be the first maternal vaccine available to help prevent this common and potentially life-threatening respiratory illness in young infants.

iii) Child Health and Mortality Surveillance Programme (CHAMPS)

In year eight of this ten-year programme, the CHAMPS programme office consolidated data from seven LMICs to determine cause of mortality in children less than five years of age. Approximately one third of all under five deaths occur in the first 28 days of life, with prematurity, intra-partum events and infections contributing to most of the deaths in this age group. Furthermore, 75% of all stillbirths are due to maternal factors that cause intra-uterine hypoxia. Considering these findings, the programme has focused on creating opportunities and interventions that can reduce childhood death.

Data and evidence-based Responsive Research

- Wits VIDA conducts clinical research studies that generate evidence-based knowledge for improving lives, developing novel vaccines, and advancing medical science. The unit has extensive experience in research in qualitative and quantitative data collection. The quality of our data is the cornerstone of our research integrity. To make informed decisions, drive innovation, and ensure responsiveness of the research conducted, Wits VIDA follows a systematic and rigorous approach that involves several key elements:Wits VIDA has developed well-defined research focal areas that have been developed in consultation with internal and external stakeholders and are regularly reviewed to remain relevant and responsive to emerging needs and priorities, that consider scientific merit, feasibility, potential impact, and ethical considerations. It further involves input from a multidisciplinary team of experts and through Good Clinical Practice that ensures the quality, accuracy, and completeness of research data, overseeing procedures for data entry, cleaning, coding, and analysis, as well as mechanisms for ensuring data security and privacy.
- We further have a system for monitoring and evaluating the progress and outcomes of research projects. This includes regular reviews of study protocols, data quality, and adherence to ethical and regulatory requirements. It involves tracking and reporting of key performance indicators, such as recruitment and retention rates, adverse event rates, and study completion rates.
- The unit has recently embarked on various unit-led and collaborative studies leveraging our Health Demographic Surveillance System to address the immediate potential for community impact interventions such as: malnutrition in infants, health-seeking behaviours during pregnancy, and barriers to vaccination.

Collaborations and Partnerships

At VIDA we foster a collaborative culture that encourages communication, information sharing, and cross-functional teamwork. Our interdisciplinary teams comprise of members from different departments with diverse skillsets. This ensures that all perspectives are considered and that our research is approached from different angles. We aim to promote technology such as project management tools that can be used to track progress and communicate updates, ensuring that our teams are well-connected and can work collaboratively.

Our Collaborations include: Setshaba Research Unit, Nantworks,Council for Scientific and Industrial Research (CSIR), Ministry of Health of the Kingdom of Eswatini, The Luke Commission, London School of Hygiene and Tropical Medicine, Columbia University, The Vaccine Confidence Project, ASSURE (African Social Sciences Unit for Research and Evaluation), Monash University, Dalhousie University, Malawi Wellcome Trust, Oxford University, Centre of Excellence for Biomedical TB Research, Botswana Harvard AIDS Institute, PATH, Wits Rural Campus – Agincourt, University of Kwazulu-Natal, University of Pretoria, University of Cape Town, Wits RHI and Next Bioscience.

Skills building through Capacity Development

Wits VIDA invests in the education and training of its employees and students at all levels. Needs may be identified with employees during performance reviews, skills audits and/or training needs analyses, or in conjunction with specific projects or research

Dr Sana Mahtab attends the 2nd Global Forum on Childhood Pneumonia

CHAMPS panel at the 2nd Global Forum on Childhood Pneumonia

Wits VIDA team members collaborating with local clinics enhancing maternal education

agenda. In collaboration with the University of the Witwatersrand and Wits Health Consortium, VIDA has conducted several training sessions and supported courses and studies throughout the reporting period. We further focus on ongoing coaching and mentoring of employees, researchers and students and facilitate and actively support the transfer of skills in the workplace. While training and development is approached in a targeted, strategic manner to ensure that it supports the Unit's research objectives and aligns with limited budgets, the Unit also has a talent development strategy that will create sustainability in the Unit and field (such as data analysis and management, research coordination, development of scientists, demographers, field health research leadership, and epidemiologists). The Unit encourages employees, researchers, and students to play an active role in the identification of their own developmental needs and a commitment to the participation in and ownership of training and development programmes to ensure the success of training and development interventions.

Knowledge Translation for an informed society

In addition to providing regular feedback to donors, collaborators, and other research stakeholders, Wits VIDA's commitment to community and broader stakeholder engagement extends through all research streams. Community engagement is supported by a dedicated team of community liaison officers and counsellors who work closely with our field research and clinical trial teams. VIDA regularly convenes our two established Community Advisory Boards meetings to provide research feedback and discuss new studies. Additional advisory and dissemination groups are convened around specific studies (e.g.,vaccination motivations feedback to provincial government groups).

Translating clinical research findings effectively to external stakeholders and the public is crucial in ensuring that the research results are understood, appreciated, and utilized to improve health outcomes. Wits VIDA regularly engages the public through our website, Wits University platforms, targeted press releases and media interviews. VIDA's social media presence and engagement continues to grow through a targeted content and outreach strategy.

Office of AIDS and TB Research

Office director:

Dr Fareed Abdullah

Research fit for purpose

Tuberculosis (TB) remains one of the most significant infectious causes of mortality and morbidity worldwide and it is the number one cause of death among those infected with HIV. Major research needs span from basic research to identify biomarkers that accurately predict outcomes of active and latent TB to clinical research to measure efficacy and effectiveness of new tools and strategies for TB. To meet this need, the National Institute of Allergy and Infectious Diseases (NIAID) created the Regional Prospective Observational Research in Tuberculosis (RePORT) International programme to support the establishment of regional RePORT consortia in cooperation with host countries.

The mission of the Regional Prospective Observational Research for Tuberculosis (RePORT) International is to advance tuberculosis (TB) science globally, with emphasis on translational research to provide new tools for TB control. To do this RePORT International promotes harmonization of data across the RePORT consortia and development of TB research capacity and infrastructure.

RePORT International represents a consortium of regional cohorts (RePORT India, RePORT Brazil, RePORT South Africa, RePORT Indonesia, RePORT Philippines, RePORT China, and the latest member – RePORT Korea) that are linked through the implementation of a common protocol for data and specimen collection and are poised to address this critical research need. Each RePORT network is designed to support local, in-country TB-specific data and specimen biorepositories and associated research. Taken together, the expected results include greater global clinical research capacity in high-burden settings, and increased local access to quality data and specimens for members of each network and their domestic and international collaborators.

On 7 and 8 September 2022, RePORT South Africa, in collaboration with the University of Cape Town, CRDF Global, the TB RePORT International Coordinating Center, Rutgers University, and sponsored by the SAMRC and the National Institutes for Health USA, hosted the 6th International RePORT Meeting at the Table Bay Hotel in Cape Town South Africa.

The first day of the meeting started with an overview of TB priorities and updates, presented by the SAMRC and NIAID, as well as presentations by scientists in the field on the importance of pathogen surveillance, biomarkers for childhood TB, subclinical TB disease, biomarkers to predict TB treatment duration, TB drugs, and the TB diagnostic pipeline. In the afternoon, the regional RePORT networks each presented an update on RePORT related research in their country. The second day saw more presentations and updates by RePORT scientists on their respective studies, followed by presentations by junior investigators from each of the regions. The meeting was closed with a discussion on future work and commitments of TB RePORT.

RePORT South Africa, in collaboration with the University of Cape Town, CRDF Global, the TB RePORT International Coordinating Center, Rutgers University, and sponsored by the SAMRC and the National Institutes for Health USA, hosted the 6th International RePORT Meeting at the Table Bay Hotel in Cape Town.

TB Think Tank

The TB Think Tank (TB TT) was established in 2014 at the 4th South African TB Conference in an effort to strengthen the government's programmatic TB response. TB TT is a national network of TB experts who advise the National Department of Health on evidence-based TB prevention and control policy and programmes, chaired by the Chief Director of the NDoH's TB Cluster Dr Norbert Ndjeka and co-chaired by the Director of the Office of Aids and TB (OATB Dr Fareed Abdullah. In addition to NDoH representatives, the TB TT consists of a wide range of TB and TB-HIV stakeholders, including public-sector health practitioners, researchers, implementing and donor organisations, civil society and private sector. The SAMRC provides core funding together with USAID and CDC.

The purpose of the TB Think Tank (TBTT) is to build a bridge between the incredible TB research community that we have in South Africa and the Department of Health. For the Department, it is a vehicle to draw on available local expertise to strengthen the National TB Control Programme (NTP). For the research community, the TBTT is the best way to translate our research into practice by recommending policy changes based on the latest evidence for which we all work so hard to produce.

Representatives from the NDoH identify annual priorities for the TB TT, and members, through individual technical Task Teams, collectively prioritise key activities. The TB TT functions through an Executive Committee responsible for delivering its mission and mandate. A Secretariat manages the day-to-day activities and the administration of Task Teams. Each Task Team is responsible for the

execution of specific work plans and enables broad-based stakeholder representation on the TB TT.

In the financial year 2022-2023, The TB Think Tank delivered the following outputs:

1. The TBTT hosted a satellite session at the SA TB Conference.

Dr Priashni Subrayen presented an overview of the TB Think Tank's vision, mission, and goals, describing how we aim to harness expertise and brainpower in the National TB Programme, the scientific community, civil society, and beyond to end TB in South Africa". She further discussed the structure of the Think Tank along with the roles of the task teams. Delegates were invited to visit the TB Think Tank's newly launched website www.tbthinktank.org and follow its Twitter account to stay updated on activities and developments.

Mr Abenathi Mcinziba presented one of the Think Tank's completed outputs: preferences for TB Preventive Therapy (TPT) among South African children, adolescents, caregivers, and health workers. Ms Erika Mohr-Holland presented on Occupational Health and Safety (OHS): The considerations regarding TB Screening for Health Workers (HWs) in South Africa. Prof Sizulu Moyo presented the landscape of shortened regimens for drug-sensitive TB in South Africa.

2. National TB Recovery Plan

The TBTT completed the preparatory phase of the plan, which is the first of the two phases of the TB recovery plan. The plan is currently under implementation phase where its activities are being rapidly scaled up, with continuous monitoring and support from the TBTT, TB recovery ad-hoc task team.

The TBTT hosted a satellite session at the SA TB Conference. Dr Priashni Subrayen presented an overview of the TB Think Tank's vision 2022-2023 financial year.

3. Republic of South Africa National Tuberculosis Programme Strategic plan 2023–2028

The TBTT provided extensive inputs into the next National TB Programme Strategic plan 2023–2028. Ahead of the Durban TB Conference in July 2022, the TB TT met in-person to share key updates and strategic direction following extensive consultations with Provincial and National Departments of Health. The meeting aimed to:

- Identify key examples of successful models that provinces can build on to achieve the objectives (much of this work has been done by TBTT Task Teams, but may need some reframing/revision)
- Decide on a minimum set of indicators to achieve objectives
- Collate a list of key references to include in the document
- Discuss potential short-term commissioned work that could ready the landscape for NTP-SP release and implementation

The Strategic Plan is scheduled to be released early in 2023.

4. Latent TB Treatment guidelines

The TBTT provided input to the guidelines, especially Prof Harry Housler and the entire TB Prevention Task Team. The guidelines were approved by the NDOH in July 2022.

French National Order of Merit:Dr Fareed Abdullah and Professor Helen Rees were recently appointed to the French National Order of Merit by French President Emmanuel Macron.

ANRS

The French Agency for Research on AIDS and Viral Hepatitis (ANRS) funds research projects and provides grants in all areas of HIV/AIDS and hepatitis research. The ANRS defines scientific priorities and mobilises researchers of different institutions and disciplines through coordinated actions, which generate momentum in scientific deliberation and organisation, team synergy, and new research projects.

ANRS emerging Infectious Diseases, founded on January 1, 2021, is an autonomous agency of Inserm whose missions are to facilitate, evaluate, coordinate, and fund research into HIV/AIDS, viral hepatitis, sexually transmitted infections, tuberculosis, and emerging and re-emerging infectious diseases (emerging respiratory diseases, including COVID-19, viral hemorrhagic fevers, arboviruses).

The agency covers all areas of research: fundamental, clinical, public health, human and social sciences, placing the accent on innovation and the strengthening of international partnerships.

With its One Health approach focused on human health, animal health and human impact on the environment, the agency is preparing a response to the scientific challenges presented by emerging diseases and for the deployment of that response in times of crisis.

ANRS | Emerging Infectious Diseases is under the authority of the Ministry of Higher Education and Research and the Ministry of Solidarity and Prevention, and directed by Prof. Yazdan Yazdanpanah.

The agency federates and facilitates a number of national and international networks of researchers and doctors employed by the principal research organizations, universities, hospitals, and associations. Patient associations and civil society representatives have a prominent place within the organization of ANRS | Emerging infectious diseases.

French National Order of Merit

Dr Fareed Abdullah and Professor Helen Rees, two South African medical practitioners with a long history of working for better healthcare and human rights within South Africa and the global community, were recently appointed to the French National Order of Merit by French President Emmanuel Macron.

In the realm of health and human rights, both Dr Fareed Abdullah and Professor Helen Rees have been a consistent and dedicated presence within South Africa and the international community for more than 25 years. They have shaped healthcare policies and responses, riding out periods of turbulent change in the form of the HIV/Aids crisis and, more recently, the Covid-19 pandemic.

In a decision taken by French President Emmanuel Macron on 7 February and announced on 22 February, Abdullah and Rees were appointed as Knight of the French National Order of Merit and Officer of the French National Order of Merit, respectively.

Abdullah, the director in the Office of Aids and TB Research at the South African Medical Research Council, was appointed a Knight of the French National Order of Merit for his involvement as a clinical researcher and public health specialist in the fight against HIV and tuberculosis, according to a letter issued to Abdullah by Lechevallier.

Health systems Strengthening

Developed a three-year strategy for the Steve Biko Academic Hospital as one of the 10 central hospitals in the public sector in South Africa, the Steve Biko Academic Hospital shoulders the important responsibility of providing apex health services for approximately 8 million people in its catchment area in addition to providing a platform for the training of medical and nursing personnel in the allied and related health professions. The mission of the hospital states that it has responsibility to support research across all the disciplines involved in the facility.

In addition to its core responsibilities, the hospital contributes to the overall leadership and operational functionality of the health service at cluster, district, provincial and national levels.

The management team believe that people are their greatest asset and an investment in creating a fulfilling and supportive environment for their personnel and systems in the hospital that facilitate efficiency and the effective delivery of services to our clients, will be the secret of the success of the hospital.

The purpose of the Strategic Plan is to chart the way towards fulfilling the hospital's mission and improving all aspects of functioning and effectiveness of the hospital whilst managing limited resources better. It is testament to the leadership of management and clinicians at Steve Biko Academic Hospital that planning is combined and based on mutual respect and collaboration, considering our joint needs and always putting the quality of care for our patients first.

The strategy was developed through a two-day workshop where different stakeholders from within the hospital and referral hospitals worked together to plot a way forward that would enable them to realise their goals. The plan identified short-, medium- and long-term plans and identified persons responsible.

The management team signed the document to demonstrate their commitment to work together to execute the bold and creative ideas that have planned for the hospital.

Pillar 6 of Presidential Health Compact

The OATB represents the SAMRC on the Committee that monitors the implementation of the Presidential Health Compact signed in 2018. Working with the National Department of Health, Treasury and the Public Policy Project, a report was produced on the state of financial management and budget and expenditure trends in the nine provincial health departments.

NACI

The OATB represents the SAMRC on the Task Team set up by the National Advisory Council on Innovation to review and recommend policy reforms for primary health care in the context of the National Health Insurance planned for the country. The committee submitted a report to the NACI who will then submit a report to the National Minister of Science and Technology.

COVID related Research

Feasibility and acceptability of a COVID 19 vaccination site for patients at Steve Biko Academic Hospital.

Given the COVID-19 vulnerabilities among people with NCDs, HIV and TB, these highly vulnerable groups can benefit from vaccinations. South Africa had made concerted efforts to vaccinate people with varying degrees of success across the country with South Africa, with easy access to convenient vaccination delivery playing a crucial role in limiting the success of these efforts. People with NCDs, HIV and TB visit hospitals regularly for their check-up and collection of medication and can therefor benefit from vaccination during their hospital visit. The aim of this project is to pilot COVID-19 vaccine provision as part of the in-patient and out-patient services at the Steve Biko Academic Hospital (SBAH) in Tshwane.

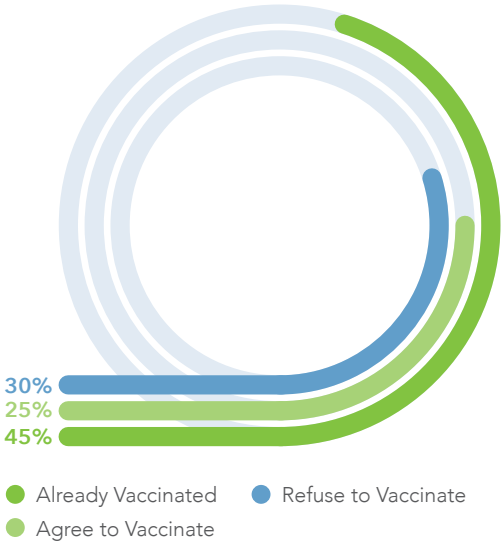
The opening of a vaccination site at SBAH is expanding the service delivery platform for the government vaccination access programme, ensuring access and increasing coverage for vulnerable groups. A vaccination site was set up on the ground floor of SBAH, close to the main entrance/exit where it attracted attention from patients entering and exiting the hospital and those collecting their medication from the pharmacy. The site operates the following: pharmacy, recruitment and counselling, registration and verification area, waiting area, vaccination area, observation area, and an emergency area.

The study team works in collaboration with the clinical teams at the hospital to recruit patients attending routine out-patient clinics. From the clinics, the majority of patients access the pharmacy to collect medication. The vaccination site will be positioned on the same level as the pharmacy, on-route to exit the hospital from the pharmacy. This location is strategically chosen to increase the probability of uptake. Administrators will be available at the site to register first time vaccinatees in real-time on the Electronic Vaccine Data System (EVDS) and assist with finding already vaccinated on the EVDS system for booster vaccinations.

The vaccination service was started as a pilot at the end of June 2022 and was then expanded once the pilot was successful. It was extended to mid-December before being started again in mid-January, when the service was expanded from three to four days a week. In the beginning a lot of work was done to raise awareness of the service and to ensure that access was easy and convenient. To date the service has optimised its functioning and been able to recruit 1,259 clients (565 males and 694 females) for vaccination as of 3 March 2023.

The initial review of 1964 engagements of the clinical associates with patients in the hospital showed the following responses from clients about their past vaccination status and their willingness to vaccinate.

COVID Vaccines Counts/Frequency



Whilst the qualitative data collection for this study has already been collected, we will still collect data till the end of the programme, expected to be mid-May 2023.

The following diagrams show some of the workers and activities:

Evaluating the humoral and cellular immunological responses to SARS-CoV-2 vaccinations administered to patients with severe immunosuppressive chronic medical conditions in Tshwane, South Africa.

Steve Biko Academic Hospital COVID-19 Vaccination site.

Evaluating the humoral and cellular immunological responses to SARS-CoV-2 vaccinations administered to patients with severe immunosuppressive chronic medical conditions in Tshwane, South Africa SARS-CoV-2 vaccinations have been shown to stimulate both humoral and cellular immunity in vaccinated individuals. Together with immunity from prior infection, vaccinations have significantly reduced rates of severe disease and death and demonstrated some protection against transmission, re-infection and long-COVID.

A literature search of studies done mostly in the developed world have shown muted immunological responses in certain disease categories including autoimmune diseases, malignancies, chronic kidney disease and advanced HIV.

Very little is known about the immunogenicity of COVID vaccines in people with severe chronic immunosuppressive medical conditions in the South African or sub-Saharan African context. In this study, we aim to evaluate vaccine immunogenicity in these groups in a tertiary hospital setting. In addition, we aim to add to the knowledge of the humoral and cellular immunogenicity in patients with untreated or advanced HIV as this is such a large sub-population in South Africa.

The aim of the study is to evaluate the immunogenicity of COVID-19 vaccines in participants with severe immunosuppressive chronic medical conditions that increase vulnerability to infection with current and future SARS-CoV-2 strains in the South African setting. This study will be undertaken from mid-January 2023 to August 2024 and is undertaken as a collaboration between SAMRC, University of Pretoria and Wits Health Consortium.

The primary objectives are:

1. To evaluate the humoral response to COVID-19 vaccines in participants with severe immunosuppressive chronic medical conditions at baseline, four weeks and 12 months following vaccination
2. To evaluate cellular immune and cytokine responses after COVID-19 vaccination in participants with severe immunosuppressive chronic medical conditions at baseline and four weeks post vaccination.

The study will be conducted at the Steve Biko Academic Hospital COVID-19 vaccination site and relevant outpatient departments. In the event of being unable to recruit the required number of participants from the Steve Biko site, approval will be requested to add additional sites in the region (additional sites include Tshwane District Hospital and Tembisa hospital). Participants will be recruited from the departments where they receive their primary care.

The study population will include adults >18 years of age with specified immunosuppressive chronic medical conditions attending the Steve Biko Academic Hospital who have opted for COVID-19 vaccination at the hospital vaccination site.

Inclusion criteria:

- 18 years of age or older
- May be a patient or staff member
- A confirmed diagnosis with any one of the specified common immunosuppressive chronic medical conditions
- Any vaccination status eligible for an additional vaccination including:
  - Previously unvaccinated
  - Vaccinated with one or two doses of JNJ
  - Vaccinated with one or two doses of Pfizer
  - Heterologous boost with JNJ and Pfizer
  - Vaccinated with booster and eligible for second booster

Exclusion criteria:

- Below 18 years old
- Severely ill patients
- Patients already fully vaccinated
- Part of another vaccine trial

This study is linked to a hospital-based SARS-CoV-2 vaccination feasibility study (UP Ethics 234/2022) in which SARS-CoV-2 vaccination is offered to all outpatients at the hospital.

Vaccinees presenting themselves for vaccinations who meet the inclusion criteria will be enrolled into the study. Recruitment will be from the departments managing patients with the disease groups of interest including oncology, nephrology, infectious diseases and rheumatology and will be done using medical officers and clinical associates. Demographic details and a medical history will the drawn from the medical records with particular attention to the diagnosis and treatment of any pre-existing chronic medical conditions. The participants will be interviewed specifically about previous vaccination experience and prior COVID-19 infection. Symptoms for COVID19 will be documented. Previous SARS-CoV-2 test results will be drawn from the NHLS lab tracker system.

Blood samples for humoral and cellular immune studies will be taken immediately prior to vaccination and at one month post vaccination. Additional samples to monitor antibody titers at 12 months.

Results at one month will be compared to the baseline studies for all participants collectively and for each disease group separately. Results will be reported following full enrollment of the one-month visit. Further results will be reported at the end of the study period for the 12-month follow humoral immunity evaluation.

The study will collect the following participant information into a developed case report form (CRF):

- Socio-demographic information including age, racial classification and gender
- Medical history including comorbidities and concurrent infections; and current treatment
- Clinical information will be extracted from the hospital record
- History and date of previous vaccination for COVID-19 and/or prior infection with COVID-19 including admission to hospital (general ward, high care, ICU, hospital name) and date of infection

In addition to demographic data, data on the primary diagnosis, co-morbidities, current complaints and lab investigations will be extracted from the patient files and National Health Laboratory System (NHLS) database with the consent of participants.

A sample size of 40 within each group would allow us to estimate a 3-fold change at 80% power assuming a type 1 error rate of 5% and a standard deviation of 0,75 on the log10 scale. To account for a maximum 10% loss of data due to loss to follow-up or death, 45 individuals will be enrolled in each group leading to a total sample size of 225. Sample size calculations have been based on predicted fold increases in the spike specific CD4 T helper cells four weeks after vaccination compared to the baseline immediately prior to vaccination.

Determining the prevalence of COVID infection in maternity patients at Steve Biko Academic Hospital

The OATB Research and the SAMRC Biostats Unit are collaborating with the University of Pretoria's Department of Obstetrics on this study to evaluate the prevalence of SARS-CoV-2 antibodies in women attending antenatal and postnatal services at the Steve Biko and Kalafong Hospitals during and after the fourth wave of COVID in Pretoria. The project is in the analysis stage and findings are due to be published in 2023.

Innovation and Research in Financing for Health

The Office of AIDS and TB Research has started a focus on research in innovative finance models to dramatically increase private sector investment in optimising health outcomes and also to use these mechanisms as a tool to drive the development of innovative flexible effective and cost-effective programmes and implementers to respond to complex social problems that negatively affect health outcomes. In this way, government only pays for successful programmes and can then scale up these successful programmes.

This focus falls within a wider focus on impact investing whereby stakeholders work together.

The first project has been to develop and implement a Social Outcomes Based Contract focusing on adolescent girls and young women that is described below. This will be the first OBC in South Africa and Africa with government as the sole provider of outcomes funding and as such is setting a precedent for further OBC and other forms of innovative financing. This project took a few years to get to the point of being launched, not least because it was the first time this was being done at the SAMRC and also because the legislative framework for such a transaction is not described in the PFMA and hence much work had to be done with national treasury before approval could be gained for the project. In the end we were able to appoint an implementer, find a private investor, get approval from the Ministers of Health, Basic Education and Finance, sign a contract with the Department of Science and Innovation who provided the outcomes funding to the MRC on behalf of national treasury and launched the project on 15 March 2023. This development work would not have been possible without the financial support from the DSI for the research to inform the package of interventions and the Global Fund to fight AIDS, TB and Malaria who supported the research to inform the package but also the project management team, the performance manager, the independent verification agent and the impact evaluation. This funding is supplemented by funding from ABSA, who are supporting the important economic evaluation

which is important to guide the scale up of the successful intervention package by the DBE.

This first OBC serves as the start of the process to build an ecosystem for innovative finance models to optimise health outcomes and is described further below.

Imagine Social Outcomes Based Contract/Social Impact Bond

The focus on Adolescent girls and young women

Adolescent girls and young women (AGYW) in South Africa face multiple challenges that significantly limit their prospects of health and wellbeing later in life. In a country where 7.9 million people are living with HIV, the burden of HIV is heavier among women than men, especially in the younger population. HIV prevalence is four times higher among young women than young men. While the roll-out of anti-retroviral therapy (ART) in South Africa has made great strides in the fight against HIV with currently an estimated 73 % of those who know their HIV status on antiretroviral treatment, AGYW however face several barriers to access, uptake and adherence of ART.

In addition to a high burden of HIV, there is also a high level of unintended pregnancies among girls and young women in SA. Just over one in two AGYW 15-24 years that has ever had sex has been pregnant, with the majority of these pregnancies being unintended. By the age of 19, almost one in three young women have begun childbearing in South Africa. Adolescent pregnancy often leads to school dropout, jeopardizing girls' future education and employment opportunities. But adolescent pregnancies also have major health consequences for adolescent mothers and their babies. Adolescent girls face a higher risk of complications and death from pregnancy and childbirth and are more prone to premature labour, obstetric complications and HIV transmission.

A myriad of social, structural but also behavioural challenges not only drive the high rates of HIV infections and unintended pregnancies in AGYW but also hinder the uptake and adherence to available prevention and treatment. The SAMRC conducted several studies during 2017 to 2019 to investigate these many social, economic, structural and behavioural among AGYW in South Africa. The results of this research have provided the SIB with a precise and up to date picture of the situation among this vulnerable group in South Africa.

What is a Social Impact Bond (SIB)?

SIBs operate through a funding mechanism where private or philanthropic investors provide up-front finance to implement an intervention and receive a return on their investment, based on the extent to which specified outcomes are achieved. Outcomes funding pays for successful outcomes. If all outcome targets are met, the initial capital invested by the social investor is repaid together with a moderate return on investment. Implementation partners are central to achieving successful outcomes. A Social Impact Bond (SIB) comprises contractual agreements between the government (outcomes funder), an implementer/ service provider and socially motivated investors in which:

1. All parties agree on specific outcomes targets for the programme, e.g., reducing [learner] pregnancies or increasing initiation on ART.
2. The socially motivated investors provide upfront funding to finance the service provider's activities.
3. The service provider delivers the programme to achieve the outcomes targets specified in the contract.
4. An independent evaluator may be included if needed to verify outcomes.
5. If the outcomes are achieved (e.g., increasing initiation on pre-exposure prophylaxis or contraception uptake rates), the government (outcomes funder) pays up to a capped amount which in aggregate provides the investors with repayment of their principal plus a modest financial return.

Partnerships

We have developed key partnerships with the University of Cape Town Graduate School of Business's Bertha Centre for Social Innovation and Entrepreneurship who have played a major role in advancing impact investing in SA, Social Finance U.K., a leader in designing social innovation projects including SIBs across the world, and the Government Outcomes Lab based at the Blavatnik School of Government at the University of Oxford.

The GO Lab hosts the global knowledge hub for those considering, designing and delivering new approaches to improve social outcomes and are supporting us to establish a similar knowledge hub for Africa including the contracting of a part time data steward to advance this mission.

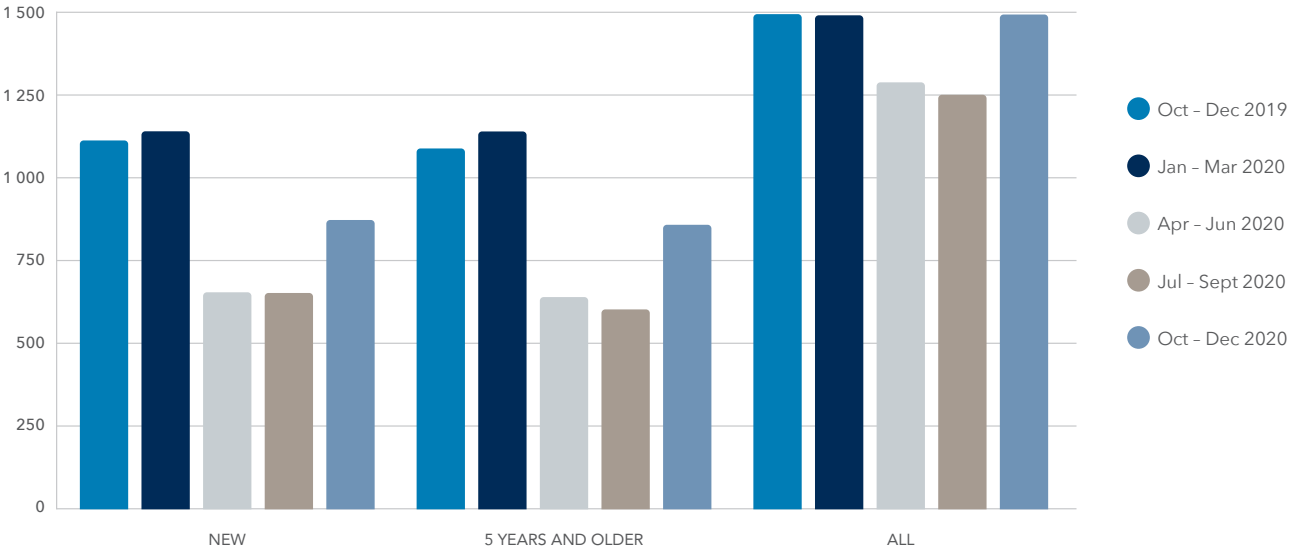
Tuberculosis Platform

Platform director:

Prof. Martie van der Walt

Research fit for purpose

The impact of COVID 19 on TB control particularly in low- and middle-income countries (LMICs) where TB is endemic and health services poorly equipped, was strained and lead to a reduction in quality of TB care and worse outcomes. The TB platform studied the impact of the response to COVID-19 in 2020 on the performance of TB care and prevention in South Africa by determining if there were any changes in provision of TB services. We hypothesised that this response resulted in a reduced demand for TB services while patients who were already on treatment at the onset of the pandemic were not offered the routine care as per the national TB guidelines. We analysed TB control data for four high TB burden districts in South Africa, Tshwane, Nkangala, Buffalo City and uMgungundlovu and compared the TB statistics of April – December 2020 with those of the preceding 12 months, and used data on TB case finding, for all drug sensitive patients, and broken down by new TB patients and children 5-years and older. For all three indicators, it showed that TB case finding dropped markedly from April 2020 and onwards. The data indicated that for all patient groups much lower numbers of patients visited clinics to be diagnosed with TB and to start with TB treatment. Under similar circumstances in future, the public should be made aware of the signs and symptoms of TB, that essential health services have not stopped and that they should still visit clinics when not feeling well.



Buffalo City Metro S-TB Treatment Start by Quarter

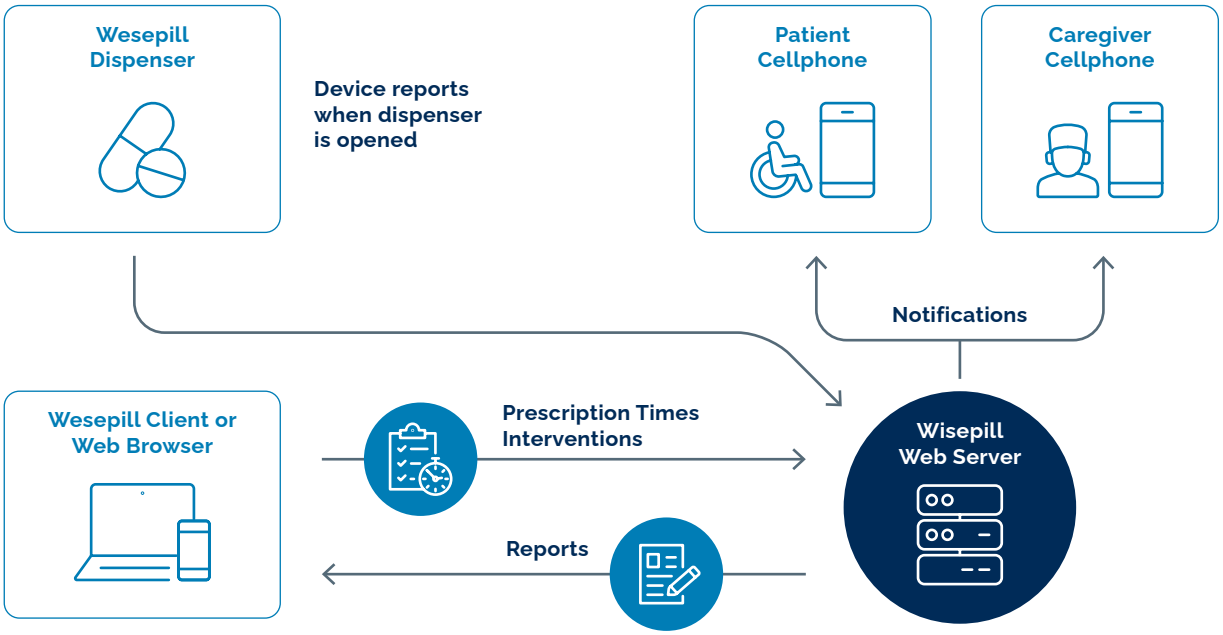
The Tuberculosis Platform team, raising awareness in their community on World TB Day.

Impactful Research Interventions

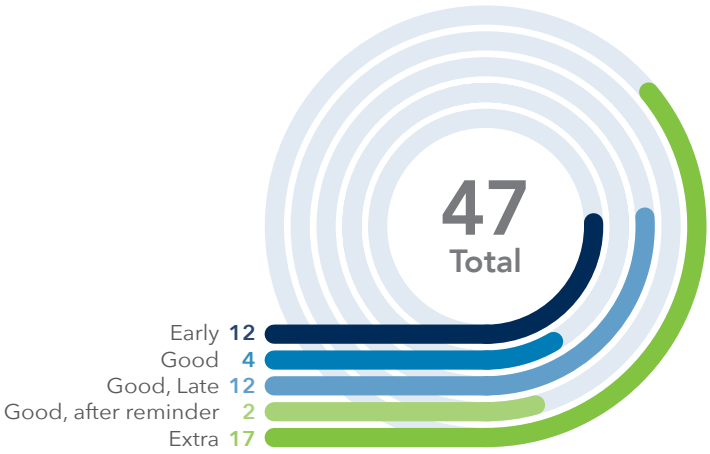
The magnitude of infectious disease outbreaks is affected by several factors such as seasonality, virulence of strains and control measures being imposed from time-to-time. Planning for disease control measures can be perceived to be as good as the methods and tools used to monitor the disease outbreaks. While AI-enabled tools are superior to classical surveillance tools for planning, AI can further be strengthened to collect and analyse data generated through non-typical public health data sources. These are collecting data through crowdsourcing, social media, remote sensing, internet forums or news media. Additionally, people continuously generate vast amounts of personal data about their opinions, experiences and behaviours, made possible by the ubiquitous use of personal computers, cell phones, wearable devices and other ways in which a steady stream of digital data are produced. The COVID-19 pandemic highlighted the importance of real-time disease surveillance systems that provide an immediate view of the evolution of the pandemic. It also highlighted the value of designing smart, artificial intelligence models that overcome the inherent challenges of retrospective collected data used in traditional mathematically modelled approaches. Machine learning AI models use data from a variety of sources and have been used to predict in real-time the evolution of COVID-19. The AI models appeared to be superior to the mathematical tools for prediction of how the COVID-19 pandemic evolved. Most epidemics do not evolve homogenous across a country, sub-national forecasting is much more valuable to public health authorities. LSTM was compared to Holts-Winters Exponential Smoothing (HWES), one of the most widely used statistical methods for forecasting the error, trend, and seasonality of time-series data, the AI-based model outperformed HWES. This is likely due to HWES not being able to adequately account for discontinuous, highly non-stationary change in each time-series. Statistical methods also struggle to select optimal parameters, and their predictions are affected by uncertainty in the presence of several unknown variables. It can be concluded that LSTM can overcome these challenges and perform well with real-time data as in the case of COVID-19 and other infectious diseases.

Data and evidence-based Responsive Research

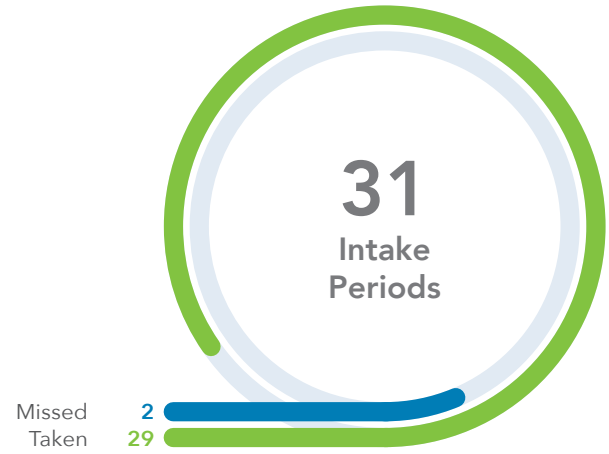
A study on understanding usability of a m-health tool to support medication adherence included determining influence of m-health feedback reminders on TB patients' medication adherence and to understand through end-user experiences the barriers to adoption and sustainability of an m-health tool. In line with WHO's strategy plan to end the global TB epidemic, the overall purpose is



Events



Adherence



to understand how technology-driven m-health can contribute to the alleviation of TB by encouraging medication adherence. The *evriMED Wisepill box* (the m-health support technology used) – is an automated electronic device that records and informs the health-care provider about the regularity with which a medicine container is opened by the patient (assuming most cases when the device is opened medication is taken). Information from the device is used as proxy and sent to a remote web-based server. A reminder text message is sent to both the patient and researcher whenever the device was not opened within the prescribed time. The study takes place in public health facilities in Gauteng: Daveyton Main CHC, Ramokonopi clinic, Goba CHC, Dresser clinic, Tembisa Main clinic and Esangweni CHC. The Wisepill system generates a graphic representation of the medication intake pattern over time. For patients that regularly miss doses, the self-efficacy and agency over treatment may be low and may impact on adoption and implementation.

Mobile clinics form an important element health service, firstly for providing routine health services to remote communities, and secondly, during times of disaster these clinics can bring much needed health services directly to the affected communities. Mobile clinics require fossil fuels to operate their engines that are petrol/diesel driven, while when parked during service delivery, the Unit's electricity is generated through an additional source of diesel. The duration of this service is driven by the amount of additional fuel carried by these mobile clinics. In Africa, mobile clinics equipped with solar panels to generate electricity to operate the clinic when stationary is an innovative approach to circumvent the limitation of diesel power generation while also move towards renewable energy-based health outreach. This addresses wider access of marginalised communities to health care, the Sustainable Development Goal 6.

Researchers from the Fraunhofer institutes for Surface Engineering and Thin Films IST and for Solar Energy Systems ISE in Germany, have developed a prototype mobile pre-clinical care platform, PreCare, mounted on a commercially available pick-up truck, and collaborates with the Tuberculosis Platform, Stellenbosch University and the non-governmental organisation Rhiza Babuyile to operate and test the prototype. The power supply of the platform is provided by photovoltaic modules fitted on the roof and a battery. During the one-year test phase the mobile clinic will deliver preventive examinations, tests, and vaccinations to less-accessible areas of Mpumalanga. Information will also be collected on operating the clinic and the desired medical services to be provided to communities, which will be used for the further development of the prototype and the improvement of care.

Skills building through Capacity Development

Using scoping review tools to gain an understanding of the role of healthcare personnel in designing and implementing tuberculosis Infection Prevention and Control guidelines in health care settings in South Africa, studiespeer reviewed and written in English were included in this review. There was no restriction on date published considering that there is paucity of evidence in this area of research involving personnel in decision making. A comprehensive search was carried out in six electronic databases: CINAHL, SCOPUS, and PubMed (NLM). Exclusion criteria included review studies, editorials, commentaries, study protocols, conference abstracts, perspective pieces. Sources included electronic databases, reference lists, and hand searching of key journals. Twelve articles were included in the review, which revealed limited involvement of healthcare providers in the development of guidelines, which influenced the implementation of these.

Knowledge Translation for an informed society

The world annually celebrates World TB Day on 24 March and for the 2022 celebration the theme was 'Invest in to End TB. End Stigma. Save Lives'. The TB Platform used this event to reach communities and to inform them about our research. We held two community engagement initiatives, with the first being with the public in Bloed Street Mall, in the central business district of Tshwane to create awareness about the signs and symptoms of TB.. We developed information pamphlets on tuberculosis and the need for investing in one's health, which were in English and handed out to individuals visiting the shopping mall, and people waiting upon taxis, as well as other street vendors and taxi drivers. When a member of the public engaged with us, we asked about the local language they were the most comfortable with, this was followed by one of the staff members fluent in that language, who engaged with them further. Through this initiative we could discuss in their local language with members of the public, they were more confident in asking questions directly to a person and using one-on-one conversations we could limit stigma and could explain in simple language. The second activity was on request from the Tshwane University of Technology in their health outreach to students and to inform students and staff about TB and the Platform's research. Using the same research translation pamphlets, Platform staff joined TUT staff for this event, and TB researchers was able to converse one-on-one with students and in their home language. We also shared with faculty and students TB research conducted by SAMRC and explained to students what a career in science is about.

The floods in KwaZulu-Natal towards the end in 2022 have destroyed roads, health care facilities and countless people had to be resettled. The flood affected communities experienced huge disruption in health care, be it treatment for diseases, diagnoses of new diseases, immunisation of children.

Mobile clinics form an important element health service, firstly for providing routine health services to remote communities, and secondly, during times of disaster these clinics can bring much needed health services directly to the affected communities.

The future driver and operator of the PreCare system explains the structure of the mobile care platform to the attendees. © Fraunhofer IST, Lothar Schäfer.

SAMRC/UCT Centre for the Study of Antimicrobial Resistance

Unit director:

Prof. Keertan Dheda

Research fit for purpose

Antimicrobial resistance (AMR) has become a major health concern affecting the global population. In South Africa, multi-drug resistant (MDR) bacterial infections are becoming increasingly common and are now considered a national health priority by the Department of Health and NICD. Of particular concern is the emergence and spread of drug resistant tuberculosis (DR-TB) which threatens to destabilise TB control in the country. It is unsustainably expensive to treat and contributes significantly to TB mortality.

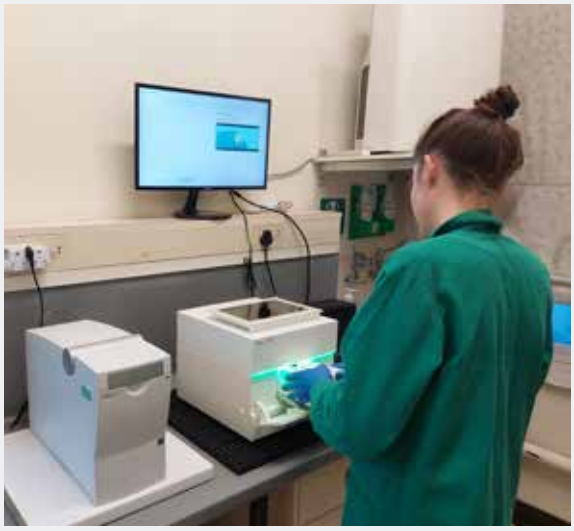
The Centre for the Study of Antimicrobial Resistance (CAMRA), which consists of a multidisciplinary team of national and international researchers, was formed to address specific aspects of mycobacterial and bacterial MDR pathogens including i) the mechanisms of pathogenesis and resistance amplification, ii) novel approaches to develop faster and more sensitive diagnostic tests to facilitate earlier treatment iii) novel approaches to treating respiratory infections caused by MDR pathogens.

Impactful Research Interventions

CAMRA is involved in several ongoing projects includingi) TB-active case finding studies,ii) sequencing-based diagnostic studies,iii) investigative studies examining sources of AMR organisms in hospital settings and iv) studies investigating drug concentrations in different biological compartments, both in DR-TB and other MDR infections to facilitate a better understanding of resistance amplification and to improve drug monitoring strategies. The research highlights for 2 studies are listed below:

PAKMAN: We and others have shown that penetration of certain drugs (e.g., moxifloxacin) into TB lung lesions is poor and can lead to sub-therapeutic drug concentrations i.e. pharmacokinetic mismatch, thereby creating an environment for resistance amplification. However, the penetrative capabilities of new and repurposed TB drugs (bedaquiline, delaminid, linezolid) and its relationship to bacterial burden within these TB lesions is unknown. This data will be important to guide dosing strategies especially given that a new MDR-TB treatment regimen (BPaL-M) containing these drugs will soon be implemented in South Africa. We have biobanked lung tissue specimens from several DR-TB patients undergoing surgical lung resection. Mass spectrometry-based assays have been developed and validated. We aim to analyse these samples in Q2 of 2023. We will also focus on other MDR pathogens from ICU patients to examine pharmacokinetic mismatch in the blood and site of disease. Other aspects of this study include evaluation of next generation targeted deep sequencing methods to improve the diagnostic sensitivity of sputum so DST readouts more accurately reflect the drug resistance profile in the TB lung cavity. We will also examine the sensitivity of measuring drug concentrations in exhaled breath and how well they can predict drug concentrations in the lung.

T3 RCT: Current drug susceptibility testing approaches often takes weeks to provide results This can have major implications on patient outcomes as initiation on a suboptimal treatment regimen can drive resistance amplification and reduce the chances of cure. This project is the first study to investigate the impact of targeted sequencing for rapid drug resistance profiling, using a commercially available



Andrea Kotze, a CLII scientist working on the T3-RCT study, preparing samples for DNA sequencing.

assay (Genoscreen) compared to the standard-of-care (Phenotypic DST), and tailored treatment on patient outcomes in a TB endemic country. A cost-effectiveness analysis will also be performed to determine implementation affordability and economic feasibility for national policymakers. This work has received ethical approval and recruitment will commence in Q1 of 2023. We have already conducted feasibility studies, which have enabled us to recruit patients and generate results within 7 working days of diagnosis.

Data and evidence-based Responsive Research

CAMRA and the CLII conduct basic science studies and clinical research trials, using novel approaches and cutting-edge tools, that translate into improving patient care and reducing morbidity and mortality associated with DR-TB and other MDR infections. The data generated from these studies can often influence policy and practice. For example, the NExT study, which investigated the impact of an all-oral shortened regimen for MDR-TB contributed to the SA dept of Health and the WHO guidelines on shortening DR-TB regimens in 2022. In terms of innovation, the T3 RCT is the first study to investigate targeted sequencing as a diagnostic tool to guide individualised therapy and its impact on patient outcomes. The XACT (XACTIII and 19) studies are using a mobile van containing novel tools for point of care testing such as the Gene Xpert and AI based CAD software for the diagnosis of TB, including DR-TB in the community. We have also implemented cough aerosol sampling technology, which can measure the infectiousness of patients, in our TB transmission studies. We currently have 3 sites within Southern Africa (in Cape Town, Harare and Lusaka; No other such facilities exist in Africa). We are also investigating the utility of novel biomarkers such as DMN trehalose to determine its utility in predicting infectiousness. These studies aim to identify those that spread the disease so they can be targeted for transmission interruption strategies. We are also looking at exhaled breath as a potential measure of TB drug levels in the lung. In terms of responsiveness, our XACT studies receive extensive media coverage. They also require extensive community engagement as we need individuals in the community to approach the mobile clinic for study participation and testing. On the non-TB front we are initiating a study looking

at differential antibiotic levels in intra-abdominal collections and patients with pneumonia in the ICU to see how this drives AMR to bacteria including evolving resistance to carbapenems.

Collaborations and Partnerships

CAMRA relies on collaborative relationships with several groups within UCT, other national institutions and international researchers to achieve its aims. For example, we are working closely with Prof Lubbe Weisner at the UCT Division of Pharmacology to develop and implement mass spectrometry-based assays for measuring drug concentrations in lung tissue, alveolar macrophages and exhaled breath specimens. Furthermore, sample collection, particularly for the CAMRA project, is facilitated through collaborations with Division of Pulmonology and Department of Cardiothoracic Surgery where an extensive patient recruitment and referral network exists for the collection of lung samples for our drug TB work. We have also built substantial collaborations (and also had substantial outputs) with several well-established SA institutions, such as Stellenbosch University (Prof Rob Warren) and UKZN, as well as those considered previously disadvantaged such as Walter Sisulu University and Sefako Makgatho Health Sciences University. At the end of last year, our collaboration on the NExT trial resulted in a paper in the American Journal of Respiratory and Critical Care Medicine (IF = 30 and one of the leading journals in respiratory disease and antimicrobial resistance) that included both WSU and SMU. We also collaborate with international institutions that bring unique skill sets to the Unit. We have a close working relationship with Professor Taane Clark, a global leader in TB Genomics at the London School of Hygiene and Tropical Medicine and collaborate with him on several projects including TB CHIM human challenge models, XACT-3 active case finding studies and studies investigating biomarkers of infectiousness. There is also an exchange of knowledge between CAMRA and LSHTM where Prof Clark has facilitated training courses and an inter-institutional exchange of students and scientists. For example, Dr Anil Pooran will visit LSHTM this year to undergo training in sequencing and bioinformatic analysis techniques as part of CAMRA and an EDCTP career development fellowship. Two other international collaborators on CAMRA are Prof Francesca Buttini (University of Parma) and Prof Erik Frijlink (University of Groningen) who are experts in drug inhalation formulation development and drug delivery, respectively. These skills are sorely lacking in South Africa, and their involvement will facilitate the development and delivery of inhaled TB drug formulations as potential strategies to overcome PK mismatch. A GMP grade dry powder inhalation formula for levofloxacin has already been developed through this collaboration.

Panel van set-up with portable point-of-care (POC) tools for screening of TB, HIV, and diabetes. Equipped with GeneXpert® Systems, a sputum-based tool to rapidly detect TB, also ultra-portable x-ray systems with artificial-intelligence (AI)-driven computer aided detection (CAD) software.

Skills building through Capacity Development

Several capacity development activities have occurred over the last year. Firstly, two female students from previously disadvantaged backgrounds have graduated with their PhDs this year. Dr Rolanda Londt is working as a postdoctoral scientist at the CLII and have close affiliations to CAMRA. Dr Phindile Gina (a black female South African) has also completed her respiratory physician training, in addition to her PhD, under the mentorship of Prof Dheda and has become a core member of CAMRA. Dr Ali Esmail a pulmonologist, PhD student and

Panel van set-up with portable point-of-care (POC) tools for screening of TB, HIV, and diabetes.

member of CAMRA will be submitting his PhD this year based on several first author publication over the last 4 years including the NExT trial published in the AJRCCM (leading respiratory journal; IF=30) and the XACTII trial in Nature Medicine (one of the highest ranked medical journals; IF=87). Several other clinicians began PhDs this year including Dr Suzette Oelofse, who is investigating the outcomes and infectiousness of patients with bedaquiline-resistant TB and Dr Alex Scott who is looking at the role of AI-based digital chest X-ray and PET CT in detecting undiagnosed asymptomatic TB patients in the community. The Unit has also been mentoring a young black female African scientist, Ms Tricia Nhlapho, through the Health Sciences Research Council internship programme which aims to provide relevant work experience for new BSc graduates interested in health sciences. We have also recently hired a new post-doctoral fellow, Dr Brandon Reyneke, who will focus on CAMRA's MDR pathogen work involving infections other than M. tuberculosis, such as, Klebsiella spp., Pseudomonas spp. and Enterobacteriaceae spp. infections in ICU patients.

Several researchers in the Unit are participating in skills development, particularly with regards to next generation sequencing and bioinformatic analysis. Two members of the unit, Dr Brandon Reyneke and Mr Linda Mbutini, recently attended the NIH funded African Tuberculosis Bioinformatics Training Programme held at Stellenbosch University in March 2023. Furthermore, as previously mentioned, Dr Anil Pooran will undergo bioinformatics training this year at LSHTM as part of CAMRA and an EDCTP carer development fellowship.

Through the XACT3 and XACT19 projects, clinical recruitment sites at BRTI in Zimbabwe and Chilenje Hospital in Zambia have been capacitated with a cough aerosol sampling system which will allow researchers to measure the infectiousness of TB patients. Staff at these sites have now been fully trained in performing CASS and the facilities are now fully operational. Additionally, a national COVID-19 clinical trials network has been set up (Cape Town, Klerksdorp, Johannesburg, and Durban with site PIs from Wits and UKZN). This has been augmented by NIH TICO ACTIVE grant award creating a platform for COVID interventional trials in the country. This initiative was facilitated through grant funding from the South African MRC and through CAMRA.

Knowledge Translation for an informed society

Prof Dheda has been interviewed across several forms of media (television, newspapers, radio) to inform the public on various topics related to TB and COVID-19 including the impact of COVID-19 pandemic on TB diagnosis. He has also been interviewed regarding the XACT active case finding studies for both TB and COVID-19 and the results of the NExT study, which evaluated an all oral 6-month drug regimen for MDR-TB. He has also led the writing of recent guidelines entitled: "TB: a practical guide to diagnosis and management of latent and active TB", which is aimed at recently qualified health professionals and junior clinicans. A full list of media stories can be found at https://lunginstitute.co.za/liiu-news/. The NExT study results have been reported to the SA Department of Health and the WHO working group to inform new policies on treatment shortening strategies for DR-TB. It was also highlighted in the MEJM journal watch, reported in SAMRC news and invited as a plenary session at the 2023 IUATLD conference in Paris this year. As part of World TB Day activities in 2022 and 2023, several members of CAMRA also organised and led information and training sessions to patients at Cloetseville Clinic, Brooklyn Chest Hospital and to undergraduate students at UCT. Our mobile van using in the XACT active case finding studies was also showcased to inform the public of these studies.

World TB Day 2022 and 2023: CAMRA members, CLII staff and FreeOfTB charity collaborated to educate communities in Stellenbosch and Brooklyn Chest Hospital (BCH) on TB prevention and control measures. Prof Keertan Dheda handing over a blood gas machine to Dr Julian Te Riele from BCH. This will be used for the management of patients with extensive lung damage or in advanced respiratory failure and was donated by the FreeOfTB charity.

There were also several high impact publications in the last year. The NExT study investigating an all oral 6-month regimen for MDR-TB has been published in the AJRCCM and received an editorial in the journal. Results of the XACTII active case finding trial was recently published in the Nature Medicine, one of the top medical journals in the world (this was also well covered by the lay press). The Rifampicin ICU study, which looked at enteral feeding and its impact on rifampicin levels in critically ill TB ICU patients, was recently published in the International Journal of Infectious Disease (IF=12.7). Finally, Prof Dheda was commissioned by the Lancet Respiratory Medicine journal to write a review article on the intersecting pandemics of COVID-19 and TB, which was published in the journal in 2022.

SAMRC/NICD Antibody Immunity Research Unit

Unit director:

Prof. Penny Moore

Research fit for purpose

The Antibody Immunity Research Unit (AIRU), when founded, was largely focussed on characterising immunity to HIV infection and vaccination. This research leveraged immunological and virological methodologies that had been established over many years in a multidisciplinary approach, and we have continued to make key basic HIV research findings, as well as to contribute extensively to clinical trials of HIV vaccines in paediatric and adult populations. We have been integral to research showing the broadly neutralizing antibodies can indeed prevent infection, and defining how much antibody is needed, as part of the seminal Antibody Mediated Prevention (AMP) trial. As SARS-CoV-2 emerged, we redeployed our platforms to this virus. AIRU has been integral to defining immune responses in infection and vaccination, and we were world leaders in defining the impact of variants of concern. Indeed, AIRU were the first in the world to show the potential of such variants for vaccine evasion. We continue to leverage our strong links to the genomics surveillance efforts and to many clinical research groups in South Africa, to perform urgent and translational public health research. Additionally, in-line with our original vision, we are expanding our programmes to other viruses of public health relevance including RSV, influenza and CMV. Capacity strengthening also remains central to AIRU's vision and has expanded through the Unit's involvement in several new training programs. Emerging leaders within the Unit are carefully mentored, and many now take leadership roles.

Impactful Research Interventions

Prevention of HIV infection through vaccination remains a priority. In the last year, AIRU contributed to proof-of-principle research showing the broadly neutralizing antibodies can indeed prevent infection if present at sufficiently high titre, and defining how much antibody is needed, as part of the Antibody Mediated Prevention (AMP) trial. This provides a solid basis for ongoing passive immunisation studies that which have expanded to paediatric populations, with ongoing AIRU research evaluating the ability of broadly neutralizing antibodies to prevent mother-to-child transmission. We continue to make contributions to understanding how such protective antibodies develop during infection, with studies in this area expanding into new epitopes, including the HIV fusion peptide and the MPER. We have also made important contributions to understanding the immune response to SARS-CoV-2 infection and vaccination. Several ongoing studies have defined the quality and quantity of responses in the context of hybrid immunity, with important implications for future vaccine efforts in South Africa. In addition, the Unit is heavily involved in pre-clinical development of multiple vaccine platforms with diverse pharmaceutical companies from across the world. We have also leveraged our ability to measure vaccine responses in people living with HIV, and much of the research that we do has expanded to this at-risk population, which remains understudied globally.

Data and evidence-based Responsive Research

AIRU is extremely well-connected, with strong national and international links to ongoing clinical development programmes, genomic surveillance programmes and vaccine developers. The Unit systematically leverages those strong links to make sure that we perform up-to-date, relevant research that is highly responsive to changing data daily. We

also have strong collaborations with laboratories across the globe, and funding through multiple sources which enables us to perform tech transfer as needed. This enables the Unit to rapidly identify new technologies of value, and to access training and skills in these emerging technologies. However, we also strategically collaborate with partners with complementary expertise, to generate data as rapidly as possible in a collaborative manner.

Collaborations and Partnerships

The Unit Director, Prof Penny Moore, has taken on a new role as Academic Head of the department of Virology and Immunology at the University of the Witwatersrand. This role enables opportunities for much stronger collaborations within the University, as new partners are identified. This has already resulted in new collaborations in diverse pathogens of public health relevance.

The Unit continues to leverage new links with various clinical teams conducting COVID-19 vaccine related trials to conduct serological and neutralization immunogenicity studies. These include the SAMRC, IAVI, and the HVTN. Collaborations have also been established with pre-clinical developers of novel vaccines which include the WHO sponsored South African mRNA Vaccine Consortium (SAMVAC), the CSIR, ImmunityBio, Dyadic International Inc., Alvea and Greenlight Biosciences.

Our continued funding through the Gates funded Global Immunology and Immune Sequencing for Epidemic Response (GIISER) grant within the Unit has established new links across Africa, India and South America. We also received a BMGF Grand Challenges award to further strengthen Brazil-South Africa research that is ongoing.

Skills building through Capacity Development

The laboratory actively trains postgraduate students (currently 3 Honours, 11 Masters and 5 PhD students) and there is on-going training of staff as new assays and techniques are implemented. Staff are actively encouraged to submit abstracts to conferences, and to attend workshops and training opportunities. The Unit also provided training to researchers from other laboratories within the NICD, external institutions and laboratories forming part of the GIISER collaborative grant. Over the last year the AIRU has hired 4 additional staff of whom 100% are black African and 2 of these are females. In 2021/22, AIRU has established new "cores" to create a niche for new emerging scientists to lead their teams and to further their scientific careers. This approach has proven to be highly successful, enhancing and accelerating collaboration within the Unit. In addition, these emerging scientists within the Unit are now successfully sourcing their own research funding and establishing independent collaborations nationally and internationally. The academic depth within the Unit has increased significantly over the last three years and is reflected in the extremely high quality of training outputs and publications.

Knowledge Translation for an informed society

Research findings generated within the AIRU have been disseminated to the scientific community by both staff and students who presented data at virtual meetings and congresses (over 50 presentations in the 2022-23 period). There were 41 papers published during the reporting period. The AIRU receives funding from several agencies (SAMRC, NRF, NIH, Gates Foundation, IAVI, EDCTP and Horizon-Europe) and we provide them with progress reports for the duration of the funding period. Prof. Penny Moore serves as Director for the Global Virus Network (GVN), South Africa. The research conducted in the AIRU has also been shared in lay articles such as an article in The Conversation by Dr Simone Richardson and Prof Penny Moore titled "Omicron doesn't need its own custom vaccine: here's why (published 7 March 2022); an article by Moore in the Southern African Journal of Infectious Diseases titled "The wondrous world of biology" (published 14 February 2022); an article by Drs Moore, Moyo-Gwete, Richardson and Scheepers titled "Pivoting from HIV vaccine research to COVID – Lessons for the next pandemic" published in Infectious Diseases Update; an audio interview by Moore, published by the New England Journal of Medicine entitled: "Dissecting the host response to SARS-CoV-2" on 2 June 2022 and lastly, also by Moore, an article published in Science entitled "Triggering rare antibodies by vaccination" on 1 December 2022. These high impact commentaries reflect the high international regard for the Unit.

SAMRC/UCT Intersection of Noncommunicable Diseases and Infectious Diseases Research Unit

Unit director:

Prof. Ntobeko Ntusi

Research fit for purpose

The NCD-ID EMU aims to contribute to improved understanding of the concepts of the intersection of non-communicable diseases (NCDs) and infectious diseases (IDs), through a systematic approach predicated on interdisciplinarity and collaboration. There are limited data on mechanisms, natural history, optimal management approaches, and outcomes of the interaction of NCDs and IDs, particularly in resource-poor settings. Therefore, the overall scientific scope of the NCD-ID EMU is the understanding and management of the interaction between endemic infections (like HIV and tuberculosis) and NCDs (heart failure, hypertension, diabetes mellitus, obesity, cancer, mental health, and chronic lung disease). Scholarship is combined with education and training, capacity development, advocacy, citizen science and community engagement. As a research unit, we constantly explore impactful scholarship through translational and implementation science, development of guidelines and policy, building 'South–South' and 'South–North' partnerships and creating advanced training opportunities for scientists and health professionals. The NCD-ID EMU addresses all the strategic aims of the SAMRC, as its core activities centre around advancing life, improving the nation's health, responsive scholarship with innovation, cutting-edge laboratory science, focusing on the leading causes of morbidity and mortality in South Africa, and pathways to impact including guideline and policy development. One example of how we have been able to combine these important strategic priorities is reflected in our ongoing research on the impact of SARS-CoV-2 on cardiovascular and mental health, as well as our study of the immunophenotypes of long-COVID. Another example is our programme of research that includes multiple investigational approaches in the study of HIV-associated and tuberculosis-associated cardiovascular disease. A final example is how our study on the causes (including genetics), natural history, optimal therapies, and outcomes of heart failure from cardiomyopathy is influencing clinical practice in management of heart failure locally.

Impactful Research Interventions

i) In the beginning of the COVID-19 pandemic, we established 3 biorepositories: (a) a cohort of healthcare workers from cape Town (n=400) that we have been following up prospectively with serial sampling to understand clinical and immunological dynamics in COVID-19 and used these to understand risk of infection, durability of immunity, risk of reinfection, immunological responses after vaccination, breakthrough infections; (b) a biorepository of hospitalised patients with COVID-19 from each of the COVID-19 waves; and (c) a collaboration with FIND where we collected clinical data, serum, plasma, saliva, urine, and nasopharyngeal swab samples from 500 hospitalised and ambulant COVID-19 patients as well as matched uninfected controls. These three biorepositories have proven a great resource to support collaborative work of many groups in this country and globally and has led to many pioneering publications that have provided important new information on the biology of COVID-19.

ii) The African Cardiomyopathy and Myocarditis Registry Programme (IMHOTEP), IMHOTEP is a multi-centre, multinational, hospital-based prospective study of the clinical characteristics, causes, treatment and outcome of cardiomyopathy

in children and adults from referral centres in Africa. The pilot phase recruited 900 patients from 7 sites in South Africa (including in the EC) and 2 sites in Mozambique. The next phase plans to scale up to recruit over 10,000 patients from 25 African countries to serve as a platform to study clinical and outcome characteristics of heart failure in Africans for comprehensive understanding of genetic determinants of heart muscle disease in Africans.

Data and evidence-based Responsive Research

It has been our firm conviction that, in all aspects of our research, we need data at the core to enable our strategies across the entire research enterprise. Data that we generate informs our thinking; and leads to faster and smarter decision making – augmented by critical, conceptual, and creative thinking. Ultimately, our scientists, through use of data, improve how they diagnose scientific problems, make better decisions, and take actions that improve research performance. Besides our capacity to generate data from research, we also use data in all aspects of the value-chain of our research.

Collaborations and Partnerships

The work of the NCD-ID EMU is predicated on many local and international partnerships, many of which are formalised through MOUs. These include collaborations with clinicians, basic scientists, statisticians, public health specialists and social scientists based at the University of Cape Town, Stellenbosch University, Walter Sisulu University, Nelson Mandela University, University of the Free State, Sefako Makgatho University, University of KwaZulu-Natal, University of Pretoria, and University of the Witwatersrand. In addition, we have productive collaborations with colleagues based at the University of Oxford, Harvard University, University of Washington, University of New South Wales, University College London, Queen Mary University of London, Imperial College London, University of Glasgow, University of Manchester, University of Minnesota, Purdue University, University of Botswana, Eduardo Mondlane University, University of Abuja, Makerere University, and McGill University.

Skills building through Capacity Development

Through the NCD-ID EMU postgraduate students are being trained. These include masters, doctoral and postdoctoral candidates as well as junior research fellows and early career scientists. In addition, the EMU partners with the UCT Cape Universities Body Imaging Centre to provide hands-on MRI training to radiographers, radiologists and cardiologists from all over South Africa. The EMU also collaborates with SA Heart and the radiological Society of South Africa to organise a large annual international conference on advanced cardiovascular imaging, the only meeting of its kind in Africa. In addition, we have partnered with several units based at UCT and with our collaborators to provide skills transfer to members of the EMU as well as our partners in the global South to enable performance of high-quality research and analysis of data and specimens locally.

Knowledge Translation for an informed society

Research findings from the NCD-ID EMU have been disseminated via publication in local and international peer-reviewed journals. In addition, our results have been shared with the scientific community via peer-reviewed conference abstracts. In the past year, our research and research findings have been featured in editorial pieces and opinion pieces and newsletters including in Nature Africa, the European Heart Journal, and the UCT News.

The Unit Director has also been invited to give talks in the community organised by the Heart and Stroke Foundation South Africa and several NGOs and civic society group where our research findings were reported as well as highlighting the important role of universities in society. In the past year, our research has also been included in guidelines and consensus statements which shape national and global policies.

Programme 4

HEALTH SYSTEMS STRENGTHENING

PURPOSE OF THE PROGRAMME

To contribute to health systems strengthening by undertaking systematic reviews, health policy and health systems research to provide evidence for policymakers, stakeholders and researchers seeking to address today's most pressing health challenges. The programme aims to take advantage of information and technology by exploring and expanding the role of eHealth (health informatics, digital health, tile health, telemedicine, eLearning and mobile health) in strengthening health systems

UNITS THAT CONSTITUTE THIS PROGRAMME

1. Burden of Disease Research Unit (IRU)
2. Biostatistics Research Unit (IRU)
3. South African Cochrane Centre (IRU)
4. Health Systems Research Unit (IRU)
5. Health Services to Systems Research Unit (ERU)

PROGRAMME STRATEGIC OBJECTIVES

- To contribute towards the evidence base for national, regional and international health-care decision making by conducting high-quality systematic reviews, and health systems and health policy research reviews to improve health systems effectiveness
- To strengthen research and development through training and mentoring postgraduate students (MSc, PhD, Postdoctoral Fellows) in eHealth, health policy, health systems research and biostatistics
- To contribute to capacity development and training in the use and conduct of systematic reviews, and support of clinical trial registration for the African region
- To synthesise evidence, optimise information and knowledge flow through ICT and other means to ensure that research results are translated into policy, practice, cost-effective products and health promotion
- To develop and enhance health information systems and surveillance through systematic evaluation and identification of processes for improvement
- To provide statistical analysis to ensure scientific validity, relevance and efficiency of health systems interventions and/or service delivery models, and engage in health systems strengthening activities
- To carry out bio-statistical support training projects to assist SAMRC researchers and postgraduate students within the SAMRC

Burden of Disease Research Unit

Unit director:
Prof. Richard Matzopoulos

Research fit for purpose

The Burden of Disease Research Unit (BODRU) uses a multidisciplinary approach to provide summary health measures, mortality estimates, health informatics, sentinel surveillance. BODRU provides accurate and reliable estimates on the burden, pattern and associated risk factors of diseases in the country. This information is essential in priority setting and shaping policy to improve the quality of life and extend life expectancy. For example, findings published most recently from the second comparative risk assessment study (SACRA2) have provided important scope for policymakers to prioritise health promotion and interventions to prevent disease attributed to unsafe sex, interpersonal violence, poverty and cardiometabolic risk factors, which continue to dominate the disease burden in South Africa.

Through the annual Rapid Mortality Surveillance project the Unit has been able to show a decline in life expectancy at birth due to the severe impact of COVID-19 on mortality especially of older persons. In collaboration with UCT, NICD Western Cape Department of Health (WCDoH) and NDoH, BODRU has set up a COVID-19 death data linkage project that has contributed to having a more complete registry of COVID-19 fatalities. This death linkage innovation has facilitated better monitoring of the COVID-19 pandemic and has even been adopted into routine data processes. Data from a forthcoming 2021 Injury Mortality Survey will contribute to completing the picture on the impact of COVID-19 by highlighting the impact of the pandemic on fatal injuries. Research into the quality and availability of morbidity data in routine hospital health information systems has informed the Technical Working Group (TWG) of the NDoH in creating a harmonised approach to clinical coding needed for the Universal Health Coverage drive.

Impactful Research Interventions

National Cause of Death Validation Project (NCoDV): Although South Africa has a well-established Civil Registration and Vital Statistics System (CRVS) with a high proportion of deaths being registered, the quality of the cause of death statistics obtained from the death notification forms completed by medical doctors is poor, making it difficult to obtain a reliable cause of death profile. To address the lack of training of medical students and doctors in the International Classification of Disease (ICD) principles, BODRU and collaborating universities have developed a free online training platform. Divided into five modules, the programme – at www.deathcertification.org – enables self-learning and is accredited for Continuing Professional Development points. Compatible with computers, tablets and mobile phones the platform includes voice-over recordings and downloadable reading materials. By end-Feb 2023, 954 medical practitioners and students had registered with 90% successfully completing the course.

Data for Health Initiative (D4H): BODRU is partnering with Department of Home Affairs, National Department of Health, Statistics South Africa (StatsSA) and the (National Institute for Communicable Diseases) through the D4H Initiative to strengthen the CRVS system in four intervention areas:

- Supporting medical certification of cause-of-death trainings through dissemination of the e-learning programme adapted for regional use;

BODRU staff assisting with blood sample pre-packs for the AVIRT study.

- Supporting ICD by expanding capacity in mortality coding, implementing the IRIS platform for coders, establishing StatsSA as an accrediting ICD coding training centre, and supporting the transition to ICD-11 mortality coding;
- Supporting verbal autopsy implementation through stakeholder coordination, development and testing; and applying data from BODRU's NCODV to develop a locally adapted symptom-cause matrix for automated assignment of cause-of-death and identification of COVID-19; and
- Developing a national roadmap to strengthen the reporting of birth and death registration, through process mapping, the establishment of a CRVS committee and reviewing law reform requirements for optimal CRVS.

D4H is funded by Bloomberg Philanthropies through the CDC Foundation, which awarded R7 million to BODRU in 2022/23 financial year.

Alcohol Diagnostic Validation for Injury-Related Trauma (AVIRT)

In collaboration with ATODRU, BODRU was awarded SAMRC Flagship funding of R4.4 million for the AVIRT study from 2022/23 to 2024/25. The study aims to validate alcohol diagnostics for injury-related trauma and assess its utility for improving national health practice and policy. During 2022/23, five focus group discussions were held with academics, clinicians, operational and policy stakeholders, to determine what type of alcohol information will be useful in the trauma and injury prevention sectors. A cross-sectional study was piloted at Groote Schuur Hospital to validate alcohol diagnostic tools (breathalyser, finger prick, ICD-10 clinical screening) against an enzyme immunoassay blood test, regarded as the gold standard for injured patients. The main validation study currently continues at Mitchell's Plain District hospital. The potential impact of the findings includes possible recommendation for further scale-up of alcohol diagnostics in trauma settings nationally.

Data and evidence-based Responsive Research

NCoDv & D4H

BODRU's National Burden of Disease Study revealed a quadruple burden of disease comprising communicable and non-communicable diseases, HIV/TB and injuries. These estimates have been used to set national research priorities. Interventions to help improve the health of South Africans have also been identified for each of the major diseases. The SAMRC, based on these data,has set the top-ten causes of death as a focal point of its strategic research plan. While the Western Cape Department of Health (WCDoH) has adopted the Unit's burden of disease methodology into its mortality surveillance system.

During the COVID-19 pandemic, BODRU together with collaborating partners were able to provide reliable estimates on mortality including excess deaths. Data from weekly reports on excess deaths due to natural causes provided compelling evidence of the true impact of the COVID-19 pandemic as well as helping to dispel disinformation around COVID-19 fatalities. Data was also used to show

BODRU staff at their Strategic Planning (23-24 March 2023), with Prof Liesl Zuhlke as invited speaker.

the link between curfews, alcohol sales bans and unnatural deaths in the country during the COVID-19 pandemic. This shaped media discourse about the impact of the alcohol bans and countered alcohol-industry funded research that sought to question their impact on alleviating the burden of injury on the health system.

BODRU is driving innovation in the transition from ICD-10 (the 10th revision of the International Classification of Diseases) to ICD-11 through the **WHO-FIC Collaborating Centre (CC),** which has developed a website where users may access up-to-date information and developments on this transition, meetings and training opportunities. BODRU also has several projects underway to develop innovative approaches to improving routine health information systems and contribute to the planned national health insurance.

Collaborations and Partnerships

In addition to AVIRT, BODRU has collaborated with the Gender and Health Research Unit (GHRU) and ATODRU on the 2020/21 Injury Mortality Survey (2020/21 IMS) to identify changes in injury mortality for the COVID-19 lockdown period. We have utilised a mixed skill set of injury epidemiology, biostatistics and qualitative research methods to work towards a common goal to inform the preventive response to injuries and related alcohol consumption. The 2020/21 IMS also extends our external collaboration with national forensic pathologists, initiated from earlier IMS studies. We have also collaborated with GHRU on South Africa's first ever Male Homicide Study that identifies and describes the setting and victim-perpetrator relationships for male homicide based on interviews with police officers.

Faced with the challenge of obtaining timely cause of death statistics, BODRU initiated a scoping study to inform the development of an Electronic Death Registration System (EDRS). In this collaborative project with the CDC and other organisations, we have completed a technical landscape analysis which has considered how the multi-institutional system currently operates and evaluates how cause of death information is developed in the health sector.

Skills building through Capacity Development

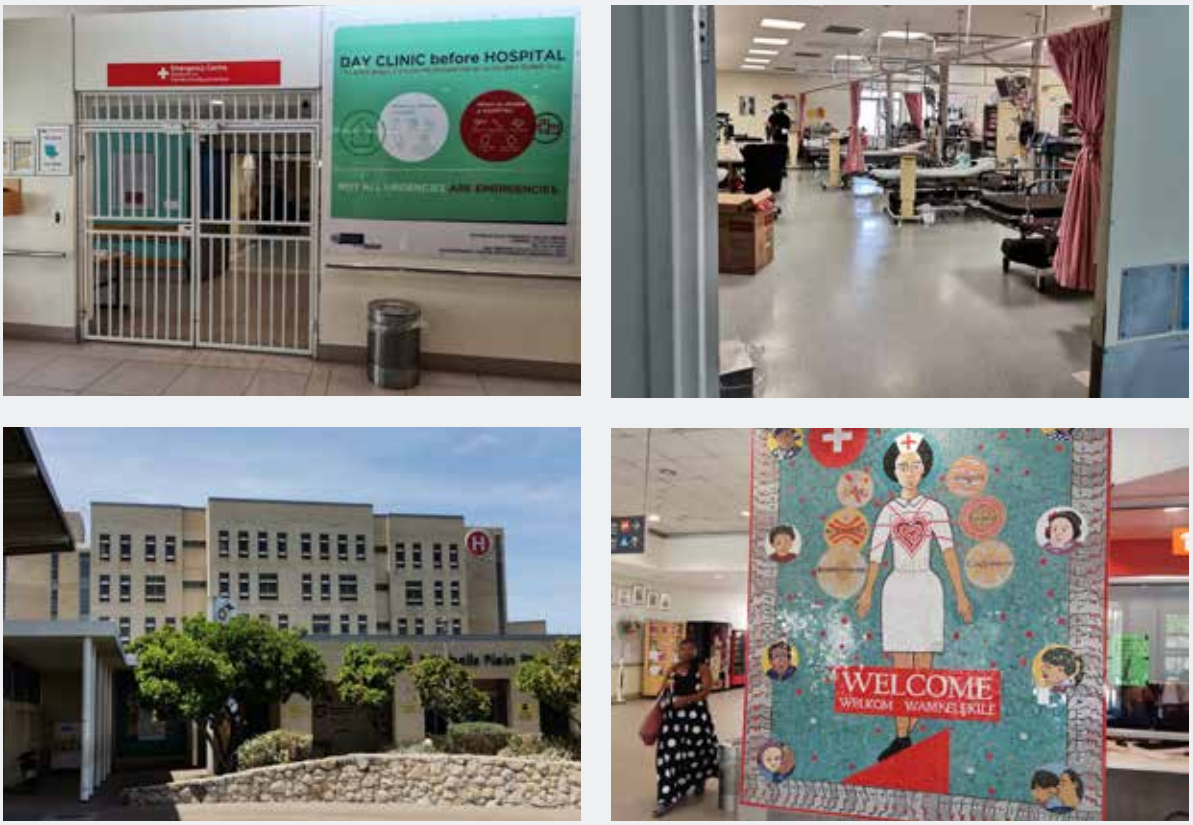
BODRU continues to support capacity development and transfer of skills in burden of disease methodology essential to the work of the Unit. Staff are encouraged and supported to pursue postgraduate studies to build skills relevant to the Unit's needs. Several staff members are currently enrolled in a postgraduate programme, including 4 PhD studies, 1 Masters and 1 post-graduate Diploma.

BODRU staff are also mentoring and passing on their skills to the broader scientific community to grow the pool of people with research and burden of disease skills in the country through supervision of postdoctoral, doctoral and masters' students.

Knowledge Translation for an informed society

The SACRA2 study was published in a special supplement edition by the South African Medical Journal (SAMJ) in September 2022, as a collection of 15 specific risk factor articles, complemented by an overview risk factors paper (Bradshaw et al, 2022) and a commentary (Jewkes & Gray, 2022). Additionally, a policy brief (Neethling et al, 2022) was released, which highlighted those risk factors that require public health attention and intervention at policy and programmatic level, to reduce the burden of disease in South Africa. Key findings highlight that unsafe sex and interpersonal violence were the leading risk factors.

A key activity related to BODRU'S work on the WHO Family of International Classifications (WHO-FIC) was the establishment of a Technical Working Group on Clinical and Diagnostic coding in South Africa (SA TWG) by the National Department of Health. The National Health Council (NHC), the highest decision-making body in the health sector, has also resolved that there will be a transition from the ICD-10 to ICD-11 as the South African National Standard for diagnosis for morbidity and mortality. One of the outcomes of the SA TWG process has been an increased understanding and appreciation of the WHO-FIC among a range of stakeholders in healthcare in South Africa.



Mitchell's Plain District hospital, the fieldwork site for the AVIRT study.

Biostatistics Unit

Unit director:
Dr. Tarylee Reddy

Research fit for purpose

The Biostatistics Research Unit (BSU), through its four divisions (Biostatistics, SAFOODS, Health GIS and Data Management), has both led and supported the generation of new knowledge over the past year. The Biostatistics Division has played a pivotal role in the design and analysis of several clinical trials in the country, including the PedMab Phase I study; the first real world SARS-CoV2 vaccine effectiveness study on the Moderna vaccine; and a Phase 2a Trial to Evaluate the Safety and Immunogenicity of COVID-19 Vaccine Boost Regimens in HIV-infected and HIV-uninfected Adults. The Unit's extensive expertise in the design and analysis of national surveys has also been displayed through two key surveys:

- A point prevalence survey of paediatric antimicrobial use and healthcare-associated infections in three academic hospitals in South Africa; and
- the 2022 South African National HIV Prevalence, Incidence and Behaviour Survey (SABSSM) which serves the critical role of measuring progress in the implementation of South Africa's national strategic plan to curb HIV, sexually transmitted infections, and tuberculosis.

Team members using the newly developed DIASA mobile application and conducting user acceptability testing.

Impactful Research Interventions

Modeling the positive testing rate of COVID-19 in South Africa: South Africa's SARS-CoV2 positive testing rate provides a more reliable measure of the country's burden of SARS-CoV2, compared to the absolute number of cases, and has been used in the planning of interventions. The Biostatistics division, through collaboration with Hasselt University (Belgium) and Durham University (UK), embarked on a study to estimate both the positive testing rate and its daily rate of change in South Africa with a flexible semi-parametric smoothing model for discrete data. This proposed semi-parametric smoothing model provided a data driven estimate for both the positive testing rate and its rate of change, which was

integrated into a publicly accessible, user friendly online R dashboard, allowing the user to estimate the positive rate in any country of interest.

BSU provided, through Dr Tarylee Reddy, statistical guidance and oversight to the World Health Organization (WHO) Multi-country Severe COVID-19 in children study.

The WHO coordinated a multi-country research study, including South Africa, India, Pakistan and Ethiopia, with the aim to understand the clinical characteristics of SARS-CoV-2 related disease in neonates, children and adolescents aged 0-19 years hospitalised with COVID-19 or MIS-C in low and middle income countries (LMICs).

Dietary Intake Assessment South Africa (DIASA): The collection of robust and accurate dietary intake data constitutes the first important step to establish the relationship between nutrition, health and disease. Advances in technology have seen a shift from paper-based dietary intake assessment questionnaires to be replaced by electronic automated tools. These digital automated tools reduce costs, increase convenience, and enhance the accuracy and efficiency of dietary intake data collection processes. In the absence of such a South African application, the South African Food Data System (SAFOODS) Biostatistics Unit has developed an interviewer administered multi-pass, 24hr dietary recall (MP24hR) web based mobile application. This application will assist the nutrition research fraternity to reduce research burden by presenting data in a format to be readily imported for linkage and statistical analyses.

Data and evidence-based Responsive Research

The data management division has innovated in the 5IR arena, by harnessing electronic data capturing (EDC) tools and creating integrated electronic datasets with excellent interactive visualisations. These products have facilitated and enhanced the management of projects in both operations, productivity and research. The GPS tracking systems used in the EDC tools allow real-time tracking of fieldwork, allowing re-allocation of resources. In

Dr Tarylee Reddy, Prof Ameena Goga and study team at the Data Analysis workshop for the Multicountry WHO Severe COVID in Children study at WHO Headquarters in Geneva.

Dr Tarylee Reddy with one of the 2022 South African National HIV Prevalence, Incidence and Behaviour Survey (SABSSM) field teams in Durban, assessing sampling and interviews of households.

the inter-connectedness realm, virtual training has allowed teaching to be conducted on EDC tools with world-wide research partners and geo-location is no longer a barrier. Machine learning, a type of artificial intelligence, has various applications in medical research such as in diagnosis and disease identification, health records improvement, image analysis and precision medicine. The Biostatistics division has collaborated with the SAFOODS Division to bring together machine learning and the novel application to food composition data to inform nutrition guidelines and policies with data-driven evidence.

Collaborations and Partnerships

The BSU plays a key role in a consortium with the University of Pretoria, Wits University, Institute of Business Management (IBM), Nelson Mandela University and the Council for Scientific and Industrial Research (CSIR) to work on spatial statistical and mathematical modeling of COVID-19. This has led to a further focus on the potential increase of current and emerging infectious diseases especially under climate change.

The Unit also embarked on a collaborative capacity development project involving Hasselt University (Belgium), University of Gondar (Ethiopia), University of Witwatersrand and University of Malawi (Malawi), Moi University (Kenya) and Makerere University (Uganda). The project centered around identifying strategies for sustainable biostatistics capacity building in the African region. This project culminated in an SAMRC led publication in Annual Reviews in Statistics and Its Application which provides key insights biostatistics capacity building.

Maize is an important staple in the country and is used as a food vehicle for fortification with the aim to improve the nutritional quality of the food supply as well as to provide a public health benefit. The SAFOODS division has led a national multi-sectoral project to determine the nutritional composition of maize meal of different mostly consumed, maize products, fortified with the new proposed mandatory fortificant to be used in the country. The results of this study will inform the nutritional composition of the maize products once the regulation has been promulgated.

Skills building through Capacity Development

The new field of data science aims to bridge the gap between statistics and technology. Two of the staff members attended training in data science and their expertise will be a valuable contribution to research in the 5IR health space. The course was hosted by The University of KwaZulu-Natal (UKZN), in collaboration with the Harvard T.H. Chan School of Public Health, and Heidelberg University, Germany. The courses covered advanced data wrangling and exploratory data analysis, information visualisation, machine learning and an introduction to the data science project pipeline. The BSU has also played a pivotal role in developing biostatistics capacity in the country through specialised training. The BSU taught an 'Introduction to Biostatistics Course" held at the SAMRC Conference Center, Cape Town, from 20-23 February 2023. The course provided participants with a theoretical background of study designs, probability theory, sampling distributions, point and interval estimation, hypothesis testing, linear and logistic regression as well as practical applications using Stata software. Preceding the in-person course, participants attended 5 virtual sessions over 3 weeks, to provide them with an introduction to Excel, data management and Stata. Seventeen participants registered for the course, with attendees from ATODRU, HSRU, BRIP and BODRU.

Knowledge Translation for an informed society

The Unit has harnessed the use of interactive, publicly accessible web-based dashboards that translate statistical modelling outputs to the general public.

The Director of the BSU, Dr Tarylee Reddy, co-presented a Community Talk webinar "Sustainable Statistical Capacity Building For Africa" hosted by Flemish Interuniversities Council – University Development Co-operation (VLIR-UOS) on 29 June 2022 and discussed the critical role statistical consultation serves in society, methods to enhance statistical consultation skills and the importance of mentoring.

The Department of Social Development has funded a project to understand the impact of COVID-19 in older persons in South Africa, with a report submitted with recommendations on how to mitigate the effects seen on mental, financial and health in this population. The BSU played a key role in this collaborative study including the Human Sciences Research Council , leading the analysis and report writing. The results and recommendations were presented at a stakeholder consultation to those involved in older person research to receive feedback and complement the findings.

Cochrane South Africa

Unit director:
Prof. Charles Shey Wiysonge

Research fit for purpose

Cochrane South Africa (SA) produces high-quality and relevant research evidence addressing important questions for healthcare decision-making. In 2022/2023, Cochrane SA staff produced more than 60 research articles on vaccine implementation science (including vaccine hesitancy), clinical trial registration, knowledge translation, pandemic preparedness and response, and other topical issues.

The vaccine implementation science work included epidemiological, qualitative, and mixed methods studies on missed opportunities for vaccination in the Western Cape; behavioural and social drivers (BESD) of uptake in human papillomavirus (HPV) vaccination in KwaZulu Natal; BESD of COVID-19 vaccination in local communities in three provinces in South Africa; COVID-19 and influenza vaccine hesitancy among healthcare workers in the Western Cape; and parental views and practices regarding childhood vaccination across Africa.

The knowledge translation work involves multiple projects, including one called Global Evidence – Local Adaptation (GELA); conducted in collaboration with partners in South Africa, Norway, UK, Malawi, and Nigeria. The project aims to enhance evidence-informed guideline recommendations for newborn and child health in sub-Saharan Africa.

Finally, regarding the pandemic, we produced rapid systematic reviews to inform advisories by various national ministerial advisory committees; and evaluated research prioritisation activities undertaken at national, continental, and global levels in response to the COVID-19 pandemic.

Impactful Research Interventions

A systematic review of factors that influence parents' views and practices around routine childhood vaccination in Africa

In Africa, there are more than 15 million children, but we currently have limited understanding of the factors that influence vaccination decision-making among parents. We therefore conducted a systematic review of qualitative studies to explore parents' views and practices regarding childhood vaccination in Africa. We found that multiple factors influence parental decision-making. We categorised these into five themes, namely, i) ideas and practices surrounding health and illness; ii) social communities and networks; iii) political events, relations, and processes; iv) lack of information or knowledge of the importance of vaccination; and v) access-supply-demand interactions. These findings will help to promote vaccine acceptance and uptake in Africa by developing and implementing tailored interventions.

Assessing and addressing missed opportunities for vaccination in Cape Town

Evidence suggests that missed opportunities for vaccination (MOV) is a major determinant of the low childhood vaccination coverage in Africa, but there was no data on MOV from SA. That is why, from 2020 to 2023, we assessed the magnitude of MOV and its contextual determinants in Cape Town and implemented and evaluated the impact of a quality improvement programme for reducing the identified burden. This was the first study in SA to estimate

the burden and associated factors of MOV, while also implementing and evaluating the effectiveness of a quality improvement intervention to address the burden. This scientifically robust research has contributed important evidence for strengthening immunisation policy and practice using multifaceted approaches to address the current sub-optimal immunisation coverage in SA. The positive feature of this work is that the solutions came from those who understand the context better (that is, healthcare workers) and may not require substantial resources to implement at scale.

Global Evidence – Local Adaptation (GELA)

The GELA project incorporates a multi-faceted and multi-disciplinary research and capacity-strengthening programme using primary and secondary research, guideline-adaptation methodology, and digital platforms to support delivery and dynamic local adaptation. The project will build on and add value to the large-scale programme of child-health guideline development led by the World Health Organization (WHO), with adaptation and implementation led by the WHO African Regional Office, WHO country offices, and national ministries of health.

Data and evidence-based Responsive Research

Cochrane SA hosts the Pan African Clinical Trials Registry, an open-access and transparent platform for prospective registration of clinical trials conducted in Africa. The Registry tracks what research is being conducted thereby identifying research gaps and ensure funding is allocated appropriately. We have facilitated the registration of clinical trials on Covid-19 (116 trials) and other diseases (3827 trials).

Cochrane SA is recognised worldwide for preparing and disseminating high-quality systematic reviews on what works and what doesn't in health care. These reviews enable policy makers, health service providers, and the public to make informed decisions about health care. We conducted multiple rapid systematic reviews and accompanied these with infographics for dissemination to policy makers.

Research plays a vital role in the effective response to outbreaks of emerging and re-emerging pathogens. We reviewed research prioritisation activities undertaken in response to the COVID-19 pandemic and engaged both researchers and research funders with the findings, leading to identification of eight key recommendations for the development and application of research priorities in response to disease outbreaks based on lessons learnt from the COVID-19 response. These are summarised in the figure below. We will disseminate to funders, researchers, and other stakeholders to engage with these recommendations.

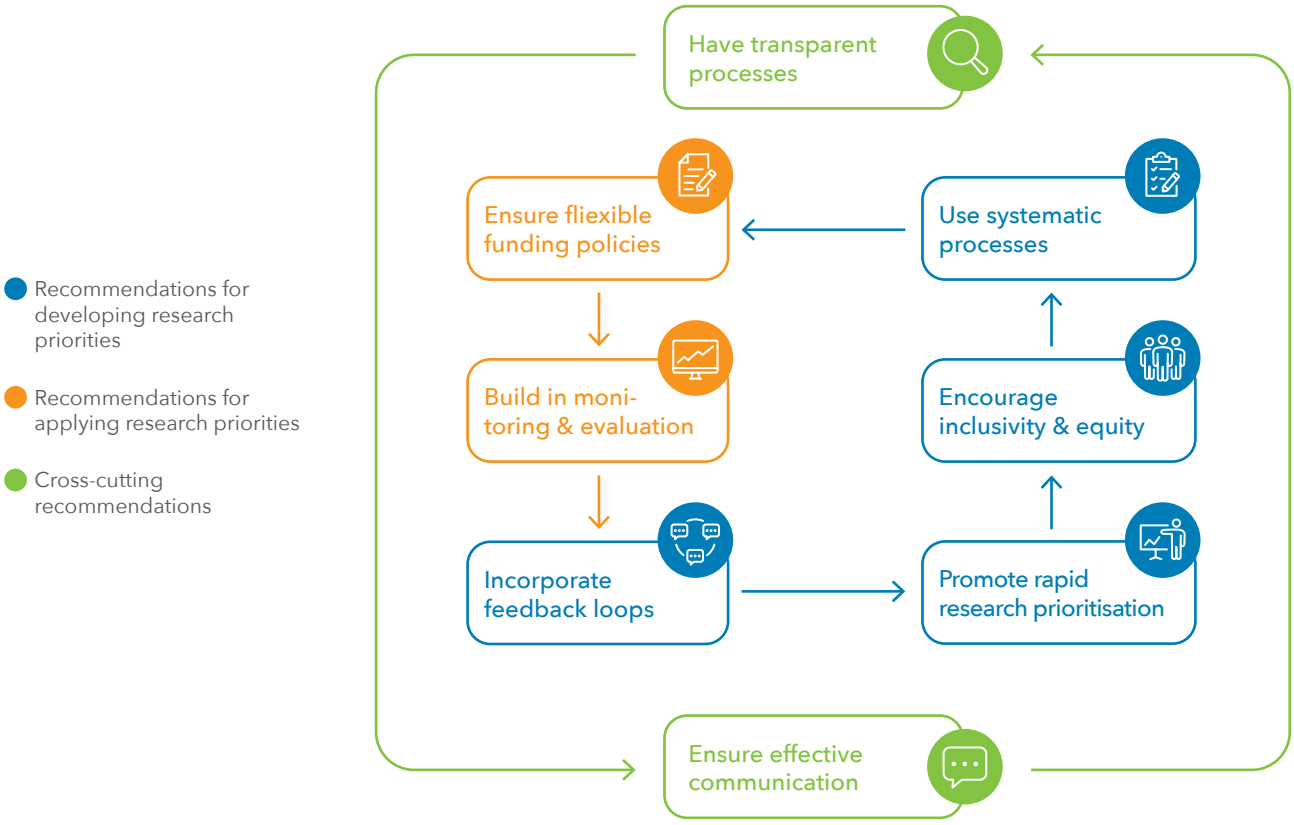
Collaborations and Partnerships

Cochrane SA collaborates with the SAMRC HIV and other Infectious Diseases Research Unit (HIDRU) at various levels. Firstly, both Units share one Unit Director. Secondly, a Cochrane SA staff member provides leadership and mentorship to staff conducting socio-behavioural research in HIDRU. Cochrane SA also collaborates with the SAMRC Health Systems Research Unit, Stellenbosch University, WHO, civil society organisations, and national government ministries of health in Malawi, Nigeria and South Africa on a project called "Global Evidence – Local Adaptation (GELA)".

In collaboration with the University of Cape Town, Cochrane SA developed training modules on evidence-informed decision-making for National Immunisation Technical Advisory Groups (NITAGs) in African countries.

Cochrane SA collaborated with colleagues at the National Institute of Epidemiology in Chennai (India) and at the Centre for Evidence-based Health Care at Stellenbosch University to conduct a scoping review of menu labelling and portion size interventions to inform WHO guidelines on the out-of-home food environment.

Cochrane SA is involved in a new project aimed at Securing Transparency And Reproducibility in studies of NUTritional interventions (STAR-NUT). This is a research programme to consolidate reporting standards for randomised controlled trials and systematic reviews of nutritional interventions. It is a collaboration between researchers across the globe, led by colleagues at the EQUATOR (Enhancing the QUAlity and Transparency Of health Research) Network, with the aim of addressing a gap in reporting guidelines.



Key recommendations in developing and applying research priorities

Proposed key recommendations for developing and applying research priorities during disease outbreak

Cochrane SA collaborates with various higher education institutions, especially historically disadvantaged institutions (HDIs), focusing on providing training on evidence-informed decision-making. In addition, staff facilitated training on the conduct and registration of clinical trials in Africa.

Skills building through Capacity Development

We continuously encourage Unit staff to build their skills and we provide opportunities to attend relevant courses, e.g., clinical practice guidelines, project management, advanced literature searching, and good clinical practice.

Staff were given an opportunity to take the Five-Lens people development programme which included coaching and leadership skills. Cochrane SA staff supervised 16 postgraduate students, of which four (3 Masters and 1 PhD) graduated during this reporting period. Additionally, Cochrane SA co-developed and co-facilitated an online short course in qualitative evidence synthesis with Stellenbosch University, and a qualitative evidence synthesis protocol development course with the University of the Western Cape.

Cochrane SA staff gave guest lectures on various aspects of systematic review methods at the University of the Western Cape's Summer School, the Evidence-based Health Care module in the Master of Public Health programme at the University of Cape Town, and the Master of Clinical Epidemiology programme at Stellenbosch University as well as guest lectures on vaccines and immunisation at the University of Cape Town's Annual African Vaccinology Course.

Cochrane SA hosts monthly webinars on methods for systematic reviews (and other forms of evidence synthesis) and guideline development, with presenters from all over the world who are leaders in their field.

Cochrane SA has also provided bursaries to SAMRC and HDI staff and students to attend the following research translation course at Stellenbosch University (which are co-facilitated by staff from the Unit): the art, the science, and complexity of knowledge translation; and engaging with the media and policymakers.

Knowledge Translation for an informed society

We ensured that potential users of our research could receive and act on the evidence bymaintaining the national subscription licence for the Cochrane Library; producing user-friendly summaries of topical Cochrane reviews and disseminating them through our three newsletters (Cochrane Nutrition, Cochrane Africa, and Cochrane South Africa); summarising Cochrane reviews with context-specific recommendations and publishing them in customised sections of the South African Medical Journal (SAMJ) and Pan African Medical Journal (PAMJ) known as Cochrane Corners; and organising the annual Cochrane Symposium where we showcased the work of the Unit. The Cochrane Library licence (in place since 2017) ensures fair, equal, and free access to Cochrane Reviews for everyone in South Africa through IP recognition. This allows practitioners, policy makers, and patients to get up-to-date, scientifically rigorous information about health care. The Unit facilitates workshops for decision makers (such as policymakers, managers, and clinicians) on how to find, critically appraise the quality, and use research evidence in decision making.

The Unit engages with potential users of our research evidence to support their evidence informed decision making. Cochrane SA uses a range of interactive approaches to build partner relationships and support their decision making for issues of importance to them. For example, as part of the Unit's study investigating vaccine hesitancy among healthcare workers, we designed and facilitated a stakeholder engagement workshop with policymakers, programme and facility managers, professional associations, and healthcare workers to obtain feedback on the study findings and explore how they can be promoted for use within policy, practice, and research. One example relates to another Unit project, the Collaboration for Evidence-Based Healthcare and Public Health in Africa (CEBHA+). Within the context of CEBHA+, Cochrane SA and other SA partners held a policy dialogue with the NDoH to share results of our research that can inform national guidance regarding prevention and management of non-communicable diseases.

Health Systems Research Unit

Unit director:
Prof. Tamara Kredo

Research fit for purpose

The Health Systems Research Unit (HSRU) conducts research to contribute to national and international evidence-informed health and social policy decision-making and strengthening health systems with the aim to achieving Universal Health Coverage and to improving health throughout the life-course.

Impactful Research Interventions

The HSRU undertakes multidisciplinary intersectoral research across several areas of the health system (private-public sector, health facilities, schools etc) and along the life course. We highlight two projects demonstrating the impactful research led by scientists in the Unit:

Public-private contracting for obstetric care: Strategies to promote universal access to safe obstetric care including caesarean delivery are urgently needed for low-and-middle income countries especially in rural contexts. Attempts to harness private sector resources need to ensure that the care provided is appropriate and patterns of inappropriate care, such as high caesarean delivery rates, are not reproduced. Tanya Doherty and colleagues led a mixed-methods study to describe utilisation of private General Practitioner (GP) contracting for caesarean deliveries, in five rural district hospitals in the Western Cape, South Africa. We found that use of private GPs as surgeon or anaesthetist for caesarean deliveries differed widely. The proportion of caesarean deliveries undertaken by private GPs as the primary surgeon was inversely related to hospital size and mean monthly deliveries. Adverse outcomes following caesarean delivery were rare. Qualitative data provided insights into contributions by private GPs and the contracting models, which did not incentivise overservicing. The most important lesson from our work is that structured appropriately, private public partnerships utilising private GPs can provide safe and appropriate caesarean care in rural district hospitals. To do so, policy makers should develop a "contracting framework" which complies with core principles yet allows flexibility in developing context specific contracting arrangements. The underlying principles include a "risk" based delivery model, adherence to public sector-protocols, time-based rather than per delivery/type of delivery remuneration models, group liability arrangements, and outcome monitoring processes. These principles have broader applicability for developing public-private partnerships harnessing private sector resources for public good in other areas of health care in South Africa and globally.

Coverage of contraception and abortion services in Cape Town: Kim Jonas and colleagues conducted a study exploring barriers to, and enablers of effective use of contraceptives and access to abortion care services among South African adolescent girls and young women (AGYW) aged 15 – 24 years. This aimed to address challenges of unintended pregnancies which remain prevalent among AGYW. Our findings showed that AGYWs' experiences are not uniform and are influenced by numerous factors – from individual level through to policy and structural levels. AGYWs' preconceived ideas about contraceptive use norms complicate their agency, awareness of their contraceptive needs and undermines their decision to access contraception services, and are influenced by politics of age, anxieties, fears of being judged and subsequently discouraged by their social circles (romantic partners, friends, family and community). Further, AGYW perceive health

Health Systems Research Unit and National Institute for Communicable Diseases staff playing Putt-putt after successfully completing COVID-19 school transmission study.

Youth participating in the positive mind study.

Imagine Evaluation study field team handing out certification of participation and first aid kit to the school principal as a token of appreciation.

School principal and school coordinators holding the certificate and first aid kit in a school in North West.

providers to be both inhibitors (e.g., rude healthcare workers hinder future access) and enablers (e.g., supportive and welcoming of using contraceptives). These findings inform the planned evaluation of the combination HIV prevention programme for AGYW, the HERStory 3 Study, assessing HIV infection and unintended pregnancies rates among AGYW.

Data and evidence-based Responsive Research

The Unit uses data to inform all aspects of our work. One project that can be highlighted, brings together big data and complex intervention design in the field of mental health. This project draws on 5IR principles of being data informed, using digital technology as part of the intervention, but is person-centred throughout. A key problem that mental health services encounter is lack of evidence on the burden of common mental health disorders (depressive and anxiety symptoms) among young people. This Wellcome Trust funded collaborative study includes a multidisciplinary group of scientists from the fields of health economics, psychology, epidemiology and biostatistics colleagues from SAMRC and Stellenbosch University (Global Health Department).

The Positive Minds project, found that the prevalence of common mental health disorders was 9% among young people in South Africa during 2020-2021, particularly amongst older adolescents, young mothers, households with absent fathers and those households that received COVID-19 aid. This study drew on big data from DSI/ SAMRC South African Population Research Infrastructure Network, to

understand the prevalence and drivers of common mental health disorders. Data from this project is currently being used to inform the design of the digital mental health tool.

Collaborations and Partnerships

The social policy and child health researchers collaborated in a multi-stakeholder, multidisciplinary study that was part of the University of Johannesburg-led Communities of Practice (CoP) in Social Systems Strengthening for Child Well-being project. Wanga Zembe led the component on "Cash Plus School-based Services" demonstrating potential for implementing a cash plus framework within the South African context combining social grants with existing social and health programs and services targeting low-income children to maximise the impact of child grants on their well being. The CoP collaborators include the universities of Johannesburg and Witwatersrand, UNICEF, Department of Health (national, provincial and local levels), Department of Basic Education, and NGOs and community-based organisations.

Simon Lewin co-leads the newly launched **Cochrane Person Centred Care, Health Systems and Public Health Thematic Group** which aims to support the systematic uptake and integration of evidence-based interventions into health and public health systems to impact individuals and communities globally. This Cochrane Thematic Group is uniquely positioned to take forward evidence syntheses that address complex issues that face health systems and public health. The group draws on a range of disciplines including person-centred care, health services research, behavioural and implementation sciences, stakeholder engagement and participatory methods, qualitative research, and quality improvement.

Nandi Siegfried led a project to understand **transmission of COVID-19 in the local school environment**. We worked with the Western Cape Departments of Education and Health, National Institute of Communicable Diseases, University of Cape Town and Stellenbosch University and undertook a pilot study evaluating COVID-19 School Transmission in a secondary school in the Western Cape. To understand the global evidence on this topic, we contributed to the COVID-19 School Transmission Living Systematic Review conducted in partnership with the University of Edinburgh UNCOVER group.

Imagine Evaluation study field team handing out certification of participation and first aid kit to the school principal as a token of appreciation.

Another example of collaboration is the **GELA – Global Evidence, Local Adaptation** project which undertakes to enhance evidence-informed guideline recommendations for newborn and young child health in three countries in sub-Saharan Africa. GELA is a three-year programme funded through the European and Developing Countries Clinical Trials Partnership (EDCTP). The partnership is co-ordinated by the SAMRC, with partners from Cochrane Nigeria at the University of Calabar Teaching Hospital, Kamuzu University of Health Sciences, Stellenbosch University, The Norwegian University of Science and Technology, Western

Norway University of Applied Science, Cochrane and the Stiftelsen MAGIC Evidence Ecosystem. GELA aims to increase capacity of decision-makers and researchers to use global research to develop locally relevant guidelines for newborn and child health. This work is enabled through African and international leaders in the field of evidence-based healthcare and guidelines methods partnering with national ministries in Malawi, Nigeria and South Africa, the WHO and its Afro regional office and the civil society group, Peoples Health Movement.

Skills building through Capacity Development

At HSRU, we prioritise developing the capacity of Unit staff through journal clubs, writing workshops and encouraging staff to pursue post-graduate degrees and attend training courses. We encourage scientists in the Unit to supervise post-graduate studies of other South African students. We contribute to a range of capacity development initiatives by leading or contributing to workshops, courses, modules and seminars. The grants that we lead or collaborate on include capacity development initiatives and funding for post-graduate students in the field of study.

Of note, during the 2022-2023 financial year, a substantial part of the operational budget was allocated to fund "seed studies" led by early- or mid-career scientists in the Unit, to support their career development goals. This initiative enabled these researchers to engage in a competitive funding application process, and supported small studies contributing to their post-graduate degrees. Applicants submitted their protocol for review by other scientists in the Unit, who assessed the proposal according to whether it met a set of priorities, namely that it built on and aligned to the Unit's existing work and mandate, supported the PhD or master's degree of a staff member, and was led by a first-time applicant. Proposals were also assessed for scientific quality and feedback was provided to strengthen proposals. Three examples of the seed studies funded during the 2022-2023 financial year were a Masters in Public Health, by Inathi Maxhakana, titled "Cash transfers and child health: Understanding barriers to early receipt of the Child Support Grant in South Africa. A case study of Langa Township in Western Cape" and 2 PhD studies in Public Health by Hlengiwe Moloi titled "A scorecard to monitor the implementation of the 71st World Health Assembly Resolution on Rheumatic Heart Disease in Africa" and Lieve Vanleeuw titled "Investigating the impact of Tuberculosis (TB) illness in the household on children in Cape Town, South Africa", respectively.

Knowledge Translation for an informed society

The HSRUs strategy aims to support evidence-informed health and social policy decision-making to support strengthening of health systems. Scientists in the HSRU are involved at national, regional and international levels in approaches and methods for processing or packaging evidence for decision making and in direct participation in decision forums.

Research briefs: The HERStory studies are mixed-methods evaluations of a combination intervention for adolescent girls and young women (AGYW) aged 10 to 24 years, implemented since 2016 in twelve districts with some of the highest rates of HIV and teenage pregnancy in South Africa. Using the emerging findings from these studies, Zoe Duby and colleagues developed a series of research briefs summarising the key findings of the HERStory studies, outlining key areas of concern, and noting implications for policy and practice in the South African context. With these research briefs, the HSRU aimed to sharethe HERStory study findings beyond the academic community, providing empirically based, practical, actionable information for policy makers, programme designers and implementers, practitioners, citizens, and communities in order to improve the health and well-being of some of the most vulnerable adolescent girls and youth women in South Africa.

Daily Maverick NHI op-eds: The South African Portfolio Committee on Health (PCH) heard oral presentations on the National Health Insurance Bill from 117 individuals, organisations and institutions from 18 May 2021 to 23 February 2022. We wanted to increase transparency regarding that process and enhance public understanding and debate around the issues that were raised. To do this, Geetesh Solanki and colleagues collated information from all presentations to the PCH, following which they were systematically analysed and published in partnership with the Daily Maverick. Six op-eds were published as part of series titled "NHI Hearings: Views on…"(e.g., https://www.dailymaverick.co.za/article/2022-05-12-the-nhi-will-not-succeed-unless-its-benefits-package-is-accepted-across-the-broad-spectrum-of-society/)".

SAMRC/UWC Health Services to Systems Research Unit

Unit director:
Prof. Helen Schneider

Research fit for purpose

At heart, health systems are the meeting point between a peopled system and technologies, the focus of the 5th Industrial Revolution. During the COVID-19 pandemic there was a leapfrogging in everyday use of synchronous (e.g., zoom) and asynchronous (e.g., WhatsApp) modalities of digital communication. The impending National Health Insurance (NHI) reforms are themselves prompting an unprecedented focus on digitalisation and data architectures in health systems. These new technologies land in systems with variable background capabilities, whether in IT infrastructures, human and organisational mindsets and cultures. This has implications for the way technologies are adopted and assimilated. The Health Services to Systems (HSSU) Unit conducts research on i) the interfaces between technical innovation, service delivery, and the leadership and governance of local health systems ii) the shifts required from traditional systems of hierarchical governance to collaborative forms of governance and co-production at the interface of communities, health and other sectors, appropriate to the 5IR.

These are evident in our research on the stewardship of quality and outcomes in sub-district and district health systems conducted as part of a national project referred to as 'Mphatlalatsane', the evaluation of the Bate-Papo! Project to increase access and uptake of immunisation in Mozambique and Malawi, a learning partnership with NACOSA and Hope Africa in Klipfontein on gender transformative programming and documentation of inter-sectoral collaboration in the Western Cape.

Impactful Research Interventions

i) We consolidated the concept of 'meso-level stewardship of quality and outcomes', based on research through the Mphatlalatsane Initiative being conducted with internal SAMRC researchers. This was documented in a well-received technical report outlining three key pillars of distributed leadership, area-based coordination and responsive district systems. Related to this research, we concluded a small follow-up evaluation of a quality improvement initiative in Waterberg District, Limpopo. This portfolio of work prompted a series of subsequent engagements with decision makers nationally and provincially and set the stage for a new phase of work on district and sub-district governance.

ii) A project that undertook the first phase of data collection in a hybrid effectiveness-implementation evaluation of the Bate-Papo Project, testing a participatory, human centred design process for increasing access and uptake of immunisation in children under two years of age in the remote rural areas of two countries (Malawi and Mozambique). The preliminary qualitative findings indicate a high level of acceptability of the approach and its ability to catalyse change in local systems through new forms of collaboration.

iii) We established a learning partnership with NACOSA and Hope Africa in Klipfontein to support gender transformative innovation in the My Journey programme focussed on adolescent vulnerability to HIV. The learning partnership has monthly reflection and training sessions building

PhD graduates with Professor Asha George.

PhD graduate Dr Waasila Jassat.

Participants in the 'My Journey' programme.

the capacity of various personnel across the organisations involved. An assessment of the co-design process is underway, as well as an analysis of how to integrate gender into health information systems.

Data and evidence-based Responsive Research

Our research agendas are responsive to provincial, national and regional and global health imperatives. We achieve this responsiveness through i) close collaboration (at times co-production) of research with communities, providers and decision-makers at multiple levels ii) evidence-informed approaches that draw on our participation in global networks and advisory bodies amongst others. For example, during 2021 and 2022, a gender and COVID-19 research agenda setting process undertook or participated in 8 global and 6 regional virtual consultations that engaged over 900 participants primarily from low- and middle-income countries in varied activities prioritising 21 research questions. The consultative and participatory ethos led to various changes in study design to ensure responsiveness to an inclusive way of working. In 2022, our work led to presenting the consultative research agenda in the WHO Roadmap meeting, the primary WHO forum for COVID-19 research.

Collaborations and Partnerships

During the reporting period, we were founding members of a multi-disciplinary national network referred to as the Health Policy and Systems Research (HPSR) Collective, consisting of eight higher education institutions. This network's purpose is to advance knowledge generation and capacity building on HPSR in South Africa, build local and provincial partnerships, use evidence and engagement to support health system renewal and achieve impacts at policy and system level. In October 2022, the collective held a national one-day workshop on research on the District Health System.

Following a call by the National Research Foundation, we also collaborated on a multi-institution proposal for a National Pandemic Institute, for which we are co-leads on Health Systems.

The HSSU are core members of a regional network called CHS [community health systems] Connect, with researchers from the Universities of Zambia, Makerere (Uganda), Muhimbili (Tanzania) and Umeå

University (Sweden). Staff are also members of global scientific bodies, for example, Asha George Chairs the Scientific Technical Advisory Group, UNDP-UNFPA-UNICEF-WHO-World Bank Special Programme of Research, Development and Research Training in Human Reproduction (HRP), Department of Reproductive Health and Research (RHR), World Health Organization, and is a member since 2017, and Helen Schneider is a member of the Scientific and Technical Advisory Committee Alliance for Health Policy and Systems Research, World Health Organization, since 2018, and is Chair of the STAC from 2023.

Skills building through Capacity Development

Members of the HSSU graduated 4 PhD students and 4 Masters students in 2022/3. The team has also mentored emerging researchers, including postdoctoral fellows and senior lecturers/ researchers, strengthening capacities in health systems research approaches and methodologies, gender transformative community engaged research, and grant management.

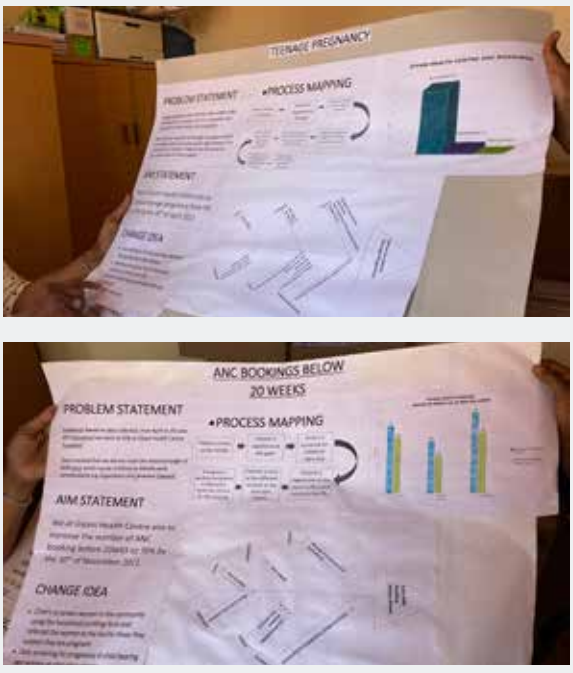
The HSSU Director continued to lead the School of Public Health's PhD programme team (~50 students). Over the last five years we have implemented an increasing array of doctoral support strategies, including a pre-doc period, an induction programme, peer exchanges, retreats and writing workshops. In 2022, the PhD programme team conducted a review of these strategies, including literature and document reviews, analysis of data, and student and alumni surveys, as part of a wider departmental review of the UWC School of Public Health. The review deepened our thinking and understanding of doctoral pedagogies and discourses, and responsive and transformative doctoral education. We plan to document these formally and are exploring ways of opening this up as an area of further research.

We anchor a network of 6 implementation research grants across 7 sub-Saharan African countries. In 2022, we led two webinars that provided training on gender transformative approaches and measurement of gender transformative approaches to approximately 40+ network participants.

Knowledge Translation for an informed society

District and sub-district health systems are a key focus of the National Health Insurance (NHI) reforms. In this regard, in October 2022, on behalf of an emerging national network of health policy and systems researchers ('the HPSR Collective'), the HSSU hosted a one-day national workshop of researchers and provincial and national decision-makers on strengthening district health systems (DHS). The HSSU Director was subsequently invited to participate in a national Department of Health review of the DHS strategy (currently ongoing); and in November 2022 gave a key plenary address to the SA National Health Research Summit on the DHS.

In the Western Cape Province, the HSSU Director also: i) co-designed and co-facilitated a two-day retreat with the ~45 top departmental managers on health systems governance ii) provided an introductory presentation on the role of the sub-district health system at a workshop of provincial managers (~100 people)iii) co-facilitated a session on governance at the provincial 'Indaba' (~300 people).



Implementation of quality improvement cycles in the Mphatlalatsane Project

Programme 5

PUBLIC HEALTH INNOVATION

PURPOSE OF THE PROGRAMME

To promote the improvement of health and quality of life (impact prevention of ill health, improvement of public health and treatment) in the Republic of South Africa through innovation, and technology development and transfer

UNITS THAT CONSTITUTE THIS PROGRAMME

1. Drug Discovery and Development Research Unit (ERU).
2. Primate Unit and Delft Animal Centre (IRU).
3. The Biomedical Research and Innovation Platform (IRU).
4. Herbal Drugs Research Unit (ERU).
5. Genomics Center (IRU).
6. Pan African Center for Epidemics Research Unit (ERU).

PROGRAMME STRATEGIC OBJECTIVES

- To establish key modern technology (enabling) platforms to facilitate generation of new drug discovery knowledge through world-class applied research.
- To establish and manage research laboratories and facilities as state-of-the-art national research facilities for research and development.
- To train and mentor a new generation of high-quality postgraduate students and Postdoctoral Fellows in multi-disciplinary research, and in so doing, equip them to compete in the science and/or education sectors nationally and internationally.
- To strengthening research and development to build on and enhance public health innovation.
- To increase the body of scientific knowledge through research translation into products, patents, research papers, policy, practice and health promotion (including to the general public).
- To increase the number of health-care innovations and to produce patents based on new discoveries and new research methodologies.

RESEARCH HIGHLIGHTS UNDER THIS PROGRAMME

SAMRC/UCT Drug Discovery & Development Research Unit

Unit director:

Prof. Kelly Chibale

Research fit for purpose

The Unit's work is broadly in translational medicine research underpinned by innovative drug discovery and development with a focus on malaria, tuberculosis, and antibiotic-resistant microbial diseases in efforts to combat antimicrobial resistance (AMR). The inter-disciplinary drug discovery research undertaken in the Unit involves the integration of multiple disciplines of chemistry, biology, and pharmacology, including drug metabolism and pharmacokinetics studies. The following projects currently undertaken include: Application of innovative artificial intelligence (AI) and machine learning (ML) tools; innovative drug discovery using the drug repurposing approach and the development of human dose prediction tools for malaria treatment.

Impactful Research Interventions

i) Application of innovative AI and ML tools: Due to the high cost and long duration of bringing new medicines from the laboratory to the patient, the drug discovery community has turned to AI and ML to accelerate research timelines and reduce attrition rates. The Unit employed an AI/ML-based tool to train small-molecule activity prediction models. By exploiting in-house data collected for over a decade of research, the Unit developed a virtual screening cascade for malaria and tuberculosis drug discovery, composed of 15 models for key checkpoint assays in the cascade. In terms of impact, we showed that computational profiling of compounds, prior to synthesis and experimental testing, can increase the rate of progression by up to 40%.

ii) Innovative drug discovery using the drug repurposing approach: Due to the limited malaria treatment options able to mitigate against drug resistance and contribute to malaria elimination, this project focused on discovering a new use in malaria treatment for the investigational cancer drug sapanisertib. The research established that sapanisertib has the potential to protect from, cure and block transmission of malaria through its ability to kill the human malaria parasite when present in the liver, in the human host red blood cells and when it divides sexually within the host red blood cells to produce the transmissible forms of the parasite, which are taken up by the female anopheles mosquito during a blood meal to infect another person. The Unit also established a novel mechanism of action in terms of how sapanisertib kills the human malaria parasite. In terms of impact, to control, and ultimately eliminate malaria there is a critical need for a pipeline of novel medicines with novel mechanisms of action to avoid potential drug resistance, as well as activity against multiple stages of the parasite life cycle, particularly against blood, transmission, and/or liver stages.

iii) Developing human dose prediction tools in malaria: The problem the research sought to address is the absence of rational human dose selection tools. A model-informed strategy based on preclinical data, which incorporates

Ersilia and H3D teams collaborating on various AI/ML projects.

The 4th H3D Symposium took place on 25-28 Oct 2022 at Webersburg, Stellenbosch.

pharmacokinetic-pharmacodynamic properties with physiologically-based pharmacokinetic modelling, was developed to optimally predict an efficacious human dose and dosage regimen for the treatment of Plasmodium falciparum malaria using chloroquine, which has an extensive clinical history for malaria treatment. The predicted efficacious human dose and dosage regimen for chloroquine were comparable to those recommended clinically for the treatment of uncomplicated malaria, which provided supportive evidence for the proposed model-based approach. In terms of impact , the Unit has developed a tool to optimally predict an efficacious human dose and dosage regimen for the treatment of Plasmodium falciparum malaria for experimental malaria drugs.

Data and evidence-based Responsive Research

The Unit generates experimental data from the various drug discovery assays across the multiple disciplines of chemistry, biology and pharmacology, including drug metabolism and pharmacokinetics. In terms of the Unit using data to make informed decisions, drive innovation and ensure that the research conducted is responsive, this is best illustrated by the project described on applying innovative AI and ML tools. This work was conducted in collaboration with Ersilia Open Source Initiative. In the project example provided we've developed ZairaChem, an AI/ML pipeline to build small-molecule activity prediction models. ZairaChem is fully automated, requires low computational resources and works across a broad spectrum of datasets, ranging from whole-cell growth inhibition assays to drug metabolism properties. The tool has been implemented end-to-end at the Unit, at which no prior AI/ML capabilities were available. We have modelled the outcomes of 15 key assays, including desired activities (e.g., antimicrobial potency) and liabilities (e.g., cytotoxicity) and subsequently deployed these models as a virtual screening cascade at an organisational scale to increase the

hit rate of current experimental assays. This is the first instance of a virtual screening cascade built with data produced on and for the African continent.

Collaborations and Partnerships

The malaria drug discovery projects required partnering with a product development partner in Medicines for Malaria Venture (MMV) and a large pharmaceutical company in Merck, as well as with an international consortium, the Malaria Drug Accelerator (MalDA) funded by the Bill and Melinda Gates Foundation. The MalDA Consortium is an innovative target-guided discovery platform and collaboration between 18 international groups, including two pharmaceutical companies in GlaxoSmithKline and Novartis. On the other hand, the tuberculosis (TB) drug discovery projects required partnering with the TB Drug Accelerator (TBDA), a ground breaking partnership between 8 pharmaceutical companies, a biotech, 18 research institutions, and a product development partnership that seeks to develop a new TB drug regimen through collaboration. Since the Unit had no prior capacity and expertise in AI and ML research, the Unit entered into a partnership with Ersilia Open-Source Initiative (EOSI), a UK-based non-profit organisation specialised in AI/ML with a focus on urgent biomedical needs in Low- and Middle-Income Countries (LMICs). One of the key highlights of 2022 for the Unit was the official launch of the Johnson and Johnson (J&J) Center for Global Health Discovery at H3D, which incorporated the Unit. H3D is one of only three J&J Satellite Centers globally, with the other two in the United Kingdom (UK) and Singapore.

H3D team of chemists, biologists and DMPK scientists.

Interview with Newzroom Afrika on the potential use in malaria of a cancer treatment currently in clinical trials.

Skills building through Capacity Development

The Unit concluded a fruitful year of capacity building and training initiatives. The following items are key highlights from the past year:

- H3D, which houses the Unit, in partnership with Bill and Melinda Gates Foundation (BMGF), Medicines for Malaria Venture (MMV) and the University of Dundee Drug Discovery Centre, launched the Ghana Drug Discovery Hub in June 2022. BMGF granted 3-years of funding to three institutions in Ghana, University of Ghana, Noguchi Memorial Research Institute and Kwame Nkrumah University of Science and Technology (KNUST). H3D will be providing mentorship, training support and access to our drug discovery platform to support the Ghanian scientists. Two of the scientists visited H3D in 2022 to learn more about health and safety procedures, chemical inventory and establishing sample management systems.
- In partnership with the South African Medical Research Council, H3D approached two of the South African Historically Disadvantaged Institutions (HDIs), University of Limpopo and University of Venda, to support them to submit 3-year drug discovery project proposals in partnership with H3D. Both proposals were awarded. 80% of the funding goes to the HDI, with the remaining 20% coming to H3D to allow the HDI full access to H3D platform services and support for the students to work at H3D for periods of their project.
- The Grand Challenges Africa Drug Discovery (GCADD) projects continued through 2022 (see Fig 1). These are supported by H3D in partnership

with the Bill and Melinda Gates Foundation (BMGF), Medicines for Malaria Venture (MMV) and Science for Africa Foundation (SFA). The support to the grantees is shown in Fig. 2.

- Launch of cohort 2 and 3 of the Global Health Mentorship Programme, in partnership with BMGF and CP+ Associates. This programme assigned industry mentors to mid-career scientific staff at H3D (cohort 2) and to scientists in the GCADD programme (cohort 3) who met regularly with their mentees for coaching in the following areas: the scientific process, scientific communication, personal interactions, career progression and scientific responsibility. The programme included an in person scientific leadership workshop on 24 October 2022 .
- H3D continued with the open drug discovery webinar programme, running 21 webinars over the course of 2022. The free webinars are advertised on the H3D social media accounts and within the African drug discovery network and typically attract 50-120 participants per webinar. Recordings of the webinars are posted to the H3D YouTube channel.
- Hosting interns, job shadow and open days are some of the ways that H3D seeks to encourage young scientists to pursue careers in drug discovery research. During 2022, H3D hosted two summer interns, Bilis Kalolella from Connecticut College (USA) and Angelina Zhang from Wellesley college (USA) from mid-June mid-August and hired 4 UCT chemistry students for vac work to assist with the chemical inventory.
- The 4th H3D Symposium took place 25-28 Oct 2022, attracting 264 attendees from 18 countries. With help from the sponsors, H3D was able to award 47 travel bursaries to students from low to medium income countries (LMICs) including 11 for students from HDIs. The Symposium was a great opportunity to showcase the work on the continent and to celebrate the success of H3D over the past 12 years.
- The Chair continues to offer formal postgraduate training to the next generation of researchers in integrated team-based inter-disciplinary drug discovery research and development (R&D), 14 postgraduate (1 MSc and 13 PhD) students and 7 Post-doctoral fellows were supervised and trained during 2022. In addition, one Senior Research Officer (Dr Vinayak Singh), two Research Officers (Dr Lauren Arendse and Dr Kathryn Wicht) and one Junior Research Fellow (Dr John Woodland) were supported and mentored by Prof Chibale.

Knowledge Translation for an informed society

H3D and the Chair participated in several high-profile events both in the scientific communities and in the general public to promote awareness around Drug Discovery in Africa.

H3D has partnered with the H3D Foundation and Merck Global Health to produce a Massive Open Online Course (MOOC) "Introduction to Drug Discovery" on the Cousera Platform. This course is scheduled for release in Q2 2023.

The Unit Director was named as one of the 25 standout voices in African public health by Harvard University's Public Health magazine and was a guest lecturer at the Harvard University Malaria Science of Elimination (SoE) Course in June 2022. He was amongst three research scientists who participated in a dialogue with Melinda French Gates (co-Chair of the BMGF) on the future of Global Health Research, Development, and Innovation in Africa at the end of July 2022. Further the Unit Director was the guest speaker at the International Federation of Pharmaceutical Manufacturers and Associations (IFPMA) council meeting at start of November 2022 as well as at the European Commission workshop on broad-spectrum antivirals in pandemic preparedness held in Brussels (Belgium) at the end of November 2022 and was interviewed on 6 November 2022 by Newzroom Afrika on the potential use in malaria of a cancer treatment currently in clinical trials.

Dr Lauren Arendse and Prof Kelly Chibale on repurposing approach of a cancer drug with potential to be used against malaria.

Primate Unit and Delft Animal Centre

Platform director:
Dr Chesa Chauke

Research fit for purpose

Primate Unit and Delft Animal Centre (PUDAC) serves as a research platform with a predominant goal of supporting biomedical research; internally and externally (locally and internationally). Key objectives of the platform include, providing stakeholders with research infrastructure and laboratory animal models to support research that is aimed at curbing the burden of human diseases in South Africa. Current efforts are directed at developing biomarkers for non-communicable diseases (NCDs) and bridging the gap in HIV vaccine research in the country. Ongoing research include projects that investigate the impact of dietary salt on the development of hypertension as well as developing and testing the efficacy of local candidate HIV vaccines in the SHIV/rhesus challenged animal model. In response to ensuring that capacity development in health research is maintained, the platform continues to

Mr Ntsham and Ms Mzananda, Animal Technicians preparing food.

engage in basic and applied collaborative contract research and conduct pre-clinical and translational research in association with academia and industry.

Impactful Research Interventions

PUDAC's self-initiated research is focusing on NCDs (hypertension, obesity, cardiovascular and gut microbiome) and tests the efficacy of candidate HIV vaccines in the background of ongoing schistosomiasis research. The latter is to support HIV vaccine using the SHIV/Chinese rhesus monkey model. The focus area of these studies currently utilises the nonhuman primate (NHP) models, the vervet and rhesus monkey. Recent research output involved the use of the vervet monkey to establish a hypertensive model. The aim was to evaluate the role of dietary salt intake on blood pressure levels and gut microbiome regulation. Findings from this study confirmed that the vervet model can be used for hypertension-related studies as they developed salt-sensitive hypertension. Both NHP models were also used for the obesity studies where obese individuals were found to be insulin resistant with a possibility of glucose intolerance. These two NHP models have been proven to be excellent models to study diabetes mellitus and hypertension-related disorders. Furthermore, a rhesus macaque virus challenge model for HIV/AIDS has been established at PUDAC using SHIV, which is a chimera virus that closely mimics HIV-1. To further develop this SHIV/rhesus model, a pilot study to document the features of parasitic worm infection has been completed, and a successful infection with the parasitic worm (Schistosoma mansoni) was achieved. The data from the pilot study will guide the implementation of further studies to test the immunogenicity of the vaccines in the current study. It also helped to set up parasitological tests such as the Kato-Katz method of enumerating the parasite eggs in the stool of infected animals.

PUDAC's molecular biology laboratory: Mr Ngqaneka, Scientist preparing samples for PCR purification.

Data and evidence-based Responsive Research

PUDAC advocates an integrated bioethics approach to the use of data for research. Hence acknowledging data sharing and open science to be important features in collaborative research, credited to produce more reproducible science, maximising the use of an important resource and encouraging innovation. As an animal research facility conducting pre-clinical research, the scientific data generated by PUDAC informs on the direction of our research with the aim of closing the scientific knowledge gaps needed to discover and develop therapeutic and preventive health strategies. Furthermore, our published scientific data enables visibility for collaboration opportunities to drive innovation while ensuring that our research remains responsive to the health needs of South Africa and the sub-Saharan countries in general.

PUDAC's Vaccinology laboratory: Drs. Chege and Magwebu, Principal Investigators in the HIV Vaccine Research Programme preparing tissue culture medium for ELISpot assays.

Collaborations and Partnerships

As a research support platform, the use of our facilities and services depends on the current needs of the scientific community. Current stakeholders include both local and international clients, users, and collaborators. Contract research is conducted with a biotech company (Italy); BRIP (intramural platform) and three local Universities (UKZN, UWC, and UCT) through the capacity development initiative. Collaboration with other researchers in the SHIV/rhesus monkey project has significantly contributed to our work by providing scientific advice, lab reagents donations, providing laboratory space & equipment, donation of challenge viruses (SHIV & SIV) and providing the Leishmania parasites.

Skills building through Capacity Development

PUDAC strive to build and enhance human capacity through skills development and training of employees (animal technicians, technologists, scientists, and administrators) and postgraduate students (MSc and PhD). Currently, the platform has three PhD students who are doing their third year through the University of the Western Cape and University of Cape Town. Two of these students are supported through the SAMRC/RCD Internship Scholarship Programme which aims to develop and empower young scientists with specialised and scarce skills. In setting the foundation for future

PUDAC's Vaccinology laboratory: A PhD student preparing for ELISpot assays.

leadership, two staff members were selected for enrolment in the New Management Development Programme short course offered by the University of Stellenbosch, and both candidates completed the course. Additionally, three of our staff members obtained their Laboratory Animal Science (LAS) course certificates (FELASA accredited). Currently, six technical staff members (1 senior technologist, 4 senior technicians and 1 technician) are enrolled for the International Animal Technology (IAT) diploma course at entry and advanced levels. This is aimed at assisting them in obtaining full SAVC registration as Laboratory Animal Technologists.

Knowledge Translation for an informed society

Due to the sensitive nature of the services that we provide, we can only engage with the public through peer-reviewed publications. Research data has also been presented at several academic forums and conferences, including South African Association for Laboratory Animal Science (SAALAS), 12th Annual BRIP Symposium, 7th UWC School of Pharmacy Postgraduate Research Symposium, 16th Early Career Scientist Convention and Virtual Federation of African Immunological Societies (FAIS). Furthermore, a senior researcher was appointed to serve as a mentor in the International AIDS Society mentorship programme of 2022.

Biomedical Research and Innovation Platform

Platform co-directors:

Prof. Rabia Johnson and
Prof. Carmen Pheiffer

Research fit for purpose

The Biomedical Research and Innovation Platform (BRIP) has responded to the strategic objectives of the SAMRC by conducting cutting-edge research and knowledge generation in non-communicable diseases (NCDs), conducting innovative research to improve health outcomes, building capacity in health research and adhering to good corporate governance.

Dr Jyoti Sharma training the first cohort of students enrolled in the Patrick Chan Soon-Shiong Family Foundation training programme on Biopharmaceutical Manufacturing.

BRIP's strategic objectives focus on: Conducting responsive research on key health challenges facing South Africa such as obesity, diabetes, hypertension, and its associated cardiovascular complications, using state-of-the-art methods to unravel the mechanisms that underlie these metabolic disorders and to identify therapeutic targets and biomarkers of disease risk. To identify therapeutics from within Africa's indigenous resources, BRIP has recently established an African Traditional Medicines (ATM) platform to serve as a pipeline for therapeutic screening in Africa. Additionallly, within the Wastewater Surveillance and Research Programme (WSRP), BRIP is developing new methodologies for detecting anti-retroviral (ARV) metabolites as emerging pollutants in the aquatic environment.

Further, the Platform is currently optimising a methodology to culture limbel stem-cells in three dimension (3D) with the aim of using its culturing facility as the African hub for stem cell therapy to treat limbal stem cell deficiency.

Impactful Research Interventions

i) Limbal stem-cell deficiencies of the cornea remains a major challenge in South Africa, with no treatment modalities currently available in Africa. With funding from the SAMRC Executive Management Committee (EMC) and the National Research Foundation (NRF), a new clinical-grade, specialised cell culture facility at BRIP has been established. BRIP has successfully cultured corneal epithelial monolayers that express cytokeratin-3 (a structural protein found in corneal epithelia) from remnant corneal buttons donated by Dr Leonard Heydenrych, an ophthalmologist. A phase IV clinical trial application is currently being reviewed at the University of Cape Town and Groote Schuur

Hospital. Transplanting of the epithelial limbal stem-cells onto corneas with stem-cell deficiencies is an accepted practice in leading international ophthalmology centres. Bringing such a culturing facility to Africa would not only make corneal epithelial transplants more affordable and accessible in Africa, but more importantly, it will improve visual acuity post-transplantation.

ii) Uncontrolled hypertension increases the risk of a variety of cardiovascular disease outcomes including stroke, coronary artery disease and heart failure. Research within BRIP aims to understand the genetic basis of uncontrolled hypertension. Analysis of clinical data showed that there is limited information available on the awareness, treatment, and several other predictors of hypertension treatment in South Africa. A study within BRIP investigated hypertension determinants in a rural community with results showing that being male was associated with a three times higher likelihood of being untreated as compared to females. The latter was attributed to females utilising health facilities more often than males. In addition, being over 50 years old, overweight or obese, eating a Westernised diet and having diabetes increased the prevalence of hypertension. From a genetic perspective, BRIP screened 80 genetic polymorphisms previously associated with hypertension in the African population. However, to date, no risk allele could be identified.

iii) The mechanisms that underlie obesity and metabolic risk are unknown. Using a 12-week combined aerobic and resistance exercise training intervention as a model to unravel the molecular mechanisms that underlie obesity, research at BRIP has showed novel epigenetic changes within subcutaneous abdominal and gluteal adipose tissue depots from South African women with obesity. These exercise-induced microRNA and DNA methylation changes were associated with improvements in cardiorespiratory fitness, insulin sensitivity and adiposity, highlighting the important role of epigenetic regulation in obesity and metabolic disease.

Data and evidence-based Responsive Research

BRIP laboratories adhere to Good Laboratory Practice (GLP), which ensures that the quality, accuracy, and integrity of data is maintained, thereby driving innovation and research as follows:

Dr Kholofelo Malemela Performing SARS-CoV-2 PCR as part of wastewater surveillance.

Dr Jyoti Sharma facilitates training and skills transfer to researchers in the wastewater surveillance program.

Based on an Aspalathin synthesis method patented by the SAMRC, the South African Nuclear Energy Corporation (NECSA), in collaboration with BRIP, developed an Aspalathin C14-labelled isotope for pharmacokinetic and pharmacodynamic studies to determine the bioavailability of synthesised aspalathin as a drug candidate for metabolic diseases. In addition, data from an on-license Aspalathin agreement was used to produce a Target Product Plan for submission to the South African Health Products Regulatory Authority (SAHPRA) to proceed to Phase I/II clinical trials to use Aspalathin as a complementary/ alternative medicine (CAM) for the treatment of cardiovascular disease.

Qualitative research data obtained by conducting focus group discussions and key informant interviews with patients attending an HIV clinic in Khayelitsha

Dr Tarryn Willmer receiving a scientist Travel Award and best poster presentation at the 55th SEMDSA Congress.

Dr Jyoti Sharma training the next generation of young female scientists as part of BRIP's capacity development programme.

were used to inform a time-restricted intervention study that aimed to reduce diabesity risk in patients living with HIV and obesity and receiving dolutegravir-based therapy. Quantitative data is being used to inform future studies and used as preliminary data to obtain grant funding. For example, data from Middle-Age Soweto cohort (MASC) study showed that the devised African-specific waist circumference cut-points had a greater ability to predict incident diabetes compared to European cut-points that are typically used. However, these cut-points still had low predictive ability, particularly in women. Based on this information and on our cross-sectional proteomic data, we successfully obtained funding from the European Research Area Network for Personalised Medicine (ERA PerMed) to follow-up MASC. In collaboration with researchers from Germany and Sweden, this study will combine proteomics and metabolomics data to identify known and novel ethnic- and sex-specific biomarkers for early prediction of diabetes in African and European populations. Biomarkers associated with dietary intake will be used to inform targeted dietary modifications for primary prevention of type 2 diabetes, which will be used to inform future implementation strategies.

Collaborations and Partnerships

By combining the skillset of public health and surveillance (Environmental and Health Research Unit (EHRU), whole-genome sequencing (Genomics Platform) and molecular biology (BRIP), the SAMRC WSRP has been successfully running as a virtual inter-departmental collaborative project for the past 2 years. Within this project weekly surveillance is being performed and wastewater is now being used to detect ARV metabolites as an emerging pollutant that can affect the aquatic environments.

To improve health outcomes, BRIP has formed an inter-departmental collaborative partnership with the Genomics Platform to conduct exome and whole-genome bisulphite sequencing, to allow for the identification of biomarkers of disease risk in pregnant women with obesity, and in individuals with hypertension.

BRIP has also established collaborations with various external partners to facilitate training and skills transfer in scarce skillsets including DNA methylation analysis using pyrosequencing and computational prediction. Bisulfite pyrosequencing for the detection of DNA methylation has become a routine molecular biology method globally, yet in South Africa this is a scarce skillset with only two pyrosequencers available within the country. BRIP has established and developed the technology, which has led to various external collaborations across South Africa, including the Universities of Limpopo, KwaZulu Natal, Cape Town and Stellenbosch. In addition, BRIP has established a computational laboratory, which will provide training in computational prediction and in silico modelling.

Skills building through Capacity Development

BRIP is committed to developing the next generation of young scientists to compete with their national and international peers. Our capacity development programme involves the training of young scientists

in relevant skills, including molecular biology, epigenetics, Polymerase Chain Reaction (PCR) and 3D cell culture, thereby equipping them with state-of-the-art skills required for international competitiveness. We have collaborated with various under-resourced institutions, facilitating the training of young black African students within BRIP laboratories. Through this programme, BRIP has graduated 6 PhD and 5 MSc students in the 2022/2023 fiscal year.

BRIP scientists are playing a leading role in the SAMRC's initiative (in partnership with the Chan Soon-Shiong Family Foundation, BARDA (US government) and the Department of Science and Innovation (DSI)) to build a skilled workforce for biopharmaceuticals and vaccine manufacturing on the African continent. This initiative will grow the next generation of vaccine scientists, technicians and professionals, which will help develop and drive the biopharmaceutical industry and contribute to the African economy.

Knowledge Translation for an informed society

BRIP has contributed to knowledge generation and disseminated research findings in the form of publications and conference presentations. This was in addition to the public awareness campaigns hosted. In this fiscal year BRIP has published 45 peer-reviewed articles in open access, peer-reviewed journals.The Platform's research was presented at various conferences with staff members attending 17 national and 13 international conferences.

BRIP scientists have received the following awards for their conference presentations:

- SEMDSA best poster award (Basic Sciences)
- SEMDSA Scientist Travel Award to enable attendance at an international congress. The value of the award is R40,000.00

In terms of awareness campaigns, BRIP, in collaboration with the Non-Communicable Research Unit (NCDRU), hosted various Awareness Campaigns as part of World Diabetes Day celebrations. These included Senior Citizen Engagement, which involved sharing information about diabetes management and risk to about 50 people. In addition, we hosted a Run/Walk for Diabetes involving SAMRC staff, students, friends and family completing either a 3 or 5 km route.

World Diabetes Day Fun Walk at Jack Muller Park.

Engaging the elderly at Parow Senior Centre on World Diabetes Day

Genomics Platform

Platform director:
Prof. Craig Kinnear

Research fit for purpose

The SAMRC Genomics Platform (SGP) is a key national resource for omics research and the implementation of precision medicine. It currently facilitates four of the key technologies driving precision medicine and precision public health: genomics, transcriptomics, epigenomics and microbiomics. The SGP operates in two distinct, interconnected arms. Firstly, the service delivery arm that is responsible for providing NGS services to clients. Secondly, the research arm, which generates independent and collaborative research for the SGP and builds NGS capacity in South Africa.

In the Service Delivery Arm, we provide whole genome sequencing (WGS), whole exome sequencing (WES), transcriptome sequencing (RNA-seq), metagenomic sequencing and whole genome bisulphite sequencing (WGBS) services to South African (and African) researchers and companies.

The second arm is our research arm where we also conduct our own independent and collaborative research, and, in so doing, build capacity for the next generation of scientists. The scientists at the SGP have their own diverse research interests which forms the basis of our research activities at the SGP.

Impactful Research Interventions

- **Globin depletion for human RNA sequencing:** We investigated the effect of bioinformatic globin depletion on human RNA sequencing differential gene expression analysis. We know that for RNA extracted from whole blood, RNA from haemoglobin can account for up to 70% of the transcriptome which has a significant effect for differential gene analysis. A result of this is that most researchers working with RNA derived from whole blood will remove globin transcripts prior to library preparation. However, it has been proposed that one could also remove the globin transcripts bioinformatically. In our study, we compared the impact of these two approaches on the outcome of differential gene expression analysis by using RNA sequencing data from 29 globin kit-depleted (TB patient and household contacts) and 29 matched non-depleted whole blood samples. We conclusively show that globin depletion prior to library preparation increased sensitivity to detect disease-relevant changes in gene expression compared to bioinformatic removal of globin reads.
- **Autophagy**: Another project investigated the time-dependent profile of autophagy activity through the course of *M.tb* infection. Autophagy activity was inferred by the turnover measurement of autophagy markers and *M.tb* bacilli in cell lines. Over 4 to 72 h, we observed highest autophagy turnover at 48 h of infection in *M.tb*-containing cells, with the highest turnover levels of p62 and intracellular *M.tb*. This supports observations of phagosomal damage mostly occurring at that time and reveals correlation of increased autophagy activity. The findings support the preservation of autophagy activity despite *M.tb* infection while also highlighting time-dependent differences in *M.tb*-infected macrophages. Future studies may explore time-dependent exogenous autophagy targeting host-directed anti-tuberculosis therapy.
- **Wild dog whole genome sequencing:** The SGP has also embraced the "One Health" concept and is using next generation sequencing to not only advance the health of humans, but animals and plants as well. We have recently collaborated

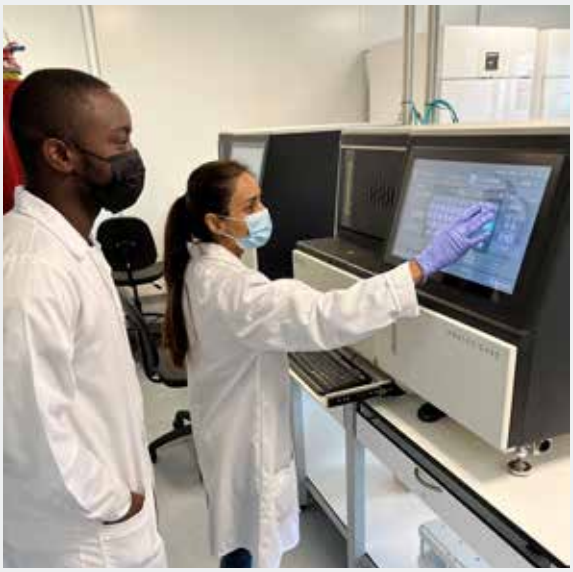
with the SAMRC Centre for Tuberculosis Research and the Division of Molecular Biology and Human Genetics at Stellenbosch University to investigate genomic diversity in African wild dogs (Lycaon pictus). The African wild dog is an endangered species that has undergone several population reductions. Small, isolated populations suffer from threats to their genetic diversity, and this may have consequences to viability of the species and its future survival. We generated whole genome sequencing data for 71 free-ranging African wild dogs from the Kruger National Park (KNP). The data showed that while these dogs are not currently inbred, they do have low genomic diversity which may influence the species viability over time. This study highlights the importance of assessing population genomic parameters to set conservation priorities.

Data and evidence-based Responsive Research

In the past year, our team have sequenced a total of 2307 samples that provided data for biomarker discover, clinical trials, diagnostics, pathogen detection and surveillance, precision medicine and vaccine development. From income generated, we funded sequencing of 354 samples that was used as pilot data for funding applications, technology development, method development and training. Furthermore, we have integrated Oxford Nanopore Technology into our Platform to make long read sequencing more accessible to local researchers.

Data generated in our laboratories are also used to improve on current sequencing protocols to improve our sequencing services. We have for example used RNA sequencing data to show that globin depletion prior library preparation increased the sensitivity to detect disease-relevant gene expression differences. Moreover, using DNA and RNA concentration and integrity data, we were able to develop protocols for sequencing low concentration and low-quality DNA and RNA samples. This was crucial given that many of our clients have stored legacy samples collected many years ago that are of substandard quality for sequencing. These samples are however extremely valuable and therefore we want to ensure that we can extract as much information from them as possible.

We also form part of a large national COVID-19 Host Gene project where we use whole genome sequencing data of individuals with severe and



Ms Samira Ghoor preparing a sequencer for whole genome sequencing.

RNA quality control training. Senior Research Technologist, Mr Martin Naicker providing training to Mr McDonald Shiri.

Chief Research Technologist, Enrico Roode extracting RNA from Blood.

Lead Bioinformaticist, Dr Brigitte Glanzmann processing sequencing data.

critical COVID-19, many who were hospitalised during the early stages of the pandemic without access to a vaccine. We believe that these datasets could provide insights into understanding the role of host genetic variants in the development of severe COVID-19.

Finally, we use data from whole genome sequencing and whole exome sequencing to identify disease-causing variants in patients with inborn errors of immunity and developmental disorders. By identifying these mutations, one can better manage the patients and make informed decisions on treatment strategies.

Collaborations and Partnerships

The SGP is a national asset and as such it is vital that the research undertaken at the SGP is aligned with the National health priorities. For this reason,

all research conducted at the SGP focuses on the current health challenges facing South Africa and the African continent. In addition to the national and pan-African priorities, the SGP is also mandated to drive the advance precision medicine in South Africa. To this end, the SPG's research activities will be to achieve this goal.

Prof Craig Kinnear already has an established network of collaborators investigating TB and has close ties with the SAMRC Centre for Tuberculosis Research. Additionally, the Platform has worked closely with the SAMRC Biomedical Research and Innovation Platform (BRIP) in establishing the Platform.

The SGP is part of a large SAMRC intra-Unit programme that uses wastewater-based epidemiology as a SARS-CoV-2 surveillance tool. Using NGS, the Genomics Platform will sequence SARS-CoV-2 RNA in wastewater samples to monitor the occurrence of new viral variants. This will later be expanded to sequence other emerging and seasonal pathogens in wastewater.

As a Distributed Platform for Omics (DIPLOMICS) partner laboratory, the SGP has already fostered good relationships with other DIPLOMICS laboratories to enable genomics research in South Africa.

Skills building through Capacity Development

The SGP has trained research technologists and postgraduate students and provide the equipment and infrastructure to train South African field application specialists, and field service engineers. In the past year, we have provided the facilities for the training to two South African MGI field application specialists and one field service engineer. By providing the training facilities we have enabled three young South Africans from disadvantaged background to gain scarce skills that will benefit all laboratories in South Africa and in Africa who perform next generation sequencing using MGI instruments.

We have consistently encouraged and enabled our staff and students to attend course and workshops and to pursue higher degrees to build capacity for our platform and for the broader community. Our staff members and students have attended courses research ethics, data analysis and interpretation, presentation skills and R-programming. These workshops were aimed at providing them with critical skills needed for the research conducted at our Platform. Furthermore, two of our staff members are also enrolled in PhD programmes, one staff member is completing her Master's in Public Health and another one is registered for an MSc.

Knowledge Translation for an informed society

Prof Craig Kinnear, Dr Ansia van Coller and Dr Brigitte Glanzmann are members of the Primary Immunodeficiency Disorders Genetics Network of South Africa which is a group of clinicians, geneticists, molecular biologists, immunologists, and genetic councillors that provide genetic diagnoses to patients with Inborn Errors of Immunity (IEI). Dr Nadia Carstens is a member of the Deciphering Developmental Delay in Africa (DDD-Africa) programme that aims to develop NGS-based testing strategies and to add precision to the diagnosis and clinical management of developmental disorders. Additionally, she is the primary investigator for a study that evaluates the utility of clinical sequencing to improve diagnostic services for critically ill infants in South Africa. Data from this pilot project will be used to inform diagnostic strategies for clinical genetic services in South Africa. All of these projects have translational impact. The findings from the genomic testing employed in these studies are communicated to the patients/families and their clinical teams so that this information can be used to their benefit in the clinic. For the majority of patients this will be their only opportunity to get a definitive diagnosis because NGS-based testing is not yet available in the SA State Healthcare system.

During the recent International Conference for Human Genetics in Cape Town, members of our team were invited to give plenary talks. Dr Brigitte Glanzmann presented work on IEIs, while Dr Nadia Carstens presented her contributions to ClinVar. Moreover, MGI showcased our laboratories as an example of the integration of technology to improve SARS-CoV2 detected. These interaction with stakeholders resulted in a number of researchers contacting the SGP for collaboration and training opportunities.

SAMRC/TUT Herbal Drugs Research Unit

Unit director:
Prof. Alvaro Viljoen

Research fit for purpose

The Herbal Drug Research Unit, through technologically advanced scientific research, seeks to make basic knowledge readily available to stakeholders, in order to promote the quality, safe and efficacious (QSE) use of herbal medicines in South Africa and the world at large. In line with the strategic objectives of the SAMRC, we have developed efficient and robust quality control protocols for the raw material used in product formulation and set qualitative and quantitative parameters for botanical raw materials and product formulations.

Additionally, using an evidence-based ethnopharmacological approach the Unit aims to provide a scientific basis for the pharmacological properties of selected traditional medicines, including the potential toxicity and biopharmaceutical aspects, as well as herb-drug interactions. This together with developing a chromatographic database of commercially important indigenous medicinal plants to be used by industry collated the information to produce a set of extended monographs for the most important South African medicinal plants.

Impactful Research Interventions

i) The absence of standardised protocols for the quality control of herbal medicines has impeded their global commercialisation. The Unit embarked on a project to produce an extended set of monographs which we collated into a book publication titled: "The South African herbal pharmacopoeia – monographs of medicinal and aromatic plants", published during the period under review. The book provides a comprehensive, up-to-date literature review of 25 medicinal plants in South Africa. It documents quality control protocols for chemical fingerprinting and biomarker identification in plant material, as well as updated safety profiles of medicinal plants. Academics researching pharmacy and analytical chemistry will benefit from the detailed chemical profile of each species presented. Industrial manufacturers of herbal products, herbal medicines, cosmetics, food supplements, and national and international policymakers and regulators will benefit from the overview provided at the beginning of each chapter.

ii) An ex vivo study investigating the nose-to-brain delivery of selected medicinal plant extracts was completed and an article was published during the reporting period). A second project which investigated the effects of herbal extracts on permeation of P-glycoprotein substrate drugs across excised pig intestinal tissue was completed and an article was published.

iii) Using a metabolomics approach to identify biomarkers for isolation and to make these commercially available, two projects were finalised and some compounds isolated, with flavonoid glycosides and ellagic acid cognates were isolated from defatted African mango (Irvingia gabonensis) seed kernel as well as the identification of commercial essential oils with anti-tuberculosis activity, as well as the bioactive constituents was possible using a biochemometrics approach.

Data and evidence-based Responsive Research

One of the greatest misconceptions is that herbal equates to being safe. Knowledge of the safety of indigenous herbal medicines is far from adequate to promote their regional and global use. The Unit has embarked on an ambitious project to document the potential toxicity of African Traditional Medicines which is crucial to ensure the safety of consumers. This information has been collated in various herbal monographs and a digital platform is currently being developed to make this information available to the general public.

Collaborations and Partnerships

Industry partners and academics were invited to co-author the monograph chapters for the book publication "The South African herbal pharmacopoeia – monographs of medicinal and aromatic plants". The various monographs in the book were authored by different co-authors from various institutions. Further collaborations were established with other institutions which assists with skills transfer and allows the Unit to conduct diverse research projects. These include North-West University,

University of the Witwatersrand,Medical University of Lublin in Poland, Nelson Mandela University, University of Johannesburg, Department of Horticulture, Tshwane University of Technology, University of Cape Town, University of Mississippi, North-West University, Tshwane University of Technology, and North-West University, respectively.

Skills building through Capacity Development

The Unit is active in the staff development programmes at TUT, which is still developing its research capacity and uses this opportunity to train staff members in the Department of Pharmaceutical Sciences, to achieve their PhD qualifications. Four staff members are currently working towards obtaining doctoral degrees under the supervision of the Unit Director. A total of seven postgraduate students (3 PhD and 4 Masters) , completed research projects with the Unit and graduated in 2022. Additionally the Unit currently has a total number of 20 postgraduate students, 11 Doctoral and 9 Masters with 5 postdoctoral fellows under training, of which the majority are from previously disadvantaged groups.

Knowledge Translation for an informed society

The Unit produced high-level chromatographic and spectroscopic fingerprints, as well as quality control protocols, that were collated into a set of monographs for 25 South African indigenous botanicals. The targeted readership includes academics and researchers in the field of pharmacognosy, pharmacy, botany and analytical chemistry, as well as manufacturers of herbal medicinal products and supplements, nutraceutical and cosmetics, and national and international policy makers and regulators. The book serves as a reference for setting quality parameters for botanical raw materials and products. The public stands to benefit from the comprehensive literature reviews that outline the traditional uses, methods of application and safety aspects of these commonly used herbal remedies.

The Unit is actively developing and validating quality control protocols for herbal raw materials and products. This has translated to an analytical service to the herbal products industry specifically local manufacturers and farmers, where chemical fingerprinting of raw materials and products are analysed for compliance.

SAMRC/UJ Pan African Centre for Epidemics (PACER) Research Unit

Unit director:

Prof. Refilwe Nancy Phaswana-Mafuya

Research fit for purpose

The need to prepare for and respond to, as well as prevent current and future pandemics and their long-term devastating direct and indirect impacts is apparent. In this regard, the SAMRC/University of Johannesburg (UJ) Pan African Centre for Epidemics Research (PACER) Extramural Unit conducts cutting edge epidemiological and public health research aimed at understanding and responding equitably, sustainably and effectively to local epidemics. In addition, PACER seeks to strengthen the country's proactive response to current epidemics and readiness for future pandemics. PACER's vision is to *"Be the leading producer of cutting-edge scientific evidence for an equitable and sustained pandemic response in the African Continent". PACER's mission is "The generation of cutting edge epidemiological and public health evidence for the equitable and sustainable response to local epidemics and future pandemic preparedness strategies in order to guide new models of health care, strengthen health systems, mitigate direct and indirect impacts, optimize post-pandemic resources and eventually improve quality of life for all."* PACER takes on ambitious research projects and finds funds for them. One of PACER's project supported by the SAMRC Research Capacity Development Programme involves building a comprehensive data repository with computational power to handle different data types across geographies and periods

Boloka is an indigenous language (Sepedi, Sesotho and Setswana) word meaning store or keep. In this case, we will keep or store big heterogeneous data.

Impactful Research Interventions

The work of PACER impacts on the NSP for HIV/STIs/TB in the country. It also contributes to new policies nationally and internationally and seeks to generate evidence to guide or improve health system planning, health service delivery, government policies, programming.

i) South Africa has information management tools, and a monitoring and evaluation system to ensure comprehensive, measurable, and meaningful responses that follow the science. However, there is no specific mechanism or centralised system to gather and monitor HIV data. This leads to lack of disaggregated information, lack of targeted approaches, missed opportunities to scale up what works, misallocation of resources, perpetuate inequalities, and may undermine the entire HIV response. The Boloka project has public health significance namely: leverage existing data to better understand the HIV epidemic; to effectively measure the population-level impact of addressing the needs of those at the highest risk, strengthen SA's health systems and public health accountability mechanisms for local epidemics and future directions, and inform key service delivery adaptations, innovations and new models of care. Several empiric, contextual, observational, and programme datasets have been harnessed including open access survey data (SABSSM 2002, 2005, 2008, 2012, and 2017), observational data from key populations' implementation science study, and DHIS routine data from the NDoH. Several papers have been published and MPH students graduating from the studies done in PACER.

ii) The extent to which COVID-19 impacted HIV services among KPs remains largely unknown, as such PACER also launched the Lokishang project to evaluate heterogeneous data, including survey, routinely collected programme data, to inform tailoring and adaptation of implementation strategies for the delivery of HIV prevention and treatment services among KPs in SA. This project will generate evidence needed to mitigate the impacts of COVID-19 on HIV service delivery and health outcomes. It will also elicit best practices, 'lessons learned', and guide modifications for the continuity, transitioning towards restoration and recovery of HIV services in primary health care facilities. To date, several students are pursuing their degree aligned focusing on the impacts of COVID-19 on HIV services among different population groups in SA. Various presentations on the impacts of COVID-19 on HIV services have been shared at conferences.

Data and evidence-based Responsive Research

The SAMRC/UJ PACER work is informed by the SA National Strategic Plan on HIV, TB & STI s2023-2028; it is aligned to the Sustainable Development Goals and National Development Goals. *"In responding to the pandemic, another wake-up call was the need to improve the understanding of current pandemics through cutting-edge Pan African and global research, epidemiological, and public health studies among marginalized populations in diverse low-resource settings in South Africa, Sub-Saharan Africa and globally. This would be the focus of Professor Refilwe Nancy Phaswana-Mafuya's Unit, the HYPERLINK "https://www.samrc.ac.za/research/extramural-research-units/pan-african-centre-epidemics" Pan African Centre for Epidemics Research Unit"* Prof Glenda Gray. Given the later, the Boloka project seeks to systematically and rigorously integrate big heterogenous HIV data, e.g., harmonisation, transformation and related using small area estimations, data science techniques. This is geared towards improving understanding of HIV acquisition and onward transmission and to mitigate the epidemic consequences of the unmet HIV prevention and treatment needs of KPs. The scientific premise of the Boloka project is that the reliance on general population-oriented approach to guide programmes has limited the impact of HIV responses in settings. We need to understand the degree to which a KPs-tailored HIV response, sensitive to heterogeneity, can effectively and efficiently reduce HIV incidence.

Additionally, the optimal implementation of innovations or adaptations made to mitigate the negative effect of COVID-19 on health care service delivery is not described in the literature. The Lokishang project characterises, monitors, evaluates, and estimates the impact of COVID-19 on the utilisation or provision of HIV prevention, diagnostic, and therapeutic services among key population who may have suffered reduced access to HIV services pre- and peri-COVID-19 given persistent barriers. This study will generate evidence needed to mitigate the impacts of COVID-19 on HIV service delivery and health outcomes. It will inform new models of care in pandemic times to ensure continuity of services and improved service utilisation, thus strengthening public health accountability mechanisms and the country's future pandemic preparedness.

Signing a data sharing agreement with GAC.

Collaborations and Partnerships

The SAMRC/UJ PACER build on long standing national and international networks. It has excellent networks with national and international universities, research agencies, NGOs, public figures, policy makers, and the media that can be leveraged.

The SAMRC/UJ PACER projects have leveraged inter-departmental at UJ and external collaborations opportunities for cross-pollination and fertilisation of knowledge and best practices in big data health science. These include: UJ Faculty of Engineering and Environmental Built (FEBE), UJ Information Computer Systems (ICS), UJ Centre for Applied Data Science, Johns Hopkins University, Emory University, University of South Carolina, University of MacMaster, Amazon Web of Science (AWS) and Data Sharing Partnerships – South African National AIDS Council (SANAC), National Department of Health (NDoH).

Skills building through Capacity Development

The SAMRC/UJ PACER seeks to build capable staff with critical skills and strengthen epidemiologic and public health capacities for handling current and future epidemics by providing excellent experiential training opportunities for young or emerging researchers who are working on their Master's (30 MPH) or doctoral(9 PhD Public Health) and (postdoctoral research fellow) PDRF (1) and attracting and graduating diverse postgraduate students and PDRFs to contribute to the transformation agenda, National Development Plans and Sustainable Development Goals.

A range of capacity building activities are explored within the projects to provide opportunities for skills transfer in terms of postgraduate training and supervision, publication co-authorships, joint scientific presentations, provision of mentorships, supporting career progression and professorships working UJ capacity building programmes. The postgraduate students including MP and doctoral students as well as PDRFs completed more than 30 UJ postgraduate capacity building workshops and seminars. The Unit staff and researchers completed the online TREEE training on introduction to research ethics, informed consent, good clinical practice and research ethics evaluation and obtained competency certificates and have registered 18 Masters of Public Health and 9 doctoral (public health) students as well as one postdoctoral research fellow. SAMRC/UJ PACER is supporting equitable scholarship through meeting educational needs of diverse group of researchers.

Two JHU MHSc students placed on internship for four months, where postgraduate students are serving as research assistants on the projects for hands-on experience. In terms of mentorship, Faculty staff members are co-authoring research manuscripts on SAMRC/UJ PACER projects. Finally, D43 Fogarty training grant application with Emory University and John Hopkins University is ongoing, to increase access/enrolments; postgraduate learning opportunities; accelerate research career pathing and academic staff retention for an increase in postgraduate qualifications; improved academic qualification; postdoctoral fellowships; and professorships with a range of institutional infrastructural supports.

Knowledge Translation for an informed society

The Unit took advantage of various dissemination platforms to translate the work done so far, including conference presentations at national, regional and international level, stakeholder meetings, and research publications.

In terms of research outputs – six papers have been published in peer-reviewed journals. With respect to community and stakeholder engagement – project presentations and discussions have been held with SANAC, Beyond Zero, NDoH, AFSA, NACOSA, GALZ, AWS, UJ FEBE and ICS.

Programme 6

BIOMEDICAL RESEARCH

PURPOSE OF THE PROGRAMME

To conduct basic research, applied research and transactional research to determine predisposition to disease. This understanding is important for planning effective intervention and disease control.

UNITS THAT CONSTITUTE THIS PROGRAMME

1. Bioinformatics Capacity Development Research Unit (ERU).
2. Precision and Genomic Medicine Research Units (ERU).
3. Stem Cell Research and Therapy Unit (ERU).
4. Antiviral Gene Therapy Research Unit (ERU).
5. Genomics of Brain Disorders Research Unit (ERU).
6. Precision Oncology Research Unit (ERU).
7. Wound and Keloid Scarring Translational Research Unit (ERU).
8. Cardiometabolic Health Research Unit (ERU).
9. Platform for Pharmacogenomics Research and Translation Research Unit (ERU).

PROGRAMME STRATEGIC OBJECTIVES

- To generate scientific knowledge in the field of biomedical science, which will provide insights into various diseases of national priority. This in turn will lead to novel diagnostic, preventive and therapeutic strategies.
- To undertake original research of high quality, which will provide novel insights into acute and chronic inflammatory diseases of national priority, thus leading to novel diagnostic, preventive and therapeutic strategies.
- To train and mentor high-quality postgraduate students who are able to compete in the science, health and/or education sectors locally and abroad.
- To strengthen biomedical research through a policy of enabling researchers from other academic institutions to have access to sophisticated laboratory equipment and supervision. In addition, to provide assistance to national research funding agencies with respect to evaluating applications for research funding.
- To translate research data into policy and practice regarding prevention, diagnosis, treatment and management of diseases.
- To develop and test biomedical innovations that will address various conditions.
- To develop health-care management systems and plan a 'gene therapy' intervention programme for retinal degenerative diseases.

RESEARCH HIGHLIGHTS UNDER THIS PROGRAMME

SAMRC/SANBI/UWC Bioinformatics Capacity Development Research Unit

Unit director:

Prof. Alan Christoffels

Research fit for purpose

The SAMRC Bioinformatics Unit focuses on the development of analytical tools to address health challenges facing South Africa and the continent. Through a series of national and international collaborations we have developed methods and to gain insight into disease mechanisms or reduce the barrier to entry for researchers in resource-limited environments.

Bioinformatics for Oncology:

Dr Bendou and his team identified a methylation CpG signature capable of predicting the amplification of *MYCN*, a predictor of poor prognosis, in the early stages of neuroblastoma. This achievement has the benefit of helping clinicians design better treatment for patients with *MYCN* amplification. The work was published in the journal *Future Oncology* with an impact factor of 3.4 (2020). Dr Bendou's PhD student Nasr Eshibona, through principal component analysis and hierarchical clustering of RNA-seq gene expression counts from paediatric acute myeloid leukaemia samples, found that samples carrying the *FLT3-ITD* mutation (poor prognosis) were grouped, in the same cluster, with samples carrying the NPM1 and the *CEBPA* mutations (favourable prognosis). This surprising result led to further bioinformatics analyses and the discovery of three genes potentially responsible for the poor prognosis in *FLT3-ITD* mutated patients.

Early warning systems for pandemic preparedness

Various infectious disease etiological agents originate from animal reservoirs, and many have, over time, acquired the ability to cross the species barrier and alter their host range. The emergence and re-emergence of zoonotic pathogens is reported to be a consequence of changes in several factors, including ecological, behavioural, and socio-economic variables which are arguably impossible to control. Computational methods with the capacity to evaluate large datasets, are considered invaluable tools for predicting and tracking disease outbreaks and are especially powerful when combined with machine learning techniques. These predictive methods may be integral, not only as early warning systems for outbreak preparedness, but also in the monitoring of intervention effectiveness during epidemics or pandemics. This study aimed to develop a machine learning model which would allow for prediction of potentially zoonotic organisms, by using viral surface proteins which facilitate viral entry into host cells, as the data input for training. Sequence data and metadata was obtained from UniProtKB, transformed into a machine-readable format, using frequency chaos game representation (FCGR). A deep convolution neural network model was developed which identified sequence patterns consistent with viruses which infect humans. The model achieved 96.78% accuracy, 0.97 F1 score and 0.93 MCC on unseen data, outperforming other machine learning models found in literature.

Wild rooibos tree growth type. This plant differs morphologically and biochemically from the commercial plants. And is only used for local tea production.

Wild Rooibos Black growth Type. This plant differs morphologically and biochemically from the commercial plants. And only used for local tea production.

Wild Rooibos (Red type). This plant type is the origin of the commercial rooibos plants

Continental data sharing platform

Despite the increase in SARS-COV-2 data production in Africa during the past 2 years, there is resistance to deposit these datasets in global repositories. This hesitancy is partly due to factors such as a mistrust and lack of reciprocity on the part of data consumers. GISAID has attempted to provide a solution during the COVID-19 pandemic, yet there remain concerns with data management. During 2022 the team led by Prof Christoffels embarked on a continental data management system that will allow African researchers to submit pathogen data to a system that will be called the African Pathogen Archive. The pilot release of this system is scheduled for June 2023. The multiple teams involved in this project and across borders is a demonstration of the diverse skills that are needed to deliver innovation that will be disruptive in the scientific community. The impact of this development is a paradigm shift where African scientists are taking the responsibility of data custodianships despite critique that we do not have the resources or skills.

Impactful Research Interventions

Determine what drives the mutational changes in the Omicron variant of concern (VOC): A/Prof Harkins and his team is part of a multi-national collaboration that uses molecular evolution techniques to understand the drivers of mutational changes in the Omicron Lineage BA.1. Selection Analysis Identifies Unusual Clustered Mutational Changes in Omicron Lineage BA.1 that Likely Impact Spike Function. These findings have potential to influence vaccine design.

Method development for using MinION sequencing machine to sequence the Rooibos genome: This project is underpinned by the overall goal of Dr Hesse to establish all methodologies essential for medicinal plant genome analysis. These methods are intended to identify rooibos genes involved in medicinal compound production and plant stress tolerance. In 2022, Dr Hesse published a method for MinION sequencing and data analysis used to generate a high-quality assembly of the 1.25Gbp rooibos genome. She optimized 3rd generation sequencing procedures for the analysis of plant transcriptomes using MinION from Oxford Nanopore. This methodological work was essential to the sequencing of 12 transcriptomes for Rooibos. This data is now being analyzed and provides a molecular understanding of the medicinal value of Rooibos.

Virtual genotyped population cohort linking genotype and routine health data: With informed consent from health care clients, it is possible to link individuals' genotype data with their routine health data to establish a genotyped virtual cohort with complex clinical phenotype data that can be updated in the future using routine health records. We are piloting this approach by establishing the informed consent process, sample and data workflows to create, in the first instance, a virtual genotyped cohort for patients with diabetes in Cape Town. Funding from UKRI/MRC will fund a pilot study for proof-of-principle establishment of a virtual genotyped population cohort using this approach, as well as establishing the infrastructure to return actionable findings from the analysis to clinicians at the Western Cape Department of Health. Tamuhla T, Tiffin N, Allie T. An e-consent framework for tiered informed consent for human genomic research in the global south, implemented as a REDCap template. BMC Med Ethics. 2022 Nov 24;23(1):119. doi: 10.1186/s12910-022-00860-2

Optimising data linkage of African health client data: When integrating individualised data from a variety of sources, different linkage algorithms can be used to ensure the most accurate linkage and deduplication of records that originate from the same individual. Most of these algorithms, however, have been developed using Euro-centric datasets and do not necessarily perform as well in African contexts, and we are working on a systematic approach to improve data linkage for routine health data. In collaboration with the Western Cape Department of Health, Prof Tiffin and her team completed a descriptive analysis of the current iteration of the

The Rooibos genomics research team led by Dr Uljana Hesse. The focus is on rooibos varieties from the Rooibos Aspalath (us linearis) complex.

linkage algorithm at the Provincial Health data centre (PHCD) at the Western Cape Department of Health. This work led to following the publication Record linkage for Routinely Collected Health Data in an African Health Information Exchange. International Journal of Population Data Science. 7. 10.23889/ijpds.v7i3.2022. This work led to a review that is underway of the governance protocols and ethical requirements for this ongoing work using routine health data at the PHDC.

Data and evidence-based Responsive Research

Development of diagnostics for Ebola detection: In 2021, Dr Cloete and his team demonstrated the use of DNA Aptamers for Rapid Screening of TB at the Point-of-Care. The work entails developing multiplex lateral flow devices (LFDs) for the detection of serum human biomarker proteins. This strategy is being used for the development of novel DNA aptamers against Ebola virus nucleoproteins

Dr Bendou and his team identified a methylation CpG signature capable of predicting the amplification of MYCN, a predictor of poor prognosis, in the early stages of neuroblastoma. This achievement has the benefit of helping clinicians design better treatment for patients with MYCN amplification.

Dr Hocine Bendou the Bioinformatics for Oncology team lead.

Collaborations and Partnerships

Dr Bendou established a collaboration with Dr Carmen Pheiffer at the SAMRC to study the effect of physical training on the expression of miRNAs in gluteal adipose tissue in women with obesity. The expertise on gene expression analysis in the Bendou lab was combined with the experimental skills of DR Pheiffer.

Data mining in an era of big data is dependent on quality data. To this end Dr Anderson at SANBI embarked on a collaboration with the National Health Laboratory Services to evaluate data quality and metadata standards with a view to improve data linkage in data holdings in a public health setting.

The continental data platform development led by Prof Christoffels includes multi-national teams comprising (1) engineers to configure the hardware for a pan-African data store, (2) software design programmers to create a user-friendly web experience, (3) bioinformatics staff from multiple labs in Africa to ensure reproductible analysis tools are used, (4) a data curation team to verify the accuracy of data that is uploaded in the system, (5) public health implementation scientists to stress test the data platform, (6) data policy specialists to review country-level access agreements.

Skills building through Capacity Development

Our academic programme support MSc and PhD student training where students register for their degrees in the Unit. Each of these research driven projects are embedded in the research progamme of each academic staff member. In addition, we provide short-term courses on behalf of the Africa CDC's pathogen genomics programme to the SADC region and beyond.

SAMRC/UP Stem Cell Research and Therapy Research Unit

Unit director:

Prof. Michael Pepper

Research fit for purpose

One of the most exciting and rapidly growing areas in the practice of medicine involves the use of cell-and gene-based therapeutic techniques for the treatment of patients with a variety of diseases and for tissue repair. Although this has been accelerating rapidly in many countries, in the past it has been limited in South Africa. Until recently, virtually nothing had been done to explore the great potential offered by these technologies to address the high disease burden in our country. Broadly speaking, advanced cellular and gene therapeutic technologies can be grouped under regenerative and adoptive strategies.

We utilise fundamental biological principles focused on specific molecules to target several diseases that contribute to the high disease burden in our country. These include communicable diseases such as HIV, non-communicable diseases such as obesity and cancer, and diseases responsible for infant morbidity and mortality. These are ambitious and forward-looking projects which aim to contribute to the alleviation of the heavy burden of disease in South Africa and thereby to contribute to the development of novel regenerative and adoptive cell therapies that will address a global need, particularly in lower-to-middle income countries.

Advanced cell and gene therapies will have a major impact on medicine in the years to come, and although South Africa has yet to establish a platform for the delivery of these technologies to its population, work in our own group and others is paving the way for the application of affordable and accessible therapies that will benefit a wide range of patients with a multitude of diseases.

Impactful Research Interventions

i) **Cancer**: Our group has been working on various facets of adoptive therapies and in particular CAR-T cells. Genetic engineering of primary human T-cells with a CAR molecule programmes these cells to bind to specific target cells and destroy them. At the ICMM, we are looking at different ways to grow CAR T-cells that may improve the clinical product as it is becoming increasingly evident that CAR T-cell subpopulation structure is important in the overall success of treatment. We currently work with a CAR targeting an HIV envelope protein that gets left behind on the surface of HIV-infected cells, but this work is transferrable to CARs targeting molecules commonly identified on the surface of cancer cells which we hope to introduce soon.

ii) **Obesity**: Our goal is to identify novel molecular targets that drive obesity. In this regard, we have identified Slc7a8 as an important molecular regulator of lipid accumulation in cells and showed that the deletion this gene significantly protects against diet induced obesity development, attenuates adipocyte hypertrophy and lipid accumulation in non-lipid storage organs (Pitere et al., 2022). Furthermore, we showed that the mechanism of prevention of adipocyte hypertrophy is fat depot specific and leads to an improvement in metabolic health and a decrease in inflammation associated with obesity development.

iii) HIV remains an incurable disease, although significant progress has been made in recent years in improving the quality of life and life expectancy of people living with HIV (PLWH) through advances in anti-retroviral therapies. HIV not only affects the immune system, but also the broader hematopoietic system. Clinically the effects of HIV on the haematopoietic system manifests as cytopenia(s) (e.g., anaemia, thrombocytopenia, neutropenia), which have a negative impact on the quality of life of PLWH and are associated with increased mortality. Cytopenia's are characterised by the presence of abnormal low blood cell numbers (of the blood cell lineage affected). Haematopoietic stem and progenitor cells (HSPCs) reside in the bone marrow and give rise, i.e., are the cells of origin, of all blood cell types. Furthermore, HSPCs are heterogenous consisting of primitive (true) hematopoietic stem cells, and progenitor cells at different stages of differentiation/maturation. Stromal cells, including mesenchymal stem cells, in the bone marrow niche play an essential role in maintaining the HSPC pool. Any disruption of this tightly balanced homeostasis will have a negative impact on the hematopoietic system and potentially also the immune system. Several reports have indicated that HIV impairs the function of HSPCs. However, the exact mechanisms involved have not been fully elucidated. Our research aims to develop a better understanding of the interactions of HIV with cells within the bone marrow niche in an attempt to identify the HSPC sub-populations and other BM-associated cell populations affected, and the mechanisms involved. We believe that extending investigations of the effect of HIV on biological systems to broader systems, such as the hematopoietic system, will result in the identification of novel cellular targets and/or biomarkers that may potentially lead to the development of novel, more targeted treatment and patient management strategies.

(Almost no research has been done on assessing haematopoiesis in HIV exposed but uninfected (HEU) infants, and our group is attempting to determine whether exposure to the maternal HIV milieu) could result in a functional disadvantage in the haematopoietic stem/progenitor cell

Members of the Stem Cell Research and Therapy group.

of these infants. Additionally, the impact of antiretroviral drugs taken by mothers in pregnancy on HSPCs of HEU infants is also being researched. By understanding the characteristics of HSPCs from this infant cohort we will be better placed to identify whether the haematological abnormalities seen in these infants could be attributed to impairment in the HSPC themselves. Furthermore, this research is the first step to determine whether it may be feasible to use the umbilical cord derived HSPCs from HEU infants for the purpose of haematopoietic stem cell transplantation in the future.

Data and evidence-based Responsive Research

Our work is driven by the need to address the high disease burden in South Africa, including communicable (HIV) and non-communicable (obesity, cancer) diseases, as well as contributors to high infant morbidity and mortality.

Collaborations and Partnerships

We have collaborations in our own institution, across South Africa, and abroad. Our collaborations include academia and industry.

Skills building through Capacity Development

One of our major goals is to develop capacity in the advanced technologies we employ, both from a research and therapeutic perspective. Members of our group reflect the demographics of South Africa, and the majority of our students are women. We have postgraduate students at all levels, and several staff members at the level of project manager and senior scientist.

All of our research is translational in nature, with patients as the end goal. All our research is undertaken on patient-derived material. Our graduates have all found employment soon after graduating, and we have become the main provider of staff for entities involved the cell and gene therapy areas in South Africa.

Knowledge Translation for an informed society

Member of the Stem Cell EMU are frequently solicited to join radio and television interviews and contribute to the lay press on their specific areas of interest. We also contribute to outreach programs for school children, and frequently host undergraduate students in the Unit for the purpose of providing them with insight into the nature of our work.

One of the major interests of the group is bioentrepreneurship. In this regard, we have been involved in the creation of start-up companies in our areas of interest, in particular Antion Biosciences SA (https://antionbio.com/#/) and Novita Biotechnologies (https://novita-biotech.com/). Antion is involved in the development of adoptive therapies using proprietary technology co-patented by the Universities of Pretoria, Geneva and Zurich. Novita is involved on the development of a universal donor cell platform for cancer and vascular diseases, as well as plasma-derived therapeutics in the equine and human industries.

SAMRC/WITS Antiviral Gene Therapy Research Unit

Unit director:

Prof. Patrick Arbuthnot

Research fit for purpose

The Wits/SAMRC Antiviral Gene Therapy Research Unit (AGTRU) works on developing use of nucleic acids (gene therapy) to treat and prevent serious viral infections of public health importance. The approach is based on rational drug design, which in turn is informed by knowledge about DNA sequences. There is now a wealth of information that may be applied to advancing this innovative approach to treating and preventing diseases of global importance, including infection with hepatitis B virus (HBV) and SARS-CoV2. Following the COVID-19 pandemic, it became clear that mRNA and engineered (recombinant) viruses may be used for vaccination against SARS-CoV2. The approach has been applied by leading international vaccine manufacturers such as AstraZeneca, Moderna, Johnson & Johnson and Pfizer/BioNTech. These technologies were initially developed for use in gene therapy and the SAMRC/Wits AGTRU previously built this know-how to treat and vaccinate against viral infections.

An important goal of the Wits/SAMRC AGTRU is to conduct research that addresses health problems that are common in South Africa and other low- and middle-income countries (LMICs). A major of research was advancement of mRNA formulations that can be used to counter a variety of serious pathogens. Initially the focus has been on countering SARS-CoV2 and hepatitis B virus (HBV), and more recently the scope has been broadened to include Mycobacterium tuberculosis (Mtb) and HIV. Innovations have included development of new DNA templates for mRNA synthesis, which may be employed to generate multivalent vaccines. A particularly exciting multidisciplinary collaboration entails use of bio-renewable compounds to generate lipid nanoparticles (LNPs). LNPs are essential to deliver mRNA to cells, because the large size and highly negative charge of mRNA limits access of the nucleic acid to cells. The lipid precursors are derived from waste products of crops that are grown widely in Africa. Our goal is to advance the technology, protect intellectual property and develop new capacity that will build capacity in South Africa and other LMICs.

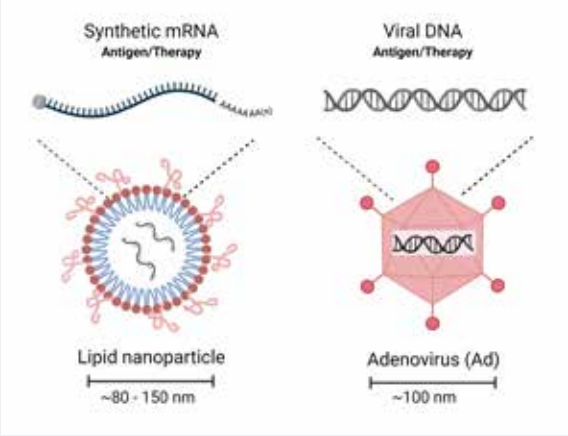
Impactful Research Interventions

i) Successful use of mRNA for vaccination has propelled the technology to prominence. Globally there has been a pressing need to develop improved mRNA synthesis methods to meet the considerable demands of prophylactic mRNA-encoded immunogens. This led the World Health Organization (WHO) to embark on an initiative to establish a hub in South Africa with spokes located in various other parts of the world. The project is intended to build capacity in Africa and other resource-challenged parts of the world. Participation in this programme has been a priority of work carried out in the SAMRC/Wits AGTRU during the reporting period. Our laboratory has provided technical support to Afrigen Biologics, the host of the mRNA vaccination hub, to produce and characterise mRNA for incorporation into LNPs. With Afrigen, we have now generated an mRNA vaccine formulation that works very well in vivo in mice. Robust neutralizing antibodies against SARS-CoV2 are generated in response to immunisation and titres of antibody responses compared favourably to commercially available vaccines. This candidate vaccine is now being prepared for phase 1 clinical trials, which are planned for the second quarter of 2023. The mRNA hub,

with input from the Wits/SAMRC AGTRU is also providing training to scientists from partners based in several LMICs throughout the world.

ii) Delivery of mRNA in safe and affordable formulations is a priority for SA and other LMICs. In partnership with the organic synthesis team of Prof Charles de Koning (Wits School of Chemistry), we have been developing use of LNPs that are made from bio-renewable precursors. This green approach to synthesis is potentially significant as it would overcome reliance on petroleum-based synthesis procedures that are currently followed for production of LNPs.

iii) Power of the mRNA vaccination technology has prompted exploration of using the approach to counter other pathogens. Currently our team is working on preventative vaccines against Mtb and HIV. These projects are being conducted in partnerships with the groups of Prof Thomas Scriba (Mtb) and Prof Anna-Lise Williamson (HIV) from University of Cape Town. Work with Prof Scriba's team is progressing well. Several candidate vaccines have been generated, which comprise Mtb antigen-encoding mRNA in LNP formulations. Expression of one of the antigens, for which an antibody is available commercially, has been demonstrated in cultured cells. Evaluation of immunogenicity in murine models has recently commenced.



Delivery of mRNA (left) and DNA (right) sequences that encode antigens used for vaccination.

Members of the SAMRC/Wits AGTRU team.

Data and evidence-based Responsive Research

For several years, the SAMRC/Wits AGTRU focused on gene therapy to treat diseases of importance to South Africa. Initially the priority was to advance gene therapy to cure infection with HBV. This serious, and underappreciated, viral infection is hyperendemic to sub-Saharan Africa, where it is the leading cause of cirrhosis and liver cancer. To advance HBV cure, work of the Unit utilised recombinant adenoviruses and in vitro synthesised messenger RNA. Application of these technologies is effective against HBV and has potential to cure individuals from the virus. In addition, the design principles are rational and essentially based on application of molecular biology and uses sequence information about pathogens. With evolution of the COVID-19 pandemic, value of mRNA and adenoviruses for vaccine technology to prevent infection with SARS-CoV-2 became clear. Research in the SAMRC/Wits AGTRU has thus logically pivoted to focus on application of its established technologies to prevent SARS-CoV-2 infection.

To ensure that mRNA synthesis capacity is responsive to pressing South African needs, our work is now also focusing on other diseases of importance to South Africa and other LMICs (see above).

Collaborations and Partnerships

Collaborations have been the cornerstone of building capacity in the SAMRC/WITS AGTRU. Partnership with industry and academia have been established to facilitate translation of research to intended clinical application. Engaging with specialists in Mtb immunology, HIV biology and organic chemistry synthesis are particularly important to the Unit. Broadening the base of expertise enables more efficient advances with our research.

Inter disciplinary collaborations involving diverse fields of expertise, e.g., synthetic organic chemistry and gene therapy, have been particularly useful to build strategically important capacity in the field of lipid nanoparticle formulation. The partnerships has also enabled leveraging of significant funding.

Collaborating with industry partners has been valuable to facilitate compliance with requirements of good laboratory/manufacturing practice, as well as the processes that are needed to take basic research to clinical use. The SAMRC/Wits AGTRU has external industry partnerships with Afrigen Biologics and previously with Biovac. Other significant partnerships have been established with the so-called spokes of the mRNA vaccination hub. These partners are teams from other LMICs that are keen to develop mRNA vaccine capacity . Members of AGTRU have engaged with scientists from Serbia, Tunisia and Kenya, amongst other countries, to advance training in mRNA synthesis in those countries. Work of the hub is facilitated by international partners such as PATH (product development consultants) and the Medicines Patent Pool (MPP).

Skills building through Capacity Development

The SAMRC/Wits AGTRU was one of the first to develop capacity for mRNA synthesis and recombinant adenoviral engineering. The capability has been consolidated and now includes skills that are required to enable clinical translation of the work. Training of young scientists is a fundamental activity of the Unit and many postgraduate students have been involved with gene therapy and nucleic acid-based vaccinology to completion of their degrees.

The WHO's call for resources that may be used to advance mRNA technology in LMICs, with this initiative being particularly important to ensure vaccine preparedness, mitigate threats of the current and future pandemics. In addition, the project aims to advance the use of mRNA to counter other infections such as are caused by Mtb and HIV. The SAMRC/WITS AGTRU has partnered with Afrigen Vaccines and Biologics to develop the South African mRNA hub. Our contribution has been to assist Afrigen by providing technical know-how of mRNA synthesis capability. We have hosted scientists from their team and have also visited their facilities to assist with establishing necessary infrastructure. In addition, the Unit has been involved in the training of scientists from so-called spoke countries. The SAMRC/WITS AGTRU has contributed to training of representatives from Argentina, Brazil, Tunisia, Kenya, Bangaladesh and Serbia amongst other countries. Overall, the AGTRU has assisted with to capacity development through its local leadership position in mRNA and adenovirus technology.

Knowledge Translation for an informed society

Stakeholders are primarily the South African public, but also the international community, especially from LMICs. Given the importance of limiting infection with SARS-CoV-2 in LMICs, capacity development for vaccine manufacture in these parts of the world is vital. During the past year, our work has been heavily involved with enabling mRNA vaccine production in South Africa as part of the WHO-initiated mRNA vaccine hub. A candidate mRNA vaccine against SARS-2 has been generated, and the formulation has excellent immunogenic properties in mice. Current work aims to evaluate the candidate vaccine in clinical trials and then to make it available to use in humans.

Members of the Unit regularly attend conferences where our work is publicised. To promote the research among the lay public, interviews are regularly given for local and international news agencies and journals. These have pertained mainly to advancing the mRNA vaccination hub located in South Africa. News agencies and journals have included the following during the past 2 years: BBC, Blumberg, eNCA, Voice of the Cape, Medicines patent pool, 91.3 FM, TV5 (French), The World (a national radio programme in the United States from PRX and GBH), Nature and Liberation (a French newspaper).

SAMRC/CPUT Cardiometabolic Health Research Unit

Unit director:

Prof. Tandi Matsha

Research fit for purpose

The Cardiometabolic Health Research Unit aims to employ a holistic approach to investigate the context specific pathophysiological factors associated with diabetes and related cardiometabolic traits. Thus, it provides a platform from which a team of researchers collaborate to provide an integrated research programme focusing on cardiometabolic traits (obesity, diabetes, hypertension, metabolic syndrome, and chronic kidney diseases): all with respect to inflammation, genetics, epigenetics, microbiome periodontal diseases and oxidative mechanisms. Further, the Unit responds to emerging health challenges and has since the advent of COVID-19, been very active in COVID-19 related studies by collaborating in an international project that seeks to study patients with COVID-19 admitted either to hospitals or Intensive Care Units at the University of Nairobi (Jomo Kenyatta National Hospital, Nairobi, Kenya, Limpopo University, South Africa, and Stellenbosch University Tygerberg Hospital, SAMRC/CPUT/Cardiometabolic Health Research Unit). The project seeks to establish the microRNA profile, biochemical and demographic factors associated with morbidity and mortality, and specifically if specific microRNAs and biochemical markers, including immunological ones, can be used to stratify these risks.

Impactful Research Interventions

Our collaboration with NIH has resulted in a publication in eClinicalMedicine (impact factor =17.033). This study highlighted the impact of combining HbA1c with glycated albumin in improving the detection of dysglycaemia for the first time in an African population. Our studies on COVID-19 have yielded three publications to date. One of these studies identified clinical and laboratory phenotype distribution patterns and their usefulness as prognostic markers in patients with COVID-19. The Unit hosted an international conference, the 1st Cardiometabolic Health & Diabetes Africa Congress, in February 2022 and was greatly supported by the African Diaspora from Europe, USA, and Africa. Our work on microRNAs extended to chronic kidney disease (CKD) [https://www.cmhcongress.org/#/]. Although in recent years the diagnostic and prognostic utility of microRNAs (miRNAs) have gained prominence in the context of CKD, its value has not been evaluated in African populations. In our studies we showed for the first time that there is a dysregulation of whole blood miR-126-3p, -30a-5p, -1299, and -182-5p in South Africans with CKD. In addition to community studies, the Unit is involved in several cell-based (in vitro) studies investigating the effects of natural compounds on cellular damage induced by high-glucose conditions. These studies will provide important information on the use of natural compounds, such as resveratrol, curcumin, and cannabinoids, in treating high-glucose conditions.

Data and evidence-based Responsive Research

The Unit obtains vast amounts of data in the form of patient data, trend data, and gene sequencing data. The scientists within the Unit use this information to drive research studies and develop novel tools to predict and treat several disease conditions, including type 2 diabetes mellitus, cardiovascular diseases, hypertension, chronic kidney disease, and various metabolic syndromes. We aim to develop a tool to predict the risk of diabetes and cardiovascular disease development using miRNA data generated from community studies. Furthermore, the data obtained over several years has been very useful in

observing trends regarding disease development and trajectory in the mixed-ancestry community. This information can be translated to inform policy makers and amend risk profiles of certain individuals.

Collaborations and Partnerships

The Unit is currently involved in several projects with national and international collaborators. We have successfully hosted undergraduate students from the Western Norway University of Applied Sciences (HVL). These students learned several skills and completed lab work for a mini-project, which formed part of their undergraduate/honors dissertation. We have also worked with researchers from HVL to publish an article on the first reported maturity-onset diabetes of the young (MODY) variants in a mixed-ancestry population from South Africa. Furthermore, a staff member will be participating in a research skills exchange trip with HVL next year to gain experience in certain skills that the Unit is lacking (in vitro manipulation, genetic expression, and NGS analysis). The Unit is in collaboration with the University of Cape Town where funding has been received from the NIH D43 Fogarty grant. This grant has enabled young researchers to receive training and contributes to the joint supervision of projects focusing on HIV-associated lymphoma. We are also working with Stellenbosch University on a COVID-19 project to determine the presence of certain miRNA biomarkers at specific points during COVID-19 infection. This collaboration will provide insightful information that may be used to predict disease outcomes in COVID-19, as well as infections with other coronaviruses. The Unit is currently working with the University of the Free State to develop a bioinformatics course to train staff and students at the Unit, since bioinformatics is a very important skill to hone while considering the 5th industrial revolution, which will see greater collaboration between humans and machines.

Skills building through Capacity Development

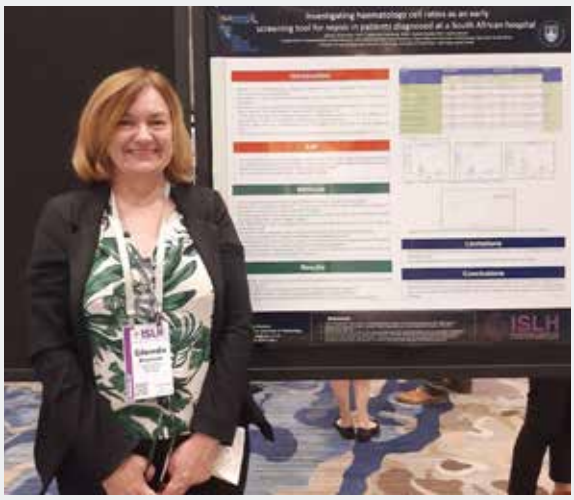
The Unit has successfully hosted two postdoctoral fellows, one of which has moved on to a permanent research position within CPUT and the Unit. This has increased productivity and ensured that we retains skilled scientists. This researcher will be visiting a collaborator at the Western Norway University of Applied Sciences to learn new skills that can then be taught to other staff members and students. The Unit is currently hosting an international postdoctoral fellow, which further increases the available skill capacity. The Unit has successfully graduated six

Collaboration with Norwegians on Statsraad Lehmkuhl ship 1. Glenda Davison & Dr Prince.

Dr Shanel Raghubeer at Northwest University of applied Science (Norway) presentation and seminar on board the Stadsraad Leh

Dr Hector at the same event.

Undergraduate students, Simone Sellevold and Johanne Njaerheim, supervised at the Cardiometabolic Health Research Unit. The students collected blood from volunteers for their research project investigating inflammatory cytokines in healthy individuals.



Glenda Davison presenting at ISLH Congres.

doctoral candidates over the past three years. Another doctoral candidate is expected to submit her thesis at the end of 2023. All doctoral candidates are from diverse communities and are gender equal. The Unit has made a significant contribution to staff development. Four of the PhD graduates have remained at the Unit (three as postdoctoral fellows who have successfully applied for MRC postdoc funding, and one as a permanent staff member and statistician), thereby increasing the staff capacity, which will promote productivity.

The Unit boasts a diverse team of staff and students, which is both gender and equity sensitive. The Unit hosted an international conference, the 1st Cardiometabolic Health & Diabetes Africa Congress, in February 2022, which involved several young scientists in the scientific and organising committees. These young researchers also planned and hosted a Young Researchers' Forum to discuss issues faced by early-career scientists and discuss ongoing projects with a group of their peers. This forum was a great success and will be held at subsequent congresses. Furthermore, we have contacted Dr Morne Du Plessis at the University of the Free State who will be assisting us with bioinformatics skills. In the interim we have registered a project on the Centre for High Performance Computing. This will allow us to analyse big data that have been generated from projects we are currently working on, including the oral microbiome and whole gene sequencing of MODY-related genes.

Knowledge Translation for an informed society

Our research articles are highly cited and viewed by the scientific community. We have published many peer-reviewed articles on our research results; however, this information is often not well-understood by the public. In an effort to translate our research, we have made an effort to engage with the public through a researcher talking to the community about oral health and the microbiome in the home language of the community (Afrikaans).

We have published an article in The Conversation Africa and a book chapter regarding glycated albumin that may be easily understood by students. Our studies are community based, as such we take the responsibility of disseminating our findings to the community very seriously. At least twice a year we meet with the councillors and arrange slots to speak at community gatherings, or informal discussions. We also have a presence in social media, Instagram, Facebook, Twitter and LinkedIn.

SAMRC/SU Genomics of Brain Disorders Research Unit

Unit director:

Prof. Soraya Seedat

Research fit for purpose

The SAMRC Unit on Genomics of Brain Disorders (GBD) aims to identify genomic biomarkers, using a systems biology approach, for a suite of brain disorders (BDs) across the lifespan. We aim to think beyond current clinical classification of BDs, to analyse cross-disorder subgroups that have biological validity and to better predict disease development or treatment response. This is achieved by addressing cross-cutting, translational neuroscience questions. Our aim to build sustainable research capacity in the genomics of BDs is facilitated by the highly collaborative nature of the Unit, which provides opportunities that contribute to the development of scientific maturity and independence in early-career scientists, and equips them with the skills necessary to conduct, high-impact science.

We also aim to secure funding for new projects, establish new collaborations, produce scholarly outputs and establish community partnerships. A focus of the Unit is to improve collaboration between African neuroscientists, and to capacitate African neuroscientists.

Impactful Research Interventions

i) We investigated the association between characteristics of the gut microbiome and host genetic components, which will shed light on the interaction between the gut microbiome and host genome in the context of posttraumatic stress disorder (PTSD). As part of the SHARED ROOTS project, genome-wide genotype data and 16S rRNA gene (V4) sequence gut microbiome data from 53 trauma-exposed controls and 74 PTSD patients, were used in an exploratory analysis to examine the association between host genotype of 143 gut microbiome-related SNPs and the summed relative abundance of 4 genus-level taxa (*Mitsuokella, Odoribacter, Catenibacterium, Olsenella*), the relative abundance of which was found in our previous study to positively correlate with the PTSD severity. Our preliminary findings indicate a genetic association between host genetic components and gut microbial composition providing valuable insight into the complex relationship between the gut microbiome and host genome. These results will be replicated in a larger sample set.

ii). Another project investigated whether childhood trauma, alone and in combination with *FKBP5* rs1360780 genotype, was associated with altered *FKBP5* methylation, and whether childhood-trauma-associated methylation profiles are associated with anxiety proneness (AP) and structural brain volumes. Mean methylation values for 12 *FKBP5* regulatory regions and 25 individual CpG sites were determined using high-accuracy measurement via targeted bisulfite sequencing. We observed an inverse association between methylation of three *FKBP5* intron 7 CpG sites (35558438, 35558566 and 35558710) and right thalamus volume, and found CpG35558438 methylation to be associated with AP scores. Our data indicate that an intron 7 methylation profile that is consistent with lower *FKBP5* expression and elevated high sensitivity glucocorticoid receptor levels, is associated with higher AP and smaller right thalamus volume. Further research into potential mechanisms underlying this relationship, and whether it confers increased risk for long-term psychopathology by altering the regulatory threshold of stress responding, is required.

iii) We investigated the association of single nucleotide polymorphisms (SNPs) in the adiponectin gene *(ADIPOQ)* and posttraumatic stress symptom (PTSS) severity, and the interaction of these SNPs with childhood trauma in modifying the association with PTSS severity in 455 rape-exposed black South African women recruited within 20 days of being raped. PTSS was assessed using the Davidson Trauma Scale (DTS) and childhood trauma was assessed using a modified version of the Childhood Trauma Scale-Short Form Questionnaire. Eight *ADIPOQ* SNPs (rs17300539, rs16861194, rs16861205, rs2241766, rs6444174, rs822395, rs1501299, rs1403697) were genotyped using KASP. Mixed linear regression models were used to test additive associations of *ADIPOQ* SNPs and PTSS severity at baseline, 3 and 6 months following rape. The mean DTS score post-sexual assault was high (71.3 ± 31.5), with a decrease in PTSS severity shown over time for all variants investigated. rs6444174TT genotype was inversely associated with baseline PTSS in the unadjusted model (ß = -13.6, 95% CI [-25.1; -2.1], p = .021). However, no genotype was shown to be significantly associated with change in PTSS severity over time and therefore *ADIPOQ* SNP x childhood trauma interaction was not further investigated. None of the ADIPOQ SNPs selected for investigation in this population were shown to be associated with change in PTSS severity over a 6-month period and therefore their additional clinical utility as risk biomarkers in this sample for rape-related PTSD appears limited. These negative findings underscore the need to further investigate genetic variants for gene-gene and gene-environment interactions which may have predictive value.

Data and evidence-based Responsive Research

Firstly, we have a biorepository of tissue samples and a repository of multi-level data. We have been working actively to exploit these resources to address novel research questions, delineate student and staff projects, and conduct secondary data analyses. We collaborate with several internal and external research partners in this regard. This allows us to be responsive to the needs of students and staff with respect to their interests and keep abreast with new developments and new methodologies or techniques in psychiatric genetics. We are also active members of the Psychiatric Genomics Consortium and ENIGMA PTSD workgroups and contribute in an ongoing way to data sharing and co-authorship on projects and manuscripts. We have a newly established Psychophysiology laboratory with state-of-the-art psycho- and electro-physiological monitoring equipment and have a number of innovative projects that will be initiated this year. We have embarked on a large consortium project on living evidence synthesis of early phase research to accelerate drug discovery and non-drug interventions that is heavily steeped in AI and machine learning methodologies.

Collaborations and Partnerships

Profs Hemmings and Seedat (Department of Psychiatry) and Prof Resia Pretorius (Department of Physiology) currently collaborate on a project that investigates the role of host genetics and the gut microbiome in the association between long-COVID and neuropsychiatric symptoms. We have an interdepartmental collaboration between the Dept of Industrial Engineering (Prof Jacomien Grobler) and the SAMRC GBD Unit. Additionally, we have collaborations with the SAMRC, Prof Naeemah Abrahams (Gender & Health Research Unit), Prof Janan Dietrich (Director of the Bio-Behavioural Research Division at the Perinatal HIV Research Unit (PHRU).) In 2022, we initiated a collaboration with Prof Tandi Matsha's SAMRC Cardiometabolic Health Research Unit.

Our collaborations with the Psychiatric Genomics Consortium Workgroup on PTSD (PGC-PTSD) continue, and various workgroups of the PGC-PTSD (e.g., the Epigenomics Workgroup, the Physical Health Workgroup, the Diverse Ancestry Workgroup and the Microbiome Workgroup, (the latter led by Prof Hemmings)), with external collaborations continuing with Profs Karoline Kuchenbaeker (University College London, UK), Cathryn Lewis (KCL, UK), Dr Joni Coleman (KCL, UK), Dr Daniel Tonge (Keele University, UK), Prof Seedat has also established collaborations with the University of Leuven, Oxford University and the Global Collaboration of Traumatic Stress that have yielded new projects, publications and grants.

Skills building through Capacity Development

Graduated female clinician-researcher, and 2 MSc students, acquired during their research included statistical analysis of genetics and brain imaging data. One of the MSc students (Ms Aqeedah Roomaney) has registered for her PhD in 2023. Miss Lauren Martin successfully submitted her MSc thesis and she graduated in March 2023, who investigated the vaginal microbiome in South African pregnant women consuming alcohol, in the context of fetal alcohol spectrum disorders. Miss Martin acquired skills in bioinformatic and statistical analysis pertaining to the microbial data. She also established a method for sequencing of the 16S rRNA gene spanning V1 to V9 on the Illumina iSeq machine. To analyse this data, Miss Martin established an analytical pipeline. Miss Martin has registered for a PhD (Psychiatry) in 2023, and will be working on research projects within the Unit. The Unit has welcomed 2 new MSc (Neuroscience) students (one female, one male) (2023), bringing the total number of both MSc students to 7, and 2 new PhD students (female). In addition, the Unit hosted two postdoctoral fellows, Dr Patricia Swart and Dr JP Fouche. Much of our microbiome and genomics research contributes to the development of the scientific capabilities of a young postgraduate students and early-career scientists. Next-generation sequencing data analysis and bioinformatic computation has become a sought-after skill within the international research landscape. Due to the enormous amount of data, that has been, and is yet to be produced, a foundation in data science and bioinformatics in R and command line, as well as associated skills (e.g., critical thinking and problem-solving skills) is in the process of being established and refined.

Prof Seedat (chair) and Hemmings (committee representative) are active members of the IDEA Committee of the International Society of Psychiatric Genetics and have contributed to training and related scientific initiatives to promote inclusion of, and opportunities for, underrepresented researchers in the psychiatric genetics field.

Knowledge Translation for an informed society

Our gut microbiome projects investigate the role of the gut microbiome in common mental disorders, in the general population. Here, we rely on the involvement of the general public, and it is important that we provide regular feedback to them. We have achieved this over the past year in the following ways: i) Prof Hemmings was a guest on a CliffCentral podcast (15-11-22);, hosted by Prof Christopher Szabo, where she provided information on the gut microbiome connection with the brain and association with mental disorders and Prof Seedat participated in a podcast on COVID-19, trauma and psychiatric outcomes. Prof Hemmings, Dr Swart and Miss O'Hare co-authored an article in Quest magazine, a popular science magazine aimed at South African youth, entitled *"Get the scoop on mental health and poop"*. This article explained the association between microbiota and mental health. We have also partnered with BiomeSight, an analytics platform with a focus on the gut microbiome as a leading indicator of wellness. BiomeSight will provide consenting participants with a readout of the relative abundances of their gut bacteria, and will also be able to provide personalised recommendations for food, prebiotic supplements and lifestyle adjustments based on up-to-date research findings, should the consenting participant request these.

SAMRC/UP Precision Oncology Research Unit

Unit director:

Prof. Zodwa Dlamini

Research fit for purpose

The Precision Oncology Research Unit (PORU) is one of the implementation instruments for the Pan African Cancer Research Institute (PACRI) and is grounded on five (5) interconnected pillars in early cancer detection, diagnosis, treatment and personalised care, with the overall aim of finding innovative homegrown solutions for Pan-African cancers. The construction of the PACRI state-of-the-art laboratories has been concluded and the occupation thereof is currently underway, as PORU will benefit from using these facilities. This is a significant milestone for PACRI/PORU and continuous efforts to furnish these laboratories through capital equipment funding applications are underway. Most of the research projects fall within precision oncology, population and preventative cancer sciences.*

Impactful Research Interventions

Convening PACRI/PORU researchers in the state-of-the art PACRI newly built laboratories is pivotal to the Unit's translational research. As a cancer genomics research Unit, identifying novel genomic/transcriptomic markers is important in understanding mechanisms employed by what was previously known as 'junk DNA'/ non-coding portion of the genome, in tumorigenic mechanisms. Of the recently completed projects titled for an MSc student 'Molecular profiling of long non-coding RNAs (lncRNAs) in prostate cancer' demonstrated the prognostic potential of these non-protein coding molecules in cancer. Although PCA3 (an FDA approved biomarker) use in African populations has not yet been established, the need to identify and develop Afrocentric biomarkers in early cancer detection and prognosis cannot be overemphasised. The Unit is also looking into developing Afrocentric cancer cell-lines and organoids. Notably, most of the postgraduate research projects are at the ethics approval level and tissue acquisition levels. Although it occurred very recently, lessons, ideas and collaborations have been by-products of the Inaugural international cancer conference, hosted by PACRI. This meeting centred around expertise on innovative approaches in cancer care, bridging the gap between basic and clinical cancer research.

Secondly a prospective observational double blinded study to establish the clinical performance and utility of TruBlood™ non-invasive platform for diagnosis of breast cancer project is underway. The clinical problem is the lack of tools for early non-invasive breast cancer diagnosis. This is a blood test-based study to analyse circulating tumour cells and be able to do all receptor status and basic prognostic tests on circulating tumour cells. This study will assist primary health care to make early diagnosis in suspected breast cancer patients by doing a blood test. We are currently, doing data analysis and will report results in the next cycle.

Lastly the completed project by a PhD student at WITS titled "The effects of indigenous South African plant extracts (Cotyledon orbiculate and Tulbaghia violacea) on Triple Negative Breast Cancer cells. The project sought to evaluate the anti-cancer activities of extracts from two indigenous plant species, Tulbaghia violacea on Triple Negative Breast Cancer (TNBC) cell lines. TNBC is resistant to hormone targeted treatments, has a low 5year survival rate, a high recurrence rate and is increasing in incidence in South Africa. The T. violacea extract

Inaugural International Cancer Meeting 1 March 2023.

New Pan African Cancer Lab.

Newly built State of the art PACRI laboratories

was shown to be active against the TNBC cell line MDA-MB231, Treatment of the TNBC cells with this extract led to an increase in apoptosis, and a significant decreased in the ability of the TNBC cells to migrate or penetrate a basement membrane. Compounds similar in structure to known anti-cancer compounds were isolated from the extract. These compounds were used in computational docking studies with the anti-apoptotic protein Cox2 and five compounds were identified with high binding affinity towards COX2. Whole transcriptome sequencing of both normal and TNBC cells treated with this extract revealed an increase in the transcription of genes associated with apoptosis. Decreases were observed in the transcription of genes involved in growth receptor signalling, angiogenesis, and cancer related pathways such as the Wnt, Notch and the PI3K pathway. The results of this study indicate that the compounds isolated from T, violacea could serve as lead compounds for the development of future therapeutic treatments for TNBC.

Data and evidence-based Responsive Research

Population and Prevention Cancer Sciences is one of the Unit's pillars. Various research projects within this pillar utilise the already available cancer genomics data from The Cancer Genome Atlas (TCGA) with the aim to compare and identify precise and population-based cancer genome markers for African populations. The underrepresentation of African genomes in global cancer genomics studies is one of the key drivers of cancer health disparities. PORU collaborates with local and global networks in tailoring cancer patient care in Africa as this is fundamental to cancer in Africa. Furthermore, one of our PhD research projects titled 'Assessing prognostic factors for survival outcomes and late presentation among cancer patients in a hospital setting in South Africa' within PORU also aims at utilising the electronic data available in hospitals towards the overall improvement of patient outcomes.

We have partnered with the University of KwaZulu-Natal and Witwatersrand in looking at up to 20 Years databases of the top 4 cancers and started analysing this data with our collaborators at the Tulane Cancer Centre in the USA to look at incorporating genomics to explain some of the cancer determinants in this data. We will be publishing this data late 2023 and 2024.

Collaborations and Partnerships

PORU has established a network of intra-disciplinary and inter-institutional research collaborations. These include collaborations with various clinical departments within UP/ Steve Biko Academic Hospital (SBAH) such as Medical Oncology, Nuclear Medicine, Anatomical Pathology, Radiation Oncology, Internal Medicine, Surgery, Community Dentistry, Maxillofacial and Oral Surgery, Plastic Surgery, Dermatology, etc. PORU also collaborates with the UP Faculties of Law and Faculty of Natural and Agricultural Sciences (NAS). The inter-institutional collaborations include University of KwaZulu-Natal (UKZN), University of the Witwatersrand (Wits), University of Limpopo (UL), University of South Africa (Unisa), Sefako Makgatho Health Sciences University (SMU), Walter Sisulu University (WSU), Central University of Technology (CUT), University of Johannesburg (UJ), MINTEK,CSIR and Cancer Association of South Africa (CANSA). In addition to the local inter-institutional collaborations, the PORU has also established a network of international collaborators which include institutions from USA, Australia, Asia, EU, UK and Caribbean Islands. Students' exchange for a given period through a recognised exchange programme; Teaching and learning including the development of a programme leading to a qualification, Universities' staff members exchange, Exchange of research material and documentation, co-ordination through their respective offices, as well as collaborative research projects. Further international collaborations include, the German Cancer Research Center (DKFZ), University of Botswana collaboration , and industry partners including, HDT Bio Corp, USA, Inqaba Biotech Industries, South Africa and CariGenetics, Hamilton, Bermuda.

Skills building through Capacity Development

Recently, PORU Director's mentorship of early-career scientists in 2022/2023 has acquired an NRF-Y rating and a post PhD NRF Thuthuka Grant. In addition, PORU has acquired 3 more NRF-Thuthuka PhD Track grants. The number of the NRF Thuthuka grantees within PORU has been increasing over the years as the Unit's research team provides grant writing workshops including SAMRC, NRF, Discovery and International funding on weekends to be able to accommodate postgraduate students and our collaborators from various disciplines. The current cohort includes 1 Post-doc, 13 PhD candidates and 1 MSc student.

International Colaborators at Cancer Meeting.

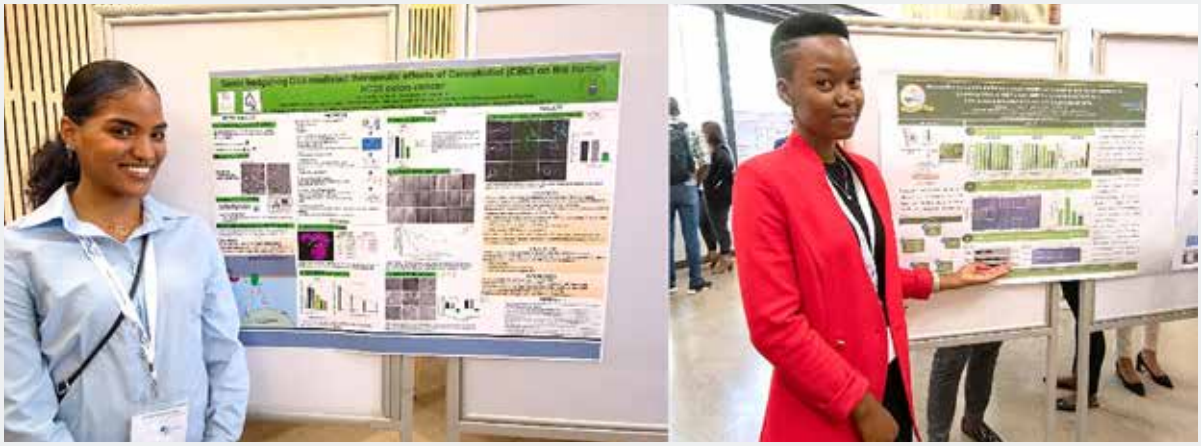
Knowledge Translation for an informed society

PACRI/PORU hosted its first international cancer conference titled 'Pan African Cancer Research Institute's Inaugural International Cancer Meeting', 26 Feb 1 Mar 2023. The theme for this meeting was Exploiting Global Networks for the Fight Against Cancer in Africa: Advancing Prevention and Transforming Care. In this meeting, basic scientists, clinicians, data scientists, policy makers/government officials and ethical-legal advocates convened together, to advance and transform cancer care in Africa. This meeting included the official signing ceremony of a partnership agreement between PACRI and HDT Bio Corp. This partnership brings HDT Bio's RNA-based cancer vaccines and immunotherapies to the African region. This is done to enhance and transform cancer care in Africa by addressing cancer disparities and inequities and increasing inclusion efforts, particularly in underserved communities. This will transform the cancer research narrative in Africa and globally. This partnership will also open doors to novel African-tailored immunotherapies.

Community engagements, Cancer awareness and screening programs are at the forefront of what PACRI/PRU does as well. March is the national

MSD PACRI workshop 26 Feb 2023.

PACRI labs seating area.



Poster presentation at Cancer meeting

colorectal cancer (CRC) awareness month in South Africa. One of the Unit's PhD candidates and a Medical Oncologist, Dr Thulo Molefi recently had a radio interview with Channel Africa and a TV interview with SABC morning live. These interviews were intended to raise awareness about CRC with the intention of assisting the community to move away from seeing cancers that involve private areas of the human body as taboo. People do not often talk about these cancers because of the stigma associated with these cancers and the concern that they might be discriminated against. Equipping and educating the community on the ability to recognise symptoms related to CRC which most people take lightly or do not relate to cancer such as bloody stools, consistent abdominal pain, and fatigue may assist in diagnosing CRC early.

PACRI/PORU published a book with Springer Nature titled 'Artificial Intelligence and Precision Oncology: Bridging Cancer Research and Clinical Decision Support', 2023. This book, with 16 Chapters, was a collaborative effort between basic scientists and clinicians.

The production of the second Book with Springer Nature titled 'Society 5.0 and Next Generation Healthcare: Patient-Focused and Technology-Assisted Precision Therapies', containing 13 Chapters is underway. This book was a collaboration between computational biologists, bioinformaticians, basic scientists, clinicians, ethical-legal experts etc. Furthermore, the third invited book proposal by Elsevier Academic Press is under review, titled 'Chemotherapy Resistance in Cervical Cancer: Strategies for Beating the Odds'. This Book proposal has 10 chapters. Overall in 2022/2023, the Unit has published 18 Book chapters and 18 (2 accepted and should be published by 20th March) journal articles with a total of 36 research outputs.

SAMRC/UCT Wound Healing and Keloid Scarring Research Unit

Unit director:

Prof. Nonhlanhla Khumalo

Research fit for purpose

The Wound and Keloid Translation Research Unit is located at the Hair and Skin Research (HSR) Lab in the Division of Dermatology at the University of Cape Town (UCT). The HSR Lab was setup as a multidisciplinary lab with scientists who include chemists, molecular biologists, and dermatologists. The primary focus of all research programme within HSR are neglected disorders that predominantly affect peoples of African ancestry. Keloid scarring is one such focus and as a result of SAMRC funding, our work has produced a keloid cell line which has the potential to revolutionise *in-vitro* studies. This is because currently, all research used primary keloid cells harvested from patients during surgery.

We have several student projects that have used multi-omics (RNA-sequencing and proteomics) approaches to identify potential biomarkers for treatment targets. One such PhD project has been completed and we are exploring potential patent protection once completing validation work.

Impactful Research Interventions

We have successfully filed a patent for the Keloid Cell Lines, which was completed on the 16th February 2023 (Patent application number: 2300611.7) being filed in the United Kingdom for expedited examination, with the next patent prosecution deadline: 16th February 2024, with a stage gate review to be held 3 months ahead of the deadline.

Briefly, the invention relates to human keloid fibroblast cell lines obtained by integrating a human telomerase reverse transcriptase (hTERT) gene into keloid fibroblasts using a non-viral vector, wherein the cell line overexpresses hTERT protein and responds to triamcinolone treatment.

Data and evidence-based Responsive Research

90% of production in the SA cosmetic market is owned by multi-national companies. We explored this further and identified some of the contributors which we are addressing. No graduate training for cosmetic formulation in SA – we established an advanced diploma to train unemployed science graduate how to formulate cosmetics in a blended programme where 9 months of the year is spent at an approved cosmetic R&I lab for hands on training. To date we've graduated 57 students with another 15 expected to graduate in December 2023, all of whom are active in the industry. The programme has produced a skills-set the industry desperately needed resulting in our students being offered more than one position and having the option to choose companies to work with. We see this as innovative thinking which is responsive and increasing employment and entrepreneurship. The next stage is to offer support for R&I for these small companies to be competitive so that in the near future production in the cosmetic market can be >50% local companies.

Members of the Research Team.

Lack of effective treatments and the high recurrence rate after excision are the major drivers of our need to find effective treatments for keloids and scarring alopecias, both conditions are prevalent in people of African ancestry. The major focus here is use bio-informatics to analyse the large volume of data produced by several omics studies conducted in both groups of disorders at HSR.

Collaborations and Partnerships

The Unit has collaborations with academics from the Departments of Plant Science and Engineering from UCT, Department of Dermatology from the Nelson Mandela, Sefako Magkatho and (most recently) Limpopo Universities.

Skills building through Capacity Development

We currently have 16 PhD students 3 have passed and another 5 expected to submit their thesis this year. Many would like to stay and mine their data further, submit patents and fully explore potentials of translating their data to products that can be marketed. We require further funding to keep these students and maximize investment in them and their projects.

Precision and Genomic Medicine Research Unit

Unit director:

Prof. Raj Ramesar

Research fit for purpose

The SAMRC's Genomic and Precision Medicine Research Unit at the University of Cape Town work aligns with the SAMRC's strategic objectives of promoting research, innovation, and development.

Our Unit's research focus is on identifying the genetic basis of inherited colorectal cancers, inherited retinal diseases, and neuropsychiatric disorders. This work not only advances our understanding of these diseases but also provides insights into new treatment approaches. For example, our Unit has identified new genes and disease-causing variants associated with the above groups of diseases; apart from providing an accurate diagnosis and basis for prognosis and clinical management, this genomic information is leading to novel therapies and screening modalities for those predisposed to these conditions.

Further, our Unit's research has led to the development of genetic tests and genetic counselling programmes, which are now being implemented in the clinical environment. These innovations have the potential to improve patient outcomes by enabling early detection and prevention of disease. For example, the Unit's work on familial colorectal cancer (fCRC) has led to the development of a genetic test that can identify individuals at high risk of developing this condition, enabling early intervention and prevention. Our more recent work (Chambuso et al., 2023) outlines our innovative effort to devise novel clinical surveillance modalities (involving an assay of the immune system in blood) to replace invasive colonoscopes (for those at risk).

Our work has also contributed to the development of human capital in South Africa, training a new generation of scientists and healthcare professionals in genomics and precision medicine. This will have long-term benefits for South Africa by building capacity in these areas and promoting scientific and technological development. Our constant development of courses and programmes stems from our research, which then shows a need for e.g. genetic counselling (MSc [Genetic Counselling] programme; PGDip Computational Health Informatics (analysis of big data and application to human health); MSc (Computational Health Informatics)].

Impactful Research Interventions

i) The Genetic basis of Inherited Retinal Diseases (IRDs):e.g., Retinitis Pigmentosa and Macular Generation) are highly heterogeneous, often leading to blindness; i.e. they look very similar to the ophthalmologist but have very different prognoses and life implications. Our work has led to precision diagnostics now offered on a multigene next gen sequencing panel, resolving up to 80% of referrals (Nicole Midgley, PhD). This reputation has attracted an international clinical trial for our patients with Stargardt Disease, which is the most common form of hereditary visual impairment in South Africa.

ii) A project investigating the Genetic basis of familial Colorectal Cancers (fCRC), We have devised a gene panel for next generation sequencing of patients with suspected fCRC. This has improved our efficiency of identifying CRC patients with germ-line mutations, and a ready means for predictive testing. Highlights on the project include: A Scoring Model and Protocol to adapt universal screening for Lynch

Syndrome to identify germline pathogenic variants by next generation sequencing, evidence that individuals and families managed with genetic testing, counselling and surveillance have their survival improved considerably, cost-benefit analysis showing the net economic benefit of using genetics and clinical surveillance to manage families with fCRC, Cancer prevention with resistant starch in Lynch Syndrome patients in the CAPP2-randomized placebo controlled trial: as shown in this planned 10-year follow-up. This was close on an earlier trial showing delay of cancer diagnosis as a result of aspirin intake, current research focussed on Immunogenomic Biomarkers for routine clinical surveillance to replace invasive colonoscopies required annually in individuals who are predisposed to Lynch Syndrome, first evidence that individuals with the Lynch Syndrome form of fCRC have a significantly decreased incidence of virally-mediated cancers (notably HPV/cervical cancer), and which has an implication for our current work characterising the immune system in Lynch syndrome, and prospects for developing vaccines to obviate perioperative sepsis in the large population.

iii) The Unit also conducted research on the genetic basis of Neurological/Neuropsychiatric Disorders is the first comprehensive genomic study in South Africa relating suicide to a wide range of neuropsychiatric conditions, the first study in a large indigenous (Xhosa) South African population aimed at identifying the genetic basis of schizophrenia as well as the first large-scale genomic study of genomic of childhood epilepsy in Africa, with meaningful clinical impact (for accurate diagnostics and guiding treatment.

Data and evidence-based Responsive Research

Our research project on heritable cancers has focused on identifying hereditary forms of colorectal cancer in patients admitted to Groote Schuur Hospital . To improve our ability to identify these patients, we are developing an App that integrates basic clinical datasets from various disciplines, such as Surgery, Oncology, Anatomical Pathology, and Human Genetics. This App will use a scoring process derived from regression data from each discipline to identify patients with Lynch syndrome or hereditary colorectal cancer. Compared to previous approaches that used a candidate gene approach, our current work involves screening a panel of genes, generating considerably more data that require greater skills in data analytics and bioinformatics. We are also using artificial intelligence to analyse H&E pathology slides to identify microsatellite unstable tumours efficiently. This technology has the potential to be used across the country and continent, given that H&E staining is a standard tissue processing step in any Anatomical Pathology laboratory. By identifying microsatellite instability on H&E slides, we can triage CRC samples into those that need to undergo genetic testing.

Our work on large population datasets has demonstrated the utility of genomics in accurately diagnosing and predicting outcomes for inherited retinal disease and colorectal cancers. In the case of fCRC, we have shown that predictive genetic testing, counselling, and clinical management are cost-effective from a health economics perspective. Our analysis of large datasets for Lynch syndrome has led to our current innovative work on correlating the profile of components of the circulating immune system in Lynch syndrome. This approach has the potential to serve as an alternative to invasive screening colonoscopies. Additionally, we are investigating the elevated immune system in Lynch syndrome, and our preliminary data on better postoperative outcomes in LS patients. We aim to investigate ways to boost the immune system of all individuals undergoing surgery to reduce the significant burden of sepsis-related morbidity and mortality.

Collaborations and Partnerships

In summary, the Unit runs several collaborative projects with clinical specialists to modernize diagnostic skillset through genomic technologies and data analytics. The Unit has provided training to several researchers and has extensive collaborations with colleagues in public health/health economics. The Unit is improving ascertainment through the development of a scoring tool, and has strong international collaborations, including a clinical trial with genetically well-characterized cohort of CRC patients. The Director has a long-standing relationship with the international group on attempting to draw out phenotype/genotype correlations from large international datasets.

Skills building through Capacity Development

A sustained training programme is at the heart of our capacity development efforts. This involves the Director's personal role as Head of the Division of Human Genetics, and driving the development of new programmes that either feed into our research programme, or feed off of it. Examples are: (i) a BScHons programme comprising of 4 formal obligatory modules (including two specially focused on bioinformatics/data analytics) and two optional modules, followed by their laboratory research project. This programme is a ready feeder of students for entry level projects (Hons level) followed by MSc and PhD projects. Despite a large majority of applicants for this programme coming from UCT and other previously advantaged institutions, the Unit has been exceptionally good at attracting postgrads (MSC/PhD) from less-favoured institutions and notably Limpopo University, amongst other institutions.

Perhaps a particular success story is the custom-made MSc (Genetic Counselling) programme that has been running for several years here in the Division of Human Genetics. This programme has been developed and curricularised on the back of research projects, which have showed evidence of strong hereditary basis to these groups of disorders: notably the Inherited Retinal Diseases project and the Familial Colorectal Cancer project. The research revealed extensive lineages of sufferers, who tested diagnostically, and their at-risk relatives (who tested predictively), and who were in desperate need of Genetic counselling to fully comprehend the information pertinent to the precise implications of both confirmatory and predictive diagnosis of disease, prognosis and potential alignment with therapeutic and clinical management options.

In order to provide appropriate training for the field of precision and genomic medicine, the director has also been instrumental in implementing a Postgraduate Diploma in Computational Health Informatics, as well as a Masters (MSc) Programme in Computational Health Informatics, considering our research as well as the practice needs of tomorrow. A PhD Programme has been approved for launching in 2024.

Knowledge Translation for an informed society

As described earlier the emphasis of our work in the Unit, is translation for public good. The colorectal cancer research project provides refinement of processes to improve ascertainment of familial colorectal cancers (fCRCs) from the larger burden of CRCs (which is the 3rd most common cancer affecting both sexes). Once fCRC subjects are ascertained through improved working together of our multidisciplinary team, application of next generation sequencing to a highly enriched cohort is meant to provide a high yield of LS positive individuals. Showing through a clinical trial, that aspirin and starch delay manifestation of fCRC disease by up to 10 years has also been of great value to such individuals predisposed disease. In addition, in a cost-benefit (health economics) study we have shown that using genetics to accurately diagnose affected individuals and the use of cascade genetic screening and clinical surveillance is hugely beneficial.

Our work on Inherited retinal diseases (IRDs) has led to the identification of the genetic basis of disease in approximately 80% of our total cohort, providing the basis for precise diagnosis and prognosis of this highly heterogeneous group of disorders. The design of a local multigene panel that can be regularly upgraded to include additional genes is producing a precise molecular diagnostic efficient. This accurate molecular diagnostic for the first time provides Ophthalmologists and their patients information for prognostication and management. Our reputation of molecularly resolving the genetic basis of a large number of IRDs, has led to us attracting an international clinical trial to South Africa, especially for molecularly-diagnosed individuals diagnosed with Stargardt Disease (STGD). STGD is the most common form of IRD in the South African setting, often affecting individuals in their teens. In work started more recently in the Unit, and of relevance to precision medicine is the research on genomics of epilepsies. This work shows ready applicability of a genomics diagnosis in our paediatric population, accessing healthcare at our Red Cross Neurogenetics clinic. The genetic dissection of the precise gene and mutation underlying this complex phenotype leads to appropriate management/treatment of a proportion of such patients, and avoidance of drugs that are contraindicated by a genetic diagnosis.

SAMRC/UCT Platform for Pharmacogenomics Research and Translation Unit (Premed)

Unit director:

Prof. Collet Dandara

Research fit for purpose

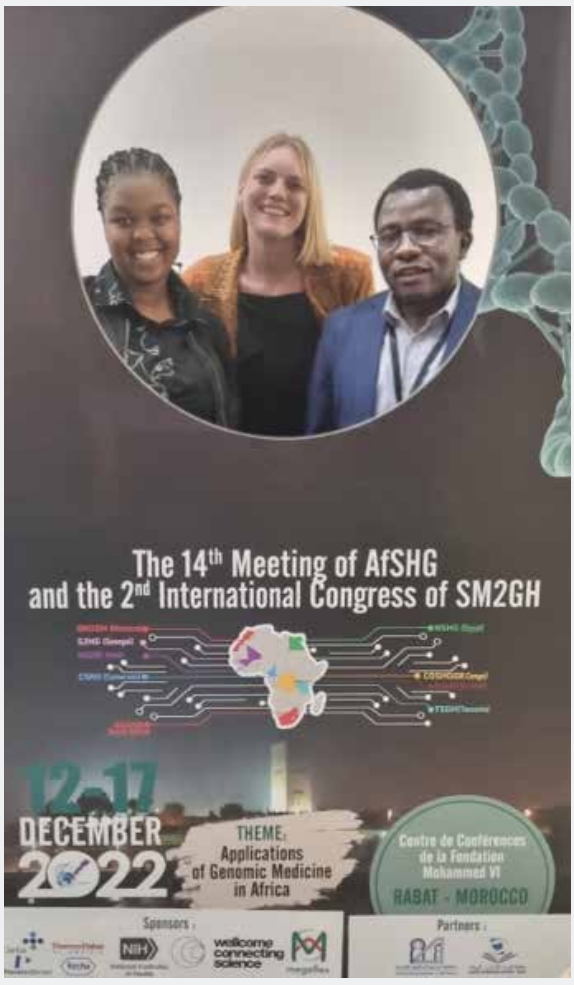
Pharmacogenomics is a core element in personalised medicine, and precision medicine. The Platform for Pharmacogenomics Research and Translation (PREMED) Unit, focusses on pharmacogenomics as a significant innovation in health care that possesses the potential to change the paradigm in the practice of medicine, through the way drugs are prescribed, discovered and developed. Our Unit strongly argues that the implementation of pharmacogenomics knowledge & technologies will ultimately have a positive impact on population health. We have recently published work on the pharmacogenomics of warfarin), which has shown that African populations possess certain genetic variants that are important for understanding the way patients respond to warfarin, and therefore necessary for inclusion as part of innovative pharmacogenomics tests. As part of our understanding of the pharmacogenomics of cancers, we study the complexity of tumorigenesis, and the interactions that allow tumor cell growth, drug resistance and metastasis . We show that tumor cells secrete factors that transform a previously anti-tumorigenic environment into a pro-tumorigenic environment, this transformation affects chemotherapeutic drug response and treatment outcome. The Unit, PREMED, responds to the SAMRC objectives of advancing science & improving the nation's health by working to bring the use of genetics as part of the clinical decision tools, which aims to reduce drug associated adverse reactions and improve drug therapy effectiveness.

Impactful Research Interventions

Following up on our work on the pharmacogenomics of warfarin among patients on treatment for atrial fibrillation (AF) and venous thromboembolism (VTE), we are now setting up to implement the use of pharmacogenomics knowledge as part of the decision making in deciding warfarin dosages. This project is part of a broad suite of projects on "Implementation of Pharmacogenetic Testing for Effective Care and Treatment in Africa (iPROTECTA)" and is aptly titled "Genotype-guided dosing of warfarin with point-of-care genetic testing (warfarin-PREMED). The primary objective is to undertake a pharmacogenomics implementation project for the use of warfarin in our local clinical setting using point-of-care genotyping information ('POCT-GGD' approach) and evaluating the potential of translating the POCT-GGD into routine clinical practice in patients prescribed warfarin for AF and VTE. The primary outcomes that are going to be used as end points for measurement are (i) time to achieve therapeutic international normalised ratio (INR) and (ii) time in therapeutic range (TTR), during a three-month timeframe. Secondary outcomes include INR >4 events, major bleeding, minor bleeding, and thromboembolism events. Secondary objective is to explore the practical implications of the adoption of a warfarin POCT-GGD from the perspectives of both the healthcare staff implementing the approach and of patients on whom the approach is being implemented.

We have two big projects under the auspices of pharmacogenomics of cardiovascular diseases.

SAMRC/UCT PREMED at the 14th Meeting of African Society of Human Genetics as Rabat, Morocco. Best Presentation award awarded to Arinao Ndadza (PhD). Image left to right: Bianca Kruger (PhD), Prof Collet Dandara, Arinao Ndadza and Nosipho Mabizela (MSc).



SAMRC/UCT PREMED at the 14th Meeting of African Society of Human Genetics as Rabat, Morocco.

The aim is to investigate the pharmacogenomic determinants of differential response to statins and antihypertensive drugs in the South African population and to create a cardiovascular specific pharmacogenomics test which will later evolve to a comprehensive pharmacogenomics tests inclusive of the most commonly used drugs in South Africa, through activities of a coordinated pharmacogenomics research and translational platform. We have already recruited more than 2000 patients. We are now preparing the DNA for genomic characterisation and will soon be identifying the very important pharmacogenes (VIP) variants for development of relevant pharmacogenomics tests.

Data and evidence-based Responsive Research

The decisions on which pharmacogenes or burden of disease areas to concentrate on is data driven. We currently have access to five cohorts comprising patients recruited for pharmacogenomic studies of populations in Southern African. The studies focus on pharmacogenomics of; (i) breast cancer patients on treatment with tamoxifen, (ii) a cohort of patients with atrial fibrillation (AF) and mechanical valves on warfarin, (iii) a cohort of patients recruited for the "Pharmacogenomics of Cardiovascular Disease in South African "PRECODE", which focusses on patients with hypertension and patients with dyslipidaemia, (iv) a cohort of patients recruited for studying pharmacogenomics of antiretroviral therapy, and (v) a cohort of patients recruited on the study of pharmacogenomics of clopidogrel and tacrolimus. From these cohorts, we have identified adverse drugs events/reactions (ADRs), comorbidities and the drugs used to treat them, and the most commonly used drugs in Southern Africa. With this data, we have generated data which is assisting us to develop a targeted list of pharmacogenes variants of interest in South Africa. All our work is done with guidance from the Human Research Ethics Committee of the Faculty of Health Sciences at the University of Cape Town.

Collaborations and Partnerships

The Platform for pharmacogenomics Research and Translation Unit (PREMED) is an inter-departmental research unit. The Director (Professor C Dandara) is in the Department of Pathology, the deputy director

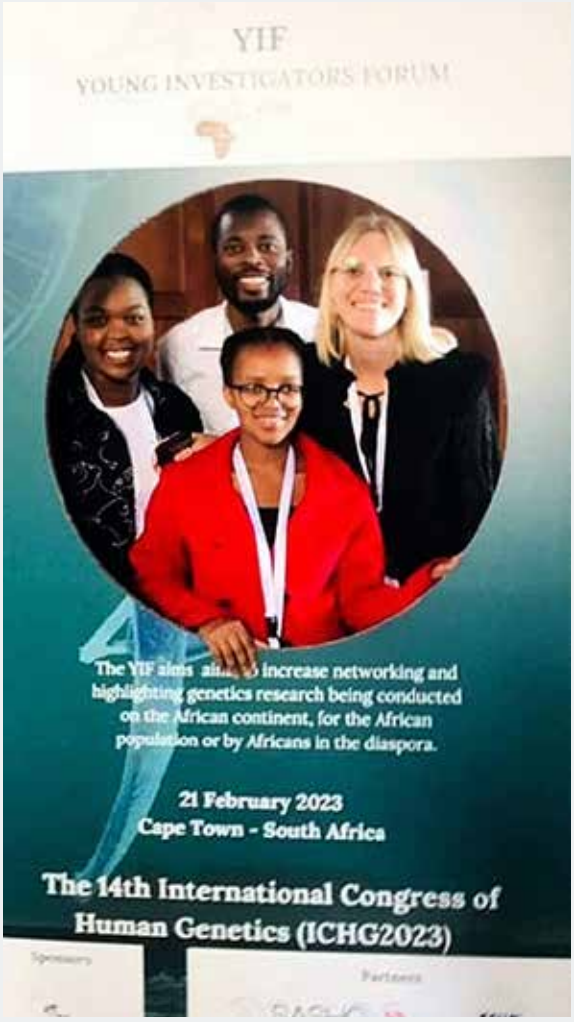
(Associate Professor Phumla Sinxadi) is the Division of Clinical Pharmacology, while the Department of Medicine (Associate Professor Erica Jones & Professor Brian Rayner), Division of Cardiology (Professor Mpiko Ntsekhe, Division of Nuclear Medicine (Dr Stuart More) and Division of Infectious Diseases are part of the Unit (Associate Professor Sipho Dlamini). We collaborate with Professor Collen Masimirembwa of the African Institute of Biomedical Sciences & Technology (AiBST), Professor Pirmohammed Munir of the University of Liverpool, Dr Nyarai Soko, Harare Institute of Technology, in Zimbabwe, and Professor Rose Hayeshi of the Northwest University Preclinical drug development Unit.

Skills building through Capacity Development

We are leveraging on the diverse expertise base permitted by our multi-disciplinary research team. In addition to this, taking advantage of being in the IDM, we are benefitting from various schemes that support student and staff development in terms of proposal developments, grant writing and budgeting. Our students and staff are able to get training from across the platform on any of the core-facilities relevant to their work.

Knowledge Translation for an informed society

We have attended conferences and disseminated our work. Professor Dandara was the local host of the International Congress of Human Genetics held from the 22nd to the 26th of February, which saw at least 1500 delegates coming to Cape Town and sharing in their research. Six people from the group presented their work (Prof C Dandara, Ms Arinao Ndadza, Ms Bianca Kruger, Ms Nosipho Mabizela, Ms Zizio Lusiki, Ms Oppah Kuguyo). In December, four members of the Unit attended the African Society for Human Genetics Conference in Morocco and shared in their work (Professor C Dandara, Ms Arinao Ndadza, Ms Bianca Kruger, Ms Nosipho Mabizela). We have published some of the work on warfarin pharmacogenomics as well as tumour microenvironment, as part of our contribution to translating and dissemination information to the public. Professor Dandara has written an Editorial, simplifying understanding on pharmacogenomics.



SAMRC/UCT PREMED at the 14th International Congress of Human Genetics (ICHG2023), Cape Town, South Africa. Image left to right: Nosipho Mabizela (MSc), Jonathan Katsukunya (MSc), Bianca Kruger (PhD) and Zizo Lusiki (MSc)-in red.

SAMRC COLLABORATING CENTRES & TB REPORT SA

SAMRC TB HIV Collaborating Centres

The South African Medical Research Council (SAMRC) has HIV/TB Centres based at various Universities in South Africa focusing on research into one of the four major epidemics facing the country, HIV and Tuberculosis (TB). The Centres were established in 2015 for multidisciplinary research to reduce the HIV/AIDS and TB burden. To ensure the Centres' sustainability, a joint programme with the National Institutes for Health was established to create RePORTSA, for these centres to apply for TB RePORT SA and RePORT requests for applications.

Clinical Cancer Research Centres

Also in 2015, two Clinical Cancer Research Centres (CCRCs) at medical schools/hospitals were established to integrate cancer-related research programmes in fields such as basic laboratory and clinical sciences, prevention and control methodologies, as well as population-based studies for a transdisciplinary cancer research centre that straddles departmental and institutional boundaries.

- SAMRC/UCT Gynaecological Cancer Research Centre (GCRC)
- SAMRC/Wits Common Epithelial Cancer Research Centre

SAMRC-JEMBI Collaborating Centre For Digital Health Innovation

The SAMRC-Jembi Collaborating Centre for Digital Heath Innovation is hosted by Jembi Health Systems NPC, a South African non-profit company specializing in digital health in low resource settings. The main objectives of the Collaborating Centre are to:

- Strengthen the SAMRC's participation in the national digital health research and innovation agenda as an active partner and affiliate in addition to its role as a funder
- Provide a vehicle for facilitating technical knowledge to support effective digital health research and implementation in South Africa and other low resource countries
- Build a collaborative network of digital health implementers and researchers in the public and private sector in South Africa and other low resource countries
- Reposition the SAMRC as a local as well as an international research leader in digital health solutions.

SAMRC collaborating centres

TUBERCULOSIS COLLABORATING CENTRE FOR CHILD HEALTH (TB-CHILD)

Centre Director: Prof Mark Nicol

ADVANCING CARE AND TREATMENT (ACT) FOR TB/HIV

Centre Director: Prof Gavin Churchyard

SOWETO MATLOSANA SAMRC COLLABORATING CENTRE FOR HIV/AIDS AND TB

Centre Director: Dr Neil Martinson

CENTRE FOR TUBERCULOSIS BIOMARKER-TARGETED INTERVENTION

Centre Director: Ass Prof Mark Hatherill

CLINICAL AND COMMUNITY HIV-TUBERCULOSIS RESEARCH COLLABORATING CENTRE

Centre Director: Prof Graeme Meintjes

WITS CLINICAL HIV/TB RESEARCH UNIT

Centre Director: Ass Prof Ian Sanne

WITS RHI COLLABORATING CENTRE FOR HIV/AIDS

Centre Director: Prof Helen Rees

TB FREE THROUGH RESEARCH AND INNOVATION

Centre Director: Prof Keertan Dheda

CENTRE FOR BASIC AND TRANSLATIONAL HUMAN TB RESEARCH

Centre Director: Prof Adrie Steyn

TYGERBERG SAMRC COLLABORATING CENTRE FOR HIV LABORATORY RESEARCH

Centre Director: Prof Wolfgang Preiser

STAKEHOLDER ENGAGEMENTS

STAKEHOLDER ENGAGEMENTS

In our everyday lives, communication plays a vital role in establishing and nurturing relationships. It serves as a powerful tool that allows us to share our experiences, express our needs, and connect with others on a deeper level. By engaging in effective communication, we can foster meaningful connections and build strong bonds with people around us.

Within the Division of Corporate and Marketing Communications at the SAMRC, it is imperative for us to stay updated on the evolving societal norms and challenges within the field of communications. This ensures that we can effectively serve and promote the SAMRC's mission to address the health needs of our nation. To stay ahead and adapt to the changing landscape, we recognize the value of embracing artificial intelligence as a tool to enhance our vision of the future. However, we remain mindful of the importance of prioritizing people and maintaining a human-centric approach. We acknowledge and emphasize the interconnectedness between human life, animal life, our climate, and the environment.

Our team is deeply committed to supporting research translation, ensuring that the impactful work conducted by the SAMRC positively influences the lives of our nation's people. We strive to uphold the integrity of the SAMRC's brand while staying true to our core values. We actively seek out opportunities that have the potential to make a positive difference in people's lives. This includes actively engaging in citizenship, fostering collaboration, and seeking partnerships that align with our mission. By embracing these opportunities, we aim to contribute to a better future and create lasting positive impact in society.

During the reporting period 2022/23, the CMC contributed in a host of stakeholder engagements promoting a social responsibility mindset of its organisation. Below we capture some of the highlights of this period:

Corporate Social Responsibilities and Campaigns

International World Environment Day

The SAMRC's ongoing "**OUR WORLD NEEDS YOU**" campaign, partnered with Save a Fishie, and NPO, in organising a beach clean-up held at Milnerton Lagoon Beach in Cape Town.

A total of 407kg's of litter was collected by the volunteers, which is nearly half a ton of waste materials that would end up in the ocean.

Madiba Day

Keeping Mandelas' legacy alive, the SAMRC came together as an organisation to donate non-perishable tinned food to community institutions in need.

Youth Month

As part of commemorating Youth Month, CMC together with Human Resources and Stellenbosch University hosted a group of 30 Grade 09 – 11 learners for the SAMRC's first Generation Science (Gen S) Job Shadowing Programme from 27 June – 01 July.

The aim was to afford learners an opportunity to have hands-on experience of the Scientific work conducted by the SAMRC. It presented them with insight on how the council is able to address the health issues of South Africans, and the impact it has to improve lives as well as an understanding of the contribution of the support services.

World Diabetes Day

Parow Senior Centre visit

Diabetes remains a major global public health problem. Under the theme "Access to Diabetes Care for All" and under the initiative of "Education to Protect Tomorrow", the SAMRC visited Parow Senior Centre sharing important information on Diabetes care and preventative measures that can be taken.

Diabetes Awareness Fun Walk

With increased physical activity playing a key role in preventing Diabetes, SAMRC also hosted it's annual Diabetes Awareness Fun Walk, at Jack Muller Park, which was well supported by families and friends.

Golden Key Career Day at Stellenbosch University: 12 October 2022

On 22 October 2022, SAMRC Corporate and Marketing division was out and about inspiring the next generation of scientists & researchers at the Golden Key Stellenbosch 2022 Career Fair, which was held at the Education Building, Faculty of Medicine and health Sciences, Tygerberg Campus.

World Aids Day

Responding to the UNAIDS call to each of us to address the inequalities holding back progress in ending AIDS. The "Equalize" slogan and theme for this year as a call to action and a prompt for all of us to work for the proven practical actions needed to address inequalities and help end AIDS.

Once again SAMRC staff came together as an organisation regionally to reiterate the theme and call to action, requiring a unified approach to address the inequalities in ending AIDS.

International Delegation visits

Beijing Genomics Institute from China visits SAMRC: 17 February 2023

Beijing Genomics Institute (BGI) Group visited SAMRC to discuss possible collaborations as well as donate a DNBSEQ-G400 gene sequencer. The sequencer will assist the SAMRC to further improve the work done by our researchers in the field of genomics capability and benefit the people of South Africa and beyond.

Kenya Medical Research Institute visits the SAMRC: 14-15 March 2023

Members of the SAMRC Executive management committee (EMC) hosted a delegation from the Kenya Medical Research Institute (KEMRI). The main purpose of their visit was to understand how best to engage with government and donors in order to secure funding as well as identify areas for potential collaboration between the two institutions.

Angolan Ministry visits SAMRC: 5 December 2022

Minister of Higher Education, Science, Technology and Innovation, Dr Maria do Rosário Bragança Sambo led an Angolan delegation to discuss possible collaborations with the SAMRC.

Mauritian Ministry visits to SAMRC: 9 December 2022

Honorable Minister Teeruthraj Hurdoyal, Minister of Public Service, Administrative and Institutional Reforms led a delegation from Mauritius to visit SAMRC to discuss possible collaborations between SAMRC and his department. Their areas of interest were in Genomics as well as Biomedical Research and Innovation.

Deputy Minister of Health visits SAMRC: 30 November 2022

The honorable deputy Minister of Health, Dr Sibongiseni Dlomo and members from his department visited SAMRC.

University of Limpopo Scholars visited the SAMRC: 26 September 2022

Scholars from the Medical Sciences Department at Limpopo University visited the SAMRC's Medicina Campus in Cape Town. Scholars were given the opportunity to engage and learn more about the SAMRC.

Women in Science' honoured by the US Secretary of State: 8 August 2022

SAMRC hosted the United States Secretary of State, Antony J. Blinken to celebrate Women in Science during the womens' month in August 2022 at the Pretoria offices.

Digital Platforms and Services

The Digital Platforms and Services office is responsible for maintaining regular channels of communication with stakeholders including managing an online presence where real time information can be shared.

Listed below are project/conference websites developed for the this financial period.

SAMRC website

The SAMRC Website stats shows an average of 11m hits per month for the period 1 April 2022 – 31 March 2023 which is attributed to the implementation of the latest responsive technology that drives growth. A total of 134 million hits for the year 2022/2023.

SISONKE 4 (SHERPA)

Sisonke Heterologous mRNA-1273 boost after prime with Ad26.COV2.S, the SHERPA Study's primary objective is to evaluate the effectiveness of the heterologous mRNA-1273 (Moderna) boost, against COVID-19 infections and severe COVID-19 disease among health care workers. The study aimed to enroll up to 15 000 Sisonke participants who have received either a single or two doses of Ad26.COV2.S. This will allow the study team to investigate the effectiveness of the Moderna COVID-19 vaccine booster against the new variants in South Africa, as well as provide the South African Health Products Regulatory Authority (SAHPRA) with additional data on this vaccine for potential licensing.

FOODSAMSA

FoodSAMSA is a three-year project that aims to address malnutrition in all its forms, including undernutrition, micronutrient deficiencies, unhealthy diets, and obesity, by assessing its determinants and by exploring interventions at the macro (policy), the meso (community) and the micro (interpersonal) level.

GAPC2023

GAPC is the leading forum for the world's alcohol policy makers, advocates, researchers, civil society activists and practitioners. With its high level of heavy epidodic drinking and related harms, and its long history of challenges in getting policy shifts in areas such as controls on alcohol marketing and retail sales of alcohol, South Africa was an ideal venue in which to discuss alcohol policy and in which to host GAPC2023. The conference theme is: Investing in people before profits: building momentum towards the Framework Convention on Alcohol Control.

Malaria Conference 2022 & 2023

The South African Medical Research Council Malaria Research Group (MRG) seeks to improve the health status and quality of life of people living in malaria endemic areas by facilitating high quality scientific research and innovative practices that informs the development of policy, health services, health promotion and capacity development. In consultation with the SA National Department of Health the MRG developed a prioritised research agenda to foster networking and collaboration among different role players to synergise efforts on malaria research towards a common goal.

PHASA2023

PHASA hosts an annual conference, with the aim of engaging public health practitioners and interested people from around the country and world to share their experiences and research, discuss topical public health issues, and mentor public health students and young researchers.

Science Writing and research translation

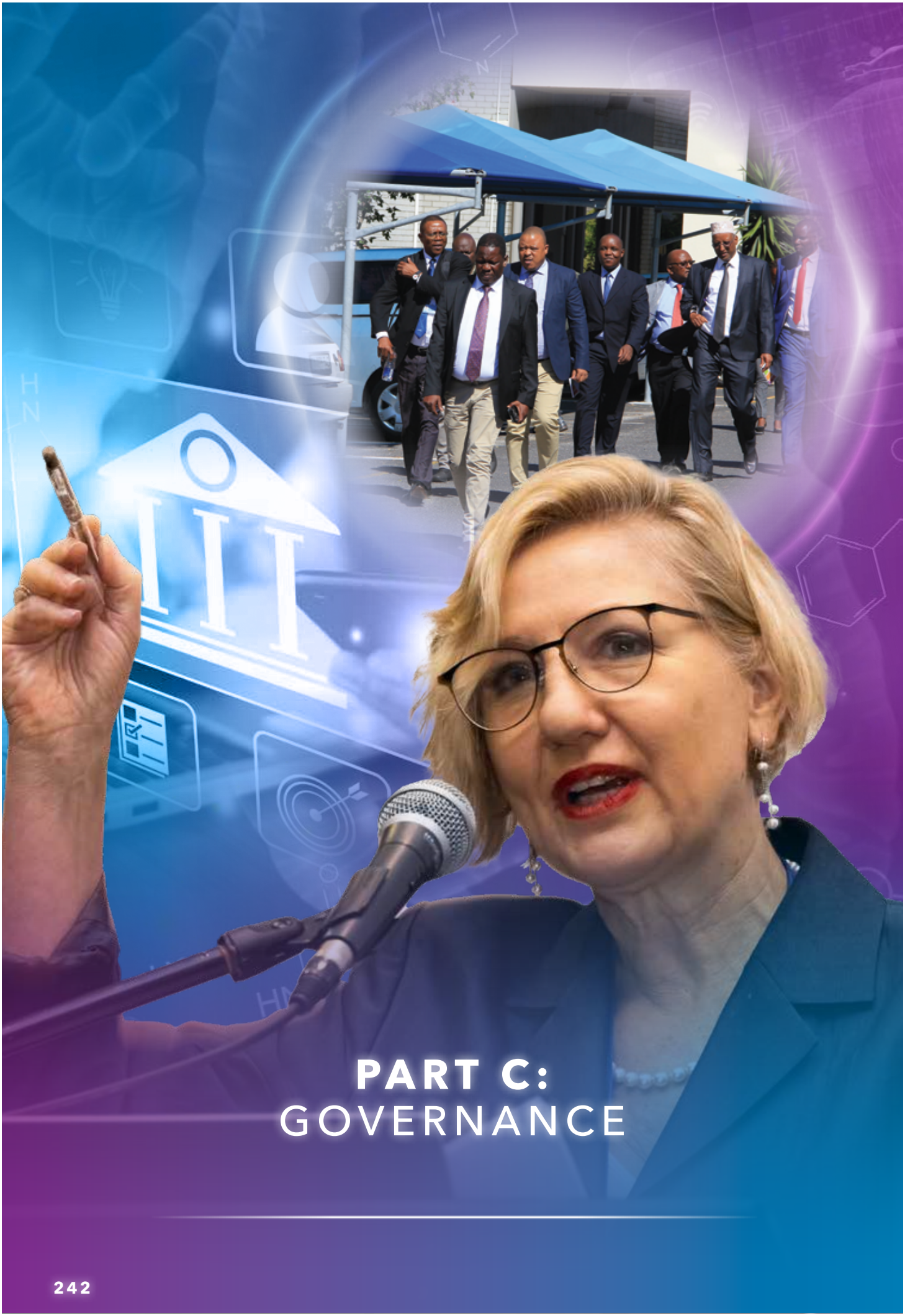
The division produces an online monthly newsletter "Our stories", a publication that features the organisation's research, including community engagements, outreach projects as well as the achievements of our staff members.

CMC also published the 2nd Issue of the SAMRC's external newsletter "Advancing Life" in December which serves as research translation tool, communicating our science to the public, conveying how we aim to make a difference and impact on the lives of others."

Public Relations

Press Releases and news articles

The SAMRC issued 35 press releases and 28 news articles during the period from 01 April 2022 to 31 March 23. All the press releases and news articles can be accessed on the SAMRC website: **www.samrc.ac.za/media**.



PART C:
GOVERNANCE

INTRODUCTION

Corporate governance embodies processes and systems by which an organisation is directed, controlled, and held to account. As a Section 3A public entity, corporate governance at the SAMRC is guided by its enabling legislation, the SAMRC Act 58 of 1991, the prescripts of the Public Finance Management Act 1 of 1999, as amended and the principles contained within the King Report on Corporate Governance. The SAMRC is accountable to Parliament for its performance and management of its budget.

The SAMRC Act provides for the appointment of a Board by its executive authority, the National Minister of Health. The Board as the accounting authority, in turn, is responsible for the corporate governance of the SAMRC. This includes fiduciary responsibilities and ensuring compliance with legislative and regulatory requirements. Furthermore, the SAMRC Board appoints the SAMRC President, who carries the responsibility for implementing the Board's mandate. The SAMRC President heads the SAMRC Executive Management Committee, which the SAMRC Act assigns responsibility for the day-to-day management of the organisation.

Our legal context

Constitutional mandate

The Constitutional (Constitution of the Republic of South Africa Act, 1996 (Act 108 of 1996, as amended) base that supports the SAMRC's mandate is:

- Section 10 (right to human dignity).
- Section 11 (right to life).
- Section 12 (right to freedom and security of the person).
- Section 14 (right to privacy).
- Section 24 (right to environment that is not harmful to health).
- Section 27 (right to healthcare, food, water, and social security).

In the Constitutional context, the outcome of SAMRC work must translate to some tangible/realisable proposition addressing one of these areas.

Statutory and other mandates

The Legal & Compliance Services Division of the SAMRC has identified 51 Acts of Parliament (with 23 of those characterised as primary (i.e., non-compliance therewith or parts thereof would be catastrophic to the business/ mandate of the SAMRC). Further to that, 7 Good Practice Standards (local and international) have been identified to be applicable to the SAMRC. Last, 10 Regulatory Authorities have been identified to have authority over the business or conduct of the SAMRC.

The 51 acts include the following:

- SAMRC Act 58 of 1991, as amended
  This is the enabling and founding legislation creating the SAMRC. It is instructive on the mandate of the SAMRC and the prioritisation of its research programmes. The SAMRC Act empowers the functional and authoritative structures of the SAMRC to source/employ such resources and engage the Executive Authority and such other key stakeholders as may be appropriate to give effect to the mandate of the SAMRC.
- The National Health Act 61 of 2003.
- Intellectual Property, Rights from Publicly Financed Research and Development Act, 2008.
- Employment Equity Act 55 of 1998, as amended.
- Labour Relations Act 66 of 1995, as amended.
- Employment Equity Act 55 of 1998, as amended.
- Basic Conditions of Employment Act 75 of 1997, as amended.
- Public Finance Management Act (No.1 of 1999 as amended by Act 29 of 1999).
- The Patents Act 57 of 1978.
- Copyright Act 98 of 1978 Trademarks Act 194 of 1993.
- Designs Act 195 of 1993.
- Implementation of Official Languages Act 12 of 2012.
- Protection of Personal Information Act 4 of 2013.

The Good Practice Codes include:

- King Code on Corporate Governance.
- Good Clinical Practices (GCP).
- Good Laboratory Practices (GLP).

The Regulatory Authorities include

- Information Regulator created in terms of the Protection of Personal Information Act.
- South African Revenue Services.
- Health Professions Council of South Africa.

All these instruments are constantly monitored to attend to necessary reviews as and when public policy, professional practice and legislative changes are initiated.

Corporate governance embodies processes and systems by which public entities are directed, controlled and held to account. In addition to legislative requirements based on a public entity's enabling legislation and Companies Act, corporate governance, with regard to public entities, is applied through the precepts of the PFMA and run-in tandem with the principles contained within the King Report on Corporate Governance.

All these instruments are constantly monitored to attend to necessary reviews as and when public policy, professional practice and legislative changes are initiated.

OUR BOARD

The role of our Board is set out in the South African Medical Research Council Act of 1991 and states that "the affairs of the SAMRC shall be managed and controlled by a Board, which shall, subject to the provisions of this Act, determine the policy and objectives of the SAMRC and exercise control generally over the performance of its functions, the exercise of its powers and the execution of its duties".

Board Charter

The Board Charter sets out the Board's role and responsibilities, as well as the requirements for its composition and meeting procedures.

The Charter is reviewed annually to ensure that the Board remains compliant with legislation and trends in corporate governance. The review of the Charter took place at the Board meeting held on 28 July 2022 and no amendments to the Charter were deemed necessary.

The Board Charter requires an annual assessment to be conducted of the Board, its Committees, and individual members, including the Chairperson. The evaluation is in the form of a self-assessment completed by every member of the Board and was conducted in October 2022.

The Board Charter details the role and responsibilities of the Board, as follows:

1. The Board is ultimately accountable and responsible for the management and control of the affairs of the SAMRC subject to the provisions of the SAMRC Act. The Board determines the policies and objectives of the SAMRC and exercises control generally over the performance of its functions, the exercise of its powers and the execution of its duties.

2. To the extent that it is not contrary to the provisions enabling legislation or the powers of the Executive Authority, the Board or its Committees have the responsibility to manage the conduct of individual members of the Board/ Board Committee as the case may be, including referral to the Executive Authority for appropriate intervention.

3. The Board constitutes the focal point and custodian of corporate governance in the SAMRC by managing its relationship with management and stakeholders along sound corporate governance principles. Accordingly, the SAMRC must be headed and controlled by an effective and efficient Board, comprising of Executive and Non-Executive members in order to ensure independence and objectivity in decision-making.

4. The Board must appreciate that strategy, risk, performance and sustainability are inseparable and to give effect to this by:

    a) Contributing to and approving the SAMRC's strategy

    b) Satisfying itself that the strategy and business plans do not give rise to risks that have not been thoroughly assessed by management

    c) Identifying key performance and risk areas

    d) Ensuring that the strategy will result in sustainable outcomes

    e) Considering sustainability as a business opportunity that guides strategy formulation

5. The Board has absolute responsibility for the performance of the entity and is accountable for such Performance. As a result, the Board should give strategic direction to the SAMRC.

6. The Board must appoint and evaluate the performance of the President, Vice Presidents, the Chief Financial Officer and other members of the EMC and ensure that an effective succession plan is in place and adhered to for all key executive posts.

7. The Board must retain full and effective control over the SAMRC and monitor management in implementing Board decisions, plans and strategies.

8. The Board must ensure that the SAMRC is and is seen to be a responsible corporate citizen by having regard to not only the financial aspects of the business of the SAMRC but also the impact that business operations have on the environment and the society within which it operates.

9. The Board must ensure that the SAMRC ethics are managed effectively.

10. The Board must ensure that the SAMRC establishes and maintains:

    a) effective, efficient, and transparent systems of financial management, risk management and internal control.

    b) a system of internal audit under the control and direction of an audit committee complying with, and operating in accordance with, the regulations and instructions which are set out in Sections 76 and 77 of the PFMA.

    c) an appropriate procurement and provisioning system that is fair, equitable, transparent, competitive and cost effective.

    d) a system for properly evaluating all major capital projects prior to the final decision on a project.

11. The Board is responsible for the governance of risk.

12. The Board is responsible for information technology (IT) governance.

13. The Board must ensure that the SAMRC complies with applicable laws and considers adherence to non-binding rules and standards.

14. The Board must approve and ensure that the SAMRC submits all reports, returns, notices and other information required by Parliament, the Executive Authority and Treasury.

15. The Board must appreciate that stakeholder's perceptions affect the SAMRC's reputation.

16. The Board must approve the SAMRC's five-year Strategic Plan before submission to the Executive Authority.

17. The Board must approve the SAMRC's Annual Report, Compliance Report(s), Strategic Plan and Annual Performance Plan before submission to the Executive Authority.

18. The Board must approve the SAMRC's Annual Financial Statements before submission to the Auditor General and subsequently to the executive authority.

19. The Board must approve the SAMRC's budget for the financial year in the prescribed format before submission to Treasury and the executive authority.

20. The Board must take effective and appropriate steps to prevent irregular and fruitless and wasteful expenditure, losses resulting from criminal conduct, and expenditure not complying with the operational policies of the SAMRC.

21. The Board must ensure that the SAMRC conducts an independent institutional review every five years.

22. The Board must act in the best interests of the SAMRC by ensuring that individual members of the Board:

    a) adhere to legal standards of conduct.

    b) are permitted to take independent advice in connection with their duties following an agreed procedure.

    c) participate in the deliberations and are enabled to vote for the approval or rejection of a motion/proposal/or recommendation placed before them.

    d) disclose real or perceived conflicts to the Board and deal with them accordingly. As such, the Board must compile and retain a register of interests for all Board members and update this register once every year.

23. The Board should do everything necessary to fulfil its role set out above.

BOARD MEMBERS 01 NOVEMBER 2022 – 31 MARCH 2023

PROF JOHNNY MAHLANGU
CHAIRPERSON

PROF BONGINKOSI CHILIZA
VICE CHAIRPERSON

PROF LUFUNO MATHIVHA

DR ZINHLE MAKATINI

PROF TRACEY NALEDI

ADV DOROTHY KHOSA

MS DORIS DONDUR

DR MZIWANDILE MADIKIZELA

PROF EMMANUEL MUKWEVHO

PROF BRUCE BICCARD

PROF RONELLE CAROLISSEN

PROF THANDISIZWE MAVUNDLA

PROF TIMOTHY TUCKER

PROF EUNICE SEEKOE

PROF MOSA MOSHABELA

PROF TAHIR PILLAY

PROF GLENDA GRAY
SAMRC PRESIDENT AND CEO

BOARD MEMBERS 01 APRIL 2022 – 31 OCTOBER 2022

PROF JOHNNY MAHLANGU
CHAIRPERSON

PROF LINDA SKAAL
VICE CHAIRPERSON

PROF SITHEMBISO VELAPHI

PROF BRANDON SHAW

PROF THOLENE SODI

PROF LINDIWE ZUNGU

PROF WILLIAM RAE

PROF COLLET DANDARA

DR MZIWANDILE MADIKIZELA

PROF EMMANUEL MUKWEVHO

PROF RONELLE CAROLISSEN

PROF THANDISIZWE MAVUNDLA

PROF TIMOTHY TUCKER

PROF EUNICE SEEKOE

ADV DOROTHY KHOSA

MS JUNE WILLIAMS

PROF GLENDA GRAY
SAMRC PRESIDENT AND CEO

COMPOSITION OF BOARD: 01 APRIL 2022 – 31 OCTOBER 2022

NAME	DESIGNATION *(In terms of the Public Entity Board structure)*	DATE APPOINTED	DATE RESIGNED	QUALIFICATIONS	AREA OF EXPERTISE	BOARD DIRECTORSHIPS *(LIST THE ENTITIES)*	OTHER COMMITTEES OR TASK TEAMS *(e.g.: Audit Committee/ Ministerial Task Team)*	NO. OF MEETINGS ATTENDED
Prof. J Mahlangu	Member (Chairperson)	1 Nov 2016	n/a	MMed Haematology; Clinical Haematology Subspecialist; Certificate Clinical Haematology; Clinical Haematology Subspecialist; FCPath Haematologist; MBBCh; BSc Lab Medicine Scientist.	Clinical Haematologist with special interest in haemostasis and thrombosis, clinical trials and other aspects of clinical and diagnostic haematology and pathology.	• WITS Health Consortium Board • BlooodSA	Board Exco	5 0
Prof. L Zungu	Member	1 Nov 2016	n/a	BCur; Diploma in Nursing Education and Administration; Primary Health Care Certificate; BCur (Hons) in Community Health Nursing; Occupational Health Programme Evaluation; MCur in Community Health Nursing; PhD in Occupational Health Nursing; Health Practitioner's Dispensing Course; Post Graduate Diploma in International Research Ethics	Occupational health and safety; Community Health	• Member of the Examination Board at Texila • American University (TAU) in India	Board REMCO	5 2

NAME	DESIGNATION *(In terms of the Public Entity Board structure)*	DATE APPOINTED	DATE RESIGNED	QUALIFICATIONS	AREA OF EXPERTISE	BOARD DIRECTORSHIPS *(LIST THE ENTITIES)*	OTHER COMMITTEES OR TASK TEAMS *(e.g.: Audit Committee/ Ministerial Task Team)*	NO. OF MEETINGS ATTENDED
Prof. W Rae	Member	1 Nov 2016	n/a	PhD (UFS); MMedSc (UCT), Medical Physicist; MBChB (Wits) Medical Practitioner; BSc (Rhodes).	Imaging Medical Physics; Quantitative Image Analysis.	n/a	Board R&D	5 1
Prof. B Shaw	Member	1 Nov 2016	n/a	PHD (Human Movement Science); D.Phil (Biokinetics); M.Phil (Biokinetics); B.A. Honours (Biokinetics) cum laude; B.A. Honours (Sport Science); B.A. (Humanities)	Clinical and community physical activity practice and policy development; prevention and rehabilitation of non-communicable diseases (NCDs).	• Executive Director: Africa & Vice-President: Publications and Communication – International Physical Activity Projects (IPAP) • Co-director: Non-Communicable Disease Intervention Research Unit (NCDIRU)	Board ARIC	5 4
Prof. L Skaal	Member	1 Nov 2016	n/a	Doctor of Public Health (DrPH); Master of Public Health (MPH); BSc Physiotherapy; Assessment and Moderation Certificate	Social & Behavioural Studies: Addictive behaviours and Obesity Prevention.	• SAIDS Board • PHASA Exec	Board ARIC	5 4
Prof. T Sodi	Member	1 Nov 2016	n/a	Honours Degree in Psychology; Masters Degree in Clinical Psychology; PhD (Psychology); Registered Clinical Psychologist	Culture and mental illness/health; Mental retardation; Mental health policy; Culture and ethics; Suicide; Health and behaviour; Archival research; Phenomenology and phenomenological research.	• Tholene Sodi and Partners Inc. (Clinical Psychologists) • ResilientMinds NPC • Member of the Ministerial Advisory Committee on Mental Health (Department of Health)	Board REMCO	5 3

NAME	DESIGNATION *(In terms of the Public Entity Board structure)*	DATE APPOINTED	DATE RESIGNED	QUALIFICATIONS	AREA OF EXPERTISE	BOARD DIRECTORSHIPS *(LIST THE ENTITIES)*	OTHER COMMITTEES OR TASK TEAMS *(e.g.: Audit Committee/ Ministerial Task Team)*	NO. OF MEETINGS ATTENDED
Prof. S Velaphi	Member	1 Nov 2016	n/a	MBChB; MMed; FC Paed, Fellowship in Perinatal Neonatal Medicine PhD	Neonatology.	• Member of Ministerial Committee of National Perinatal Morbidity and Mortality Committee (NaPeMMCo); • Member of Ministerial Committee on COVID-19 (MAC); • Clothing Company for Church Clothes/ Uniform	Board R&D	4 1
Prof. E Seekoe	Member	1 Nov 2019	n/a	D Cur; MBA (Health); M SocSc (Nursing Education); Advanced Diploma in Psychiatric Nursing Science; B A Cur (Nursing Education and Community Health Nursing); Diploma in General Nursing Science and Midwifery; Certificate in Reproductive Health (Family Planning); Certificate in Quality of Health Services; Certificate in Decentralisation of Health Services; Certificate in Strengthening Human Resource in Health	Health Systems strengthening through mentoring and leadership.	• Sub-Saharan-FAIMER Regional Institute (SAFRI) – Vice Chair • Albertina Sisulu Executive Leadership Programme in Health (ASELPH) SMT – Co Director • Joint Fundraising Committee of PHASA and UFH Faculty of Health Sciences – Chair • Oversight Committee of (PHASA) and UFH Faculty of Health Sciences – Co Chair • Planning, Organising and Fundraising Committee, International Centenary Transformation in Higher Education, UFH – Chair	Board R&D	5 2

NAME	DESIGNATION *(In terms of the Public Entity Board structure)*	DATE APPOINTED	DATE RESIGNED	QUALIFICATIONS	AREA OF EXPERTISE	BOARD DIRECTORSHIPS *(LIST THE ENTITIES)*	OTHER COMMITTEES OR TASK TEAMS *(e.g.: Audit Committee/ Ministerial Task Team)*	NO. OF MEETINGS ATTENDED
Prof. E Mukwevho	Member	1 Nov 2019	n/a	PhD Anatomy& Cell Biology; MSc Molecular & Cell Biology; BSc (Honours) Biochemistry; Bachelor of Science; MBA; Certificate in Project Management. Certificate in Financial Management	Obesity and Diabetes Metabolic syndrome; Mitochondrial Energy metabolism; Epigenetics of the Obesogenes.	n/a	Board R&D	5 2
Prof. C Dandara	Member	1 Nov 2019	n/a	PhD Biochemistry; MPhil Biochemistry; BSc (Hons) Biochemistry; Bachelor of Science	Human Genetics; Pharmacogenomics; Molecular biology; Drug metabolism.	• HPSCA registered member • Southern African Society for Human Genetics (SASHG) member • African Society for Human Genetics (AfSHG)	Board R&D	5 2
Prof. T Tucker	Member	1 Nov 2019	n/a	MBChB; PhD; F.C.Path (SA)Viro	Clinical Virology; Health Systems Strengthening; Digital health Pathology Laboratory Service; Clinic-Laboratory-Interface; Public-private-partnerships.	• SEAD Consulting (Pty) Ltd – Shareholder and board member • UCT SHAWCO NPO – Board Member • Mothers-2-Mothers NOP – board member • NIH Strategy Working group on HIV/AIDS – US Gov – Committee Member • UCT School of Public Health and Family Medicine – Adjunct Assoc. Professor • Trustee Tucker Family Trust	Board REMCO	5 3

NAME	DESIGNATION *(In terms of the Public Entity Board structure)*	DATE APPOINTED	DATE RESIGNED	QUALIFICATIONS	AREA OF EXPERTISE	BOARD DIRECTORSHIPS *(LIST THE ENTITIES)*	OTHER COMMITTEES OR TASK TEAMS *(e.g.: Audit Committee/ Ministerial Task Team)*	NO. OF MEETINGS ATTENDED
Prof. R Carolissen	Member	1 Nov 2019	n/a	DPhil Psychology; MA Clinical Psychology; Higher Diploma in Education; BA Hons Psychology; Bachelor of Arts; Registered Clinical Psychologist.	Feminist social justice approaches to teaching and learning and critical community psychology perspectives on youth citizenship, identities, belonging and community engagement in educational contexts.	• Stellenbosch University, Maties Gemeenskapsdiens (Community Engagement): Chair of Board: (2018-2022) • Psychological Association of South Africa: Member of Council and Chair of Division of Community and Social Psychology (Sept 2015-Sept 2019) • Psychological Association of South Africa: Member of Council and Chair of standing committee: Equity and Redress, member of publications standing committee (that oversees matters related to the South African Journal of Psychology)	Board REMCO	5 2

NAME	DESIGNATION *(In terms of the Public Entity Board structure)*	DATE APPOINTED	DATE RESIGNED	QUALIFICATIONS	AREA OF EXPERTISE	BOARD DIRECTORSHIPS *(LIST THE ENTITIES)*	OTHER COMMITTEES OR TASK TEAMS *(e.g.: Audit Committee/ Ministerial Task Team)*	NO. OF MEETINGS ATTENDED
Advocate D Khosa	Member	1 Nov 2019	n/a	Bachelor of Laws (LLB); Master of Management: Public and Development Management; Practice Management Training; Design Thinking Course; Labour Dispute Resolution Practice; Certificate in Principles of Business and Management; Diploma in Labour Law; Certificate in Gender Policy Management; BA Honours in Human Resource Management: Labour Relations; Post Higher Education Diploma; Bachelor of Arts.	Human Resource Management; Law; Mediation; Arbitration; Negotiation; Research.	• Bula Maseve Trading CC (Directorship) • Constructive Employment Relations Services (Directorship) • Sedibeng TVET College (Board membership) • South African Board for People Practices (Professional Affiliation) • The Legal Practice Council (Professional Affiliation)	Board REMCO	5 3
Ms J Williams	Member	1 Nov 2019	n/a	Bachelor of Science; Higher Diploma in Education; BSc Honours; Postgraduate Diploma in Accounting; B Comm Hons in Accounting CA(SA)	Audit and Finance	• Boland TVET College Council • Breede River Municipality Audit and Performance Audit Committee • Stellenbosch Audit and Performance Audit Committee	Board ARIC	5 4

NAME	DESIGNATION *(In terms of the Public Entity Board structure)*	DATE APPOINTED	DATE RESIGNED	QUALIFICATIONS	AREA OF EXPERTISE	BOARD DIRECTORSHIPS *(LIST THE ENTITIES)*	OTHER COMMITTEES OR TASK TEAMS *(e.g.: Audit Committee/ Ministerial Task Team)*	NO. OF MEETINGS ATTENDED
Prof. T Mavundla	Member	1 Nov 2019	n/a	B Cur (Nursing & Midwifery); IPHC Intensive Primary Health Care; PGDEL (Education Management & Leadership) M Cur Advanced Psych-Mental Health; AUDNE Nursing Education; PhD Mental Health.	Male Sexual and Reproductive Health; Psychiatric-Mental Health; Qualitative Research and Theory Development.	n/a	Board ARIC	5 4
Dr M Madikizela	Member	1 Nov 2019	n/a	BSc (Biochemistry); BSc Honours (Biochemistry); MSc (Biochemistry); PhD (Biochemistry); MBA	Bio-economy; Life Sciences; Technology management and commercialization of public research results and Business management.	n/a	Board ARIC	8 6

COMPOSITION OF BOARD: 01 NOVEMBER 2022 – 31 MARCH 2023

NAME	DESIGNATION *(In terms of the Public Entity Board structure)*	DATE APPOINTED	DATE RESIGNED	QUALIFICATIONS	AREA OF EXPERTISE	BOARD DIRECTORSHIPS *(LIST THE ENTITIES)*	OTHER COMMITTEES OR TASK TEAMS *(e.g.: Audit Committee/ Ministerial Task Team)*	NO. OF MEETINGS ATTENDED
Prof J Mahlangu	Member	1 Nov 2016	n/a	MMed Haematology; Clinical Haematology Subspecialist; Certificate Clinical Haematology; Clinical Haematology Subspecialist; FCPath Haematologist; MBBCh; BSc Lab Medicine Scientist.	Clinical Haematologist with special interest in haemostasis and thrombosis, clinical trials and other aspects of clinical and diagnostic haematology and pathology.	• WITS Health Consortium Board • Blood SA	Board	3
Prof E Seekoe	Member	1 Nov 2019	n/a	D Cur; MBA Health; M SocSc Nursing Education; Advanced Diploma in Psychiatric Nursing Science; B A Cur Nursing Education and Community Health Nursing; Diploma in General Nursing Science and Midwifery; Certificate in Reproductive Health (Family Planning); Certificate in Quality of Health Services; Certificate in Decentralisation of Health Services; Certificate in Strengthening Human Resource in Health;	Health Systems strengthening through mentoring and leadership.	• Vice-Chair, Sub-Saharan-FAIMER Regional Institute (SAFRI); • Albertina Sisulu Co-Director, Executive Leadership Programme in Health (ASELPH) SMT; • Chair, Joint Fundraising Committee member, PHASA and UFH Faculty of Health Sciences; • Co-Chair, Oversight Committee of (PHASA) and UFH Faculty of Health Sciences; • Chair, Planning, Organising and Fundraising Committee of the International Centenary Transformation in Higher Education, UFH.	Board R&D	3 0

NAME	DESIGNATION *(In terms of the Public Entity Board structure)*	DATE APPOINTED	DATE RESIGNED	QUALIFICATIONS	AREA OF EXPERTISE	BOARD DIRECTORSHIPS *(LIST THE ENTITIES)*	OTHER COMMITTEES OR TASK TEAMS *(e.g.: Audit Committee/ Ministerial Task Team)*	NO. OF MEETINGS ATTENDED
Prof. E Mukwevho	Member	1 Nov 2019	n/a	PhD Anatomy and Cell Biology; MSc Molecular & Cell Biology; BSc Honours Biochemistry; Bachelor of Science; MBA; Certificate in Project Management; Certificate in Financial Management.	Obesity and Diabetes Metabolic syndrome; Mitochondrial Energy metabolism; Epigenetics of the Obesogenes.	None	Board ARIC	3 2
Prof T Tucker	Member	1 Nov 2019	n/a	MBChB; PhD; F.C.Path (SA)Viro.	Clinical Virology Health Systems Strengthening Digital health Pathology Laboratory Service Clinic-Laboratory-Interface Public-private-partnerships	• SEAD Consulting (Pty) Ltd – Shareholder and board member • UCT SHAWCO NPO – Board Member • Mothers-2-Mothers NOP – board member • NIH Strategy Working group on HIV/AIDS – US Gov – Committee Member • UCT School of Public Health and Family Medicine – Adjunct Assoc. Professor • Tucker Family Trust Trustee	Board REMCO	3 1

NAME	DESIGNATION *(In terms of the Public Entity Board structure)*	DATE APPOINTED	DATE RESIGNED	QUALIFICATIONS	AREA OF EXPERTISE	BOARD DIRECTORSHIPS *(LIST THE ENTITIES)*	OTHER COMMITTEES OR TASK TEAMS *(e.g.: Audit Committee/ Ministerial Task Team)*	NO. OF MEETINGS ATTENDED
Prof R Carolissen	Member	1 Nov 2019	n/a	DPhil Psychology; MA Clinical Psychology; Higher Diploma in Education; BA Hons Psychology; Bachelor of Arts; Registered Clinical Psychologist.	Feminist social justice approaches to teaching and learning and critical community psychology perspectives on youth citizenship, identities, belonging and community engagement in educational contexts.	• Stellenbosch University, Maties Gemeenskapsdiens (Community Engagement): Chair of Board: (2018-2022) • Psychological Association of South Africa: Member of Council and Chair of Division of Community and Social Psychology (Sept 2015-Sept 2019) • Psychological Association of South Africa: Member of Council and Chair of standing committee: Equity and Redress, member of publications standing committee (that oversees matters related to the South African Journal of Psychology)	Board REMCO	1 1

NAME	DESIGNATION *(In terms of the Public Entity Board structure)*	DATE APPOINTED	DATE RESIGNED	QUALIFICATIONS	AREA OF EXPERTISE	BOARD DIRECTORSHIPS *(LIST THE ENTITIES)*	OTHER COMMITTEES OR TASK TEAMS *(e.g.: Audit Committee/ Ministerial Task Team)*	NO. OF MEETINGS ATTENDED
Advocate D Khosa	Member	1 Nov 2019	n/a	Bachelor of Laws (LLB); Master of Management: Public and Development Management; Practice Management Training; Design Thinking Course; Labour Dispute Resolution Practice; Certificate in Principles of Business and Management; Diploma in Labour Law; Certificate in Gender Policy Management; BA Honours in Human Resource Management: Labour Relations; Post Higher Education Diploma; Bachelor of Arts.	Human Resource Management; Law; Mediation; Arbitration; Negotiation; Research.	• Bula Maseve Trading CC (Directorship) • Constructive Employment Relations Services (Directorship) • Sedibeng TVET College (Board membership) • South African Board for People Practices (Professional Affiliation) • The Legal Practice Council (Professional Affiliation)	Board REMCO	3 1
Prof. T Mavundla	Member	1 Nov 2019	n/a	B Cur (Nursing & Midwifery); IPHC Intensive Primary Health Care; PGDEL (Education Management & Leadership) M Cur Advanced Psych-Mental Health; AUDNE Nursing Education; PhD Mental Health.	Male Sexual and Reproductive Health; Psychiatric-Mental Health; Qualitative Research and Theory Development.	n/a	Board ARIC	3 2

NAME	DESIGNATION *(In terms of the Public Entity Board structure)*	DATE APPOINTED	DATE RESIGNED	QUALIFICATIONS	AREA OF EXPERTISE	BOARD DIRECTORSHIPS *(LIST THE ENTITIES)*	OTHER COMMITTEES OR TASK TEAMS *(e.g.: Audit Committee/ Ministerial Task Team)*	NO. OF MEETINGS ATTENDED
Dr M Madikizela	Member	1 Nov 2019	n/a	BSc Biochemistry; BSc Hons Biochemistry; MSc Biochemistry; PhD Biochemistry; MBA.	Bioeconomy, Life Sciences, Technology Management and Commercialization of Public Research Results and Business Management	n/a	Board ARIC	3 2
Prof. B Biccard	Member	1 Nov 2022	n/a	PhD; (UKZN); FCA(SA); FFARCSI; MMedSc; MBChB.	Anaesthesiology; Perioperative outcomes; Global Surgery.		Board R&D	3 0
Prof B Chiliza	Member	1 Nov 2022	n/a	PhD, Stellenbosch University, 2015; Fellow of the College of Psychiatrists of South Africa (FC Psych), 2003; Bachelor of Medicine and Bachelor of Surgery (MB ChB) University of Natal, 1997.	Psychiatry; Psychosis; Clinical psycho-pharmacology; Health services research; Psych epidemiology;	South African Society of Psychiatrists	Board RemCo	2 1

NAME	DESIGNATION *(In terms of the Public Entity Board structure)*	DATE APPOINTED	DATE RESIGNED	QUALIFICATIONS	AREA OF EXPERTISE	BOARD DIRECTORSHIPS *(LIST THE ENTITIES)*	OTHER COMMITTEES OR TASK TEAMS *(e.g.: Audit Committee/ Ministerial Task Team)*	NO. OF MEETINGS ATTENDED
Ms D Dondur	Member	1 Nov 222	n/a	Masters in Business Administration; Honours in Business Administration; Honours in Accounting; Bachelors in Accounting; International Executive Development Programs; Certificate in Labour Relations; Chartered Accountant (South Africa); Chartered Director (South Africa).	Auditing; Finance and Accounting; Combined Assurance and Enterprise Risk Management; Corporate Governance; Strategy; Human Resources and Labour Relations.	• South African Institute of Professional Accountants (SAIPA) • PPS Holdings Trust • PPS Insurance Company • PPS Retirement Annuity Fund • PPS Beneficiaries Trust • Doris Dondur Consulting CC (Dormant)	Board ARIC	3 2
Prof Z Makatini	Member	1 Nov 2022	n/a	BSc (Hons) Univ London (Kings College); MSc Immunology (Univ of London LSTM&H); MBChB (Univ Sheffield), FC Path Viro (CMSA); PhD Virology (SMU); Dip Travel Med (Univ of Glasgow); DTM&H (Wits); Dip HIV in Workplace (Stellenbosch Univ).	Clinical virology and immunology with focus on HIV and clinical trials.		Board REMCO	3 1

NAME	DESIGNATION *(In terms of the Public Entity Board structure)*	DATE APPOINTED	DATE RESIGNED	QUALIFICATIONS	AREA OF EXPERTISE	BOARD DIRECTORSHIPS *(LIST THE ENTITIES)*	OTHER COMMITTEES OR TASK TEAMS *(e.g.: Audit Committee/ Ministerial Task Team)*	NO. OF MEETINGS ATTENDED
Prof L R Mathivha	Member	1 Nov 2022	n/a	FCPaed – Critical Care Medicine; Post Graduate Diploma in Health Sciences Education; Diploma in Business Administration; MBChB; USMLE 1 & 2 Course in Mediation in Medical Negligence.	Critical Care Medicine (Adult & Pediatric); Fellowship Programme Director Organizational skills in ICU setting and HR Capacitation; Principal Investigator in multi-national RCT trials; Scientific Advisory Committee work (National and International); Enabling work and research environment; Utilization of resources in a constrained environment.	n/a	Board R&D	2 0
Prof M Moshabela	Member	1 Nov 2022	n/a	PhD, Public Health (2012) MSc, Field of Study: Demography and Health (2017) Masters in Family Medicine (2009) MBChB (2001) Diploma: HIV (SA), (2006)	Public Health; Implementation Science; Health Systems.	• National Research Foundation – NRF (Independent Board Chairperson) • Africa Health Research Institute – AHRI (Director – UKZN) • Centre for AIDS Programme of Research in South Africa – CAPRISA (Director – UKZN) • KZN Centre for Radio Astronomy, Economic Advancement, Technology and Entrepreneurship – KREATE (Director – UKZN) • Sugar Milling Research Institute – SMRI (Alternate Director – UKZN)	Board R&D	3 0

NAME	DESIGNATION *(In terms of the Public Entity Board structure)*	DATE APPOINTED	DATE RESIGNED	QUALIFICATIONS	AREA OF EXPERTISE	BOARD DIRECTORSHIPS *(LIST THE ENTITIES)*	OTHER COMMITTEES OR TASK TEAMS *(e.g.: Audit Committee/ Ministerial Task Team)*	NO. OF MEETINGS ATTENDED
Prof Tracey Naledi	Member	1Nov 2022	n/a	FCPHM(SA); MBChB.	Translation of research into policy and practice; Health Equity, Social and Structural Determinants of Health, Youth and adolescent Health; HIV Prevention.	• Children's Institute • SHAWCO • Global Brain Health Institute • Global Brain Health Institute Governing Board Member (University of California, San Francisco (UCSF) and Trinity College Dublin (Trinity) • Africa Centre for HIV/ AIDS Management (Advisory Board Chair) • Council for Public Health Medicine (South Africa) • Tekano (Founding Board Chairperson) • Perinatal Mental Health Project (Board of Advisors)	Board ARIC	3 1
Prof Tahir Pillay	Member	1Nov 2022	n/a	PhD (Cantab); FRCPath (London); FCPath (SA); MBChB cum laude.	Molecular & cellular biology; Expression cloning of proteins; Single domain antibodies (nanobodies); Assay of glycated proteins Molecular modelling of ligands and receptors.	n/a	Board R&D	3 0

BOARD AND COMMITTEES: 01 APRIL 2022 – 31 OCTOBER 2022

Committee	No of meetings held	No of Members	Name of Members
Board	5	16	Prof. J Mahlangu (Chair)
			Prof. T Tucker
			Prof. R Carolissen
			Advocate D Khosa
			Prof. T Mavundla
			Dr M Madikizela
			Prof. E Seekoe
			Prof. E Mukwevho
			Prof. L Zungu
			Prof. L Skaal
			Prof. B Shaw
			Ms J Williams
			Prof. T Sodi
			Prof. W Rae
			Prof. S Velaphi
			Prof. C Dandara
ARIC	4	6	Prof. B Shaw (Chair)
			Dr. M Madikizela
			Prof. T Mavundla
			Ms J Williams
			Mr J Watson
			Prof. L Skaal
HR & REMCO	13	5	Prof. T Sodi (Chair)
			Prof. T Tucker
			Prof. R Carolissen
			Advocate D Khosa
			Prof. L Zungu
R&D	2	5	Prof. E Seekoe (Chair)
			Prof. E Mukwevho
			Prof. C Dandara
			Prof. W Rae
			Prof. S Velaphi
EXCO	0	5	Prof. J Mahlangu (Chair)
			Prof. B Shaw
			Prof. E. Seekoe
			Prof. L Skaal
			Prof. T Sodi

BOARD AND COMMITTEES: 01 NOVEMBER 2022 – 31 MARCH 2023

Committee	No of meetings held	No of Members	Name of Members
Board	3	16	Prof. J Mahlangu (Chair)
			Prof. T Tucker
			Prof. R Carolissen
			Advocate D Khosa
			Prof. T Mavundla
			Dr M Madikizela
			Prof. E Seekoe
			Prof. E Mukwevho
			Ms D Dondur
			Prof. T Naledi
			Prof. B Chiliza
			Prof. Z Makatini
			Prof L R Mathivha
			Prof B Biccard
			Prof M Moshabela
			Prof T Pillay
ARIC	2	7	Ms D Dondur (Chair)
			Prof. T Naledi
			Dr M Madikizela
			Prof. T Mavundla
			Prof. E Mukwevho
			Ms J Williams
			Mr J Watson
HR & REMCO	1	5	Prof. T Tucker (Chair)
			Prof. R Carolissen
			Advocate D Khosa
			Prof. B Chiliza
			Prof. Z Makatini
R&D	0	5	Prof. E Seekoe (Chair)
			Prof L R Mathivha
			Prof B Biccard
			Prof M Moshabela
			Prof T Pillay
EXCO	2	4	Prof. J Mahlangu (Chair)
			Prof. E. Seekoe
			Prof. T Tucker
			Ms D Dondur

ENTERPRISE RISK MANAGEMENT

The Board retains overall responsibility for determining the risk appetite of the SAMRC, assessing significant and emerging risks, and overseeing the risk management processes. It has delegated responsibility to the Audit and Risk and IT Committee (ARIC) for overseeing and reviewing the efficacy of these arrangements as well as that of the SAMRC's internal and external auditors. The Board maintains a strong and regular oversight of the committees work and receives regular updates on the activities of the ARIC, and reports on its review in the SAMRC's Annual Report.

The SAMRC has a comprehensive risk management system designed to identify and appropriately mitigate emerging and significant risks faced by the organisation. The Enterprise Risk Management (ERM) Unit at SAMRC is a dedicated department that reports directly to the ARIC and has primary responsibility for the design, implementation and monitoring of corporate enterprise-wide risk management across the SAMRC and has put in place a number of risk control strategies and policy documents designed to govern risk management within the organisation. These are subject to annual review to ensure alignment with international best-practice and the SAMRC business environment and include the:

- Risk Management Strategy;
- Risk Management Policy;
- Risk Appetite and Tolerance Framework; and
- Fraud Prevention Policy

Risks & mitigation activities

A key objective of risk management is to ensure that potentially significant risks facing SAMRC and opportunities associated with realising the strategic objectives are identified, proactively assessed, and managed in such a way that its impact is maintained in accordance with the SAMRC's risk appetite.

The SAMRC's significant risks and opportunities are determined through a strategic risk review process where the SAMRC Executive Management and Board assesses its impact on the achievement of the strategic objectives, which is updated as and when emerging risks and opportunities are identified. Where appropriate, management action plans to further improve the management of these risks have been developed and being implemented.

Risk dashboards are utilized to report quarterly to the Executive Management Committee and Audit, Risk & IT Committee. Further support is provided by internal audit in the form of assurance on the effectiveness of control procedures in place to reduce the possibility and outcome of the known risks.

Related risks are aggregated and grouped to determine the significant risk category/context. Selected significant risks and opportunities (grouped by strategic priorities), together with key mitigating measures, are listed in the table below.

Strategic priorities	Significant risk category/context	Risk description	Key response measures
Administer health research effectively and efficiently in South Africa	POPIA Compliance	Staff not aware of the extensive the legislative requirements SAMRC needs to comply with due to the onerous nature and complexity of the Act	• Policies, guidelines, and manual legislative compliance framework • Dedicated legal compliance staff and appointed of Deputy Information Officers
	Corporate process improvements	The risks of delayed support/ slow response times by support functions to assist research units in executing the SAMRC mandate	• Management oversight • Online helpdesk services and technology • Contracts for major procurement spends • Policies, processes, SOPs
	Infrastructure management and revitalisation of Delft site	Infrastructure deterioration and aging buildings and research assets	• Asset management and verification • Capital project refurbishment • Preventative maintenance plans • Revamping office space
	Health, Safety & Environment (HSE)	H&S exposures on premises and community-based research programmes, delays programmes/ project and adverse impact on future funding	• HSE Management System • Emergency Preparedness and Response Procedure • COVID-19 preparedness plans • National and international COVID-19 research funding
	Data management	Cyberthreats and loss of SAMRC research data/intellectual property	• Firewall protection • Management monitoring and oversight • Policies, processes, SOPs
Lead the generation of new knowledge	Maintaining research integrity	The risk involves application of inconsistent data management processes; inadequate mentorship and unclear mechanisms and processes in place to ensure protection of personal data	• Establish Research Integrity Office • Human and animal ethics committees • Policies, guidelines and SOPs
	Transformation	Progression of staff transformation potentially constrained by both internal and external factors, including limited budget; limited pool of public health scientists, behavioural scientist and medical clinical research scientists	• Transformation Strategy and EE Plan • Appointment of Intra-Mural Unit Deputy Directors • Diversity intervention initiatives/ programs • Succession planning
	Sustained leadership at EMC level	Pre-mature loss and lack of timely replacement of EMC members	• Policies and guidelines
	Refocus of the Intra-Mural domain	New emerging/re-emerging epidemics and pandemics Effect of climate change on health and increased prevalence of NCDs	• Realigned research focus • Increase capacity development funding aligned to the 20/21-24/25 Strategic Plan
	Inability to maintain and diversify funding	Failure to appropriately utilise available funding to generate future funding opportunities Grow funding opportunities from the private sector to be leverage	• Dedicated on-going investigation for further international and private sector funding opportunities

Strategic priorities	Significant risk category/context	Risk description	Key response measures
Support, through funding and other mechanisms, technology development and implementation, and innovations in health and technology delivery to improve health	Lack of further development and commercialization of (a) SAMRC-owned and (b) SAMRC-funded innovations	Limited funding for/value proposition of the innovation reducing interest from industry to commercialize or target market to implement the innovation	• IP and Commercialization Policy, Strategy and Procedures • External partnering to pursue commercialization opportunities
Build human capacity for the long-term sustainability of the South African health research	Limited research capacity in scarce skills	Further focus required in the development of research scientists to assist in growing the pool of South African HDI medical research scientist	• Capacity building strategy for supporting the development of HDI research scientist • Scholarship and bursary programs • Strategic relations with institutions for collaboration and accessing researchers to build clinical research capacity
	Funding scientific excellence and innovation	Risk of a poor oversight of the scientific review, i.e. project owners not understanding the science	• Implemented a quality review process for all externally funded projects • Scientific advisory committees established
Translate new knowledge into policies and practices to improve health	Ensuring knowledge translation	Risk of inconsistent funding decisions/ineffective project due diligence and limited dissemination through channels that are accessed by key stakeholders	• SAMRC strategic and business plans in place • Oversight and leadership support by executive team • Ongoing guidance and training on research translation

Internal control and assurance

The SAMRC has a comprehensive risk management and internal control system in place. The system is designed to identify and appropriately mitigate the emerging and significant risks of the business and ensure the accuracy and reliability of the SAMRC's financial reporting, while facilitating the delivery and sustainability of the strategic goals.

The Board acknowledge that they are ultimately responsible for the organisation's system of internal financial control and place considerable importance on maintaining a strong control environment. Key features of the SAMRC's financial reporting internal controls include:

- clearly defined delegations of authority and lines of accountability;
- policies and procedures governing financial resource management, financial reporting and key IT projects;
- assurance on key processes and audits as part of the internal audit coverage;
- an annual IT general control assessment conducted by the external auditors on the business applications which support the financial close process; and
- a detailed review by the Audit and Risk and IT Committee (ARIC) and the Board of the financial statements and disclosures within the annual report.

The ARIC is required to ensure that management has adequate controls in place over assets, risk and financial systems, and has systems to allow for timeous and accurate financial reporting that complies with all applicable requirements and legislation. The ARIC therefore plays a key role in the assurance process and effectiveness of risk management process at the SAMRC.

The Internal Audit function is a key element of the organisation's internal control environment and works closely with the ERM Unit. Its role is to provide assurance that the SAMRC's risk management and internal control systems are well designed and operate effectively and that any corrective action

is taken in a timely manner. Its audits cover internal controls and risk management processes relating to the financial and operational, as well as IT and compliance activities of the SAMRC. The outsourced Internal Audit function reports functionally to the ARIC and is overseen by the Internal Audit Charter, which set out the purpose, scope and authority of the Internal Audit function. Internal Audit has unrestricted access to the Chairperson of the ARIC and SAMRC President.

The work of Internal Audit focuses primarily on areas that present the greatest risk to the SAMRC. This is achieved by following a risk-based assurance approach, focus on the key risk exposure as approved by the Board. An Internal Audit Plan is prepared annually and set on a three-year rolling basis. Focus areas are determined and updated annually using a risk-based approach and ensuring the work is appropriately aligned to and coordinated with the activities of other relevant assurance providers.

The ARIC receives quarterly reports on progress against the Internal Audit Plan and corrective actions taken by management in response to internal audit findings. Based on the results of the planned audits and adhoc reviews undertaken during the financial year, it is concluded that the key internal financial controls were generally effective in all material aspects and reported findings did not expose the SAMRC to significant risk.

The Auditor-General South Africa (AGSA) is responsibility for expressing an opinion on the financial statements and to report on findings relating to the audit predetermined objectives, and material non-compliance with specific requirements in key applicable legislation. The AGSA is invited to all ARIC meetings and receives copies of all relevant papers and meeting minutes.

Business ethics and intergrity management

The SAMRC's commitment to high standards of business conduct and ethics is set out in the SAMRC's values and is supported by the Board approved Code of Business Conduct Framework Policy (Code). In this regard the SAMRC's commitment to the Code provides a framework of ethical practices and business conduct that are applicable to the Board, employees and external stakeholders, such as suppliers.

The Code is available to all employees on SAMRC's in-house intranet and to external stakeholders on the SAMRC external website. In an event where an employee breaches the provisions of the policy, this will be addressed in terms of the SAMRC's Employment Relations Policy.

The SAMRC has a zero tolerance for unethical business conduct, in particular fraud and corruption and is committed to fighting fraudulent behaviour at all levels of the organisation. The SAMRC Fraud Prevention Policy addresses fraud risk management both proactively and reactively, and the Fraud Prevention Plan developed includes a fraud strategy as one of the outputs of the plan. Internal controls, including our policies and procedures, also plays a critical role in fraud mitigation.

A key control within SAMRC's is an on-line whistle-blower hotline where staff can report fraudulent activities/incidents, knowledge of perceived and alleged irregular or unethical behaviour in a confidential and controlled environment anonymously. The webpage, 'Report fraudulent activities at the SAMRC', is available to all staff via the SAMRC Intranet home page.

Research integrity and ethical conduct

The SAMRC is commitment to foster research integrity at all levels and firmly supports research practices that reflect core values of respect, equity, transparency, scientific merit and integrity, benevolence, justice, beneficence and nonmaleficence. In addition, the SAMRC adheres to the minimum national benchmark of norms and standards for conducting responsible and ethical research set by the National Health Research Ethics Council (NHREC) and other applicable laws, regulations, policies, and practices. The SAMRC recognises the importance of Promotion of Access to Information Act (PAIA) and Protection OF Personal Information Act (POPIA). Any information pertaining to natural persons is processed in line with 8 conditions of lawful processing of personal information as outlined in POPIA. Furthermore, access to information held by the SAMRC can be accessed in line with the SAMRC PAIA manual which available on the SAMRC website.

The SAMRC has an established two research ethics committees, Human Research ethics committee (HREC) and Animal Research Ethics Committee (REC). During the last audit by the NHREC, the SAMRC received good feedback for well-functioning committees and well managed review-processes.

The SAMRC has key controls that promote responsible conduct of research such as ethics training that aims to influence the moral behaviour of individuals and to get researchers to collectively commit to conducting research within the lens of research integrity and ethical standards. In line with the SAMRC value of CITIZENSHIP, it has an accredited training programme in applied ethics which is offered to its own staff and external institutions nationally, including University of Venda, Northwest University and Durban University of Technology.

As a public entity and an institution that subscribes to openness, the SAMRC affords the public an opportunity to report any alleged research misconduct and/or breaches of research norms and standards. As such, the SAMRC invites all stakeholders who have knowledge of occurrence of a breach of research norms and standards or research misconduct to exercise their moral duties and ethics of responsibility to promptly report any reasonable suspicions.

SAMRC'S MATERIALITY AND SIGNIFICANCE FRAMEWORK: 2022/2023

The proposed Materiality and Significance Framework for the SAMRC, in terms of the Treasury Regulation 28.3.1 and the National Treasury Practice Note on Applications under of Section 54 of the Public Finance Management Act (PFMA), is as follows –

Section 50: Fiduciary duties of accounting authorities

1) The accounting authority for a public entity must –

PFMA Section	Quantitative [Amount]	Qualitative [Nature]
(c) on request, disclose to the executive authority responsible for that public entity or the legislature to which the public entity is accountable, all material facts, including those reasonably discoverable, which in any way may influence the decisions or action of the executive authority or that legislature;	Disclose all material facts.	The Board will disclose to the National Department of Health all material facts as requested and all material facts not requested, including those reasonably discoverable, which in any way may influence the decisions or action of the National Department of Health, at the discretion of the Board.

Section 51: General responsibilities of accounting authorities

1) An accounting authority for a public entity –

PFMA Section	Quantitative [Amount]	Qualitative [Nature]
(g) must promptly inform the National Treasury on any new entity which that public entity intends to establish or in the establishment of which it takes the initiative, and allow the National Treasury a reasonable time to submit its decision prior to formal establishment; and	Disclose all material facts timeously.	Full particulars to be disclosed to the Minister of Health for approval after which it is to be presented to Treasury.

Section 54: Information to be submitted by accounting authorities

2) Before a Public Entity concludes any of the following transactions, the Accounting Authority for the Public Entity must promptly and in writing inform the relevant Treasury of the transaction and submit relevant particulars of the transaction to its Executive Authority for approval of the transaction:

PFMA Section	Quantitative [Amount]	Qualitative [Nature]
a) establishment of a company;	Any proposed establishment of a legal entity.	Full particulars to be disclosed to the Minister of Health for approval and National Treasury for noting
b) participation in a **significant** partnership, trust, unincorporated joint venture or similar arrangement;	Qualifying transactions exceeds R15Mil (based on 1% – 2% guidance of total average SAMRC assets, as at 31 March 2021). This includes research collaborative arrangements	
c) acquisition or disposal of a **significant** shareholding in a company;	Greater than 20% of shareholding.	
d) acquisition or disposal of a **significant** asset;	Qualifying transactions exceeds R15Mil (based on 1% – 2% guidance of total average SAMRC assets, as at 31 March 2021). Including Financial Leases	Any asset that would increase or decrease the overall operational functions of the SAMRC, outside of the approved strategic plan and budget.
e) commencement or cessation of a **significant** business activity; and	Any activity not covered by the mandate/core business of the SAMRC and that exceeds the R15Mil transaction value (based on 1% – 2% guidance of total average SAMRC assets, as at 31 March 2021).	Full particulars to be disclosed to the Minister of Health and Minister of Finance (National Treasury) for approval (simultaneous submission).
f) a significant change in the nature or extent of its interest in a significant partnership, trust, unincorporated joint venture or similar arrangement.	Qualifying transactions exceeds R15Mil (based on 1% – 2% guidance of total SAMRC assets, as at 31 March 2021)	

Section 55: Annual report and financial statements

2) The annual report and financial statements referred to in subsection (1) (d) ("financial statements") must –

a) fairly present the state of affairs of the Public Entity, its business, its financial results, its performance against predetermined objectives and its financial position as at the end of the financial year concerned;

b) include particulars of –

PFMA Section	Quantitative [Amount]	Qualitative [Nature]
(i) any material losses through criminal conduct and any irregular expenditure and fruitless and wasteful expenditure that occurred during the financial year:	All instances	• Report quarterly to the Minister of Health. • Report annually in the Annual Financial Statements.
(ii) any criminal or disciplinary steps taken as a consequence of such losses or irregular expenditure or fruitless and wasteful expenditure;		
(iii) any losses recovered or written off;		
(iv) any financial assistance received from the state and commitments made by the state on its behalf; and		
(v) any other matters that may be prescribed.	All instances, as prescribed	

Section 56: Assignment of powers and duties by accounting authorities

PFMA Section	Quantitative [Amount]	Qualitative [Nature]
1) The accounting authority for a public entity may – (a) In writing delegate any of the powers entrusted or delegated to the accounting authority in terms of this Act, to an official in that public entity (b) Instruct an official in that public entity to perform any of the duties assigned to the accounting authority in terms of this Act.	Values excluded from the Delegation of Authority Framework Policy.	Instances that are excluded from the Delegation of Authority Framework Policy.
2) A delegation or instruction to an official in terms of subsection (1) – (c) Is subject to any limitations and conditions the accounting authority may impose; (d) May either be to a specific individual or to the holder of a specific post in the relevant public entity; and (e) Does not divest the accounting authority of the responsibility concerning the exercise of the delegated power or the performance of the assigned duty.	Values excluded from the Delegation of Authority Framework Policy.	Instances that are excluded from the Delegation of Authority Framework Policy.

Treasury Circulars and Guidelines related to Supply Chain Management

1) National Department of Health and National Treasury are to be notified of procurement transactions exceeding R15 Million;

2) Obtained prior written approval from National Treasury for variation amounts in excess of:

   a) 20% or R20 Million (including applicable taxes) for construction related orders; and

   b) 15% or R15 Million (including applicable taxes) for goods/service related orders

The materiality level mentioned above was calculated using the guidance practice note of the National Treasury. Using these guidance parameters below, the SAMRC materiality level calculation outcomes are as follows:

Element range	% to be applied against R value	Audited Value at 31 March 2021	Calculated Materiality and Significance Value
Total Assets (1%-2%)	1.63%	R922 076 642	R15 000 000

The SAMRC materiality and significance value will be R15 Million based on the percentage range of the total asset element and the significant fluctuations in the month-to-month total asset value. This is the most stable element, given the performance statement outcomes associated with the current economic climate challenges.

B-BBEE compliance performance information

The SAMRC 's compliance report in terms of section 13G(1) of the Broad Based Black Economic Empowerment (B-BBEE) Act, No. 46 of 2013 , read with section 12(1) of the B-BBEE Regulations of 2016 and B-BBEE Explanatory Notice 01 of 2018 is detailed below.

As contained int the annual report guide for Schedule 3A and 3C public entities, the SAMRC has applied the relevant code of Good Practice in the following manner

Criteria	Response (Yes/No)	Discussion
Determining qualification criteria for the issuing of licences, concessions or other authorisations in respect of economic activity in terms of any law?	No	Not applicable
Developing and implementing a preferential procurement policy?	Yes	SAMRC complies with the Preferential Procurement Regulations of 2017 & 2022
Determining qualification criteria for the sale of state-owned enterprises?	No	Not applicable
Developing criteria for entering into partnerships with the private sector?	No	Any public private partnerships (PPP) that SAMRC may enter into will be in line with the Treasury Regulations. However, SAMRC receives some funding from the private sector, and these funds do not constitute PPP
Determining criteria for the awarding of incentives, grants and investment schemes in support of Broad Based Black Economic Empowerment?	No	However, two of the indicators of Programme 4 address the issue of capacitating black/historically disadvantaged individuals

During the reporting period, SAMRC had submitted all the initial information required by the appointed independent economic empowerment rating agency to perform the audit. However, at the time of reporting, the SAMRC's B-BBEE certificate had expired, and the agency was yet to finalize the rating process before issuing a new certificate.

Procurement through other means

No	Project Description	Name of Supplier	Type of Procurement by Other means	Contract Number	Value of Contract
1	Qiagen Rneasy PowerSoil Total RNA Kit	The Scientic Group	Sole Source	SS4979	R2,182,700.00
2	MGI sequencing kits, reagents and equipment	NextGen Molecular Supplies PTY (LTD)	Sole Source	SS5988	R30,000,000.00
3	The procurement of Elsevier services (ScienceDirect Freedom Collection; The Lancet journals; Scopus and SciVal)	Elsevier B.V	Sole Source	SS855	R9,537,814.97
4	EbscoHost Databases	EBSCO Information Services	Sole Source	SS3971	R8,500,000.00

OTHER NOTABLE RELATIONSHIPS

National government departments who provide contract/grant funding to SAMRC

Dept of Science and Innovation
Dept of Social Development

Board members	Term start	Term end	Employed by universities who contract with SAMRC for grant income or collaborative research	Other entities	Board member	Director
Prof. J Mahlangu (Chairperson)	1 November 2019	Current	University of Witwatersrand			
Prof. B Biccard	1 November 2022	Current	University of Cape Town			
Prof. R Carolissen	1 November 2019	Current	University of Stellenbosch			
Prof. B Chiliza	1 November 2022	Current	University of KwaZulu- Natal			
Prof. C Dandara	1 November 2022	Current	University of Cape Town			
Ms. DT Dondur	1 November 2022	Current	None			
Adv. D Khosa	1 November 2019	Current	None			
Dr. M Madikizela	1 November 2019	Current	None			
Prof. Z Makatini	1 November 2022	Current	University of Witwatersrand			
Prof. LR Mathivha	1 November 2022	Current	University of Witwatersrand			
Prof. T Mavundla	1 November 2019	Current	University of South Africa			
Prof. M Moshabela	1 November 2022	Current	University of KwaZulu-Natal	Africa Health Research Insitute	√	
				CAPRISA	√	
				National Research Foundation	√	
Prof. E Mukwevho	1 November 2019	Current	North West University			
Associate Prof. T Naledi	1 November 2022	Current	University of Cape Town			
Prof. T Pillay	1 November 2022	Current	University of Pretoria			
Prof. WID Rae	1 November 2016	31 October 2022	None			
Prof. E Seekoe	1 November 2019	Current	University of Fort Hare			
Prof. B Shaw	1 November 2016	31 October 2022	None			

OTHER NOTABLE RELATIONSHIPS (CONTINUED)

Board members	Term start	Term end	Employed by universities who contract with SAMRC for grant income or collaborative research	Other entities	Board member	Director
Prof. L Skaal	1 November 2016	31 October 2022	University of Limpopo	Public Health Association of South Africa		√
Prof. T Sodi	1 November 2016	31 October 2022	University of Limpopo			
Dr. T Tucker	1 November 2019	Current	University of Cape Town			
Prof. S Velaphi	1 November 2016	31 October 2022	University of Witwatersrand			
Ms. J Williams	1 November 2019	31 October 2022	None			
Prof. L Zungu	1 November 2019	31 October 2022	University of South Africa			

Key management

	Position	Entity	Board member	Director	Other
Prof. G Gray	CEO/PRESIDENT	Wits Health Consortium			Researcher
		National Research Foundation	√		
		Hutchinson Centre Research Insititute of SA		√	
		HPCRISA		√	
		GARDP	√		
Mr. N Buick	Chief Financial Officer	None			
Ms. N. Bam	Executive Director: Human Capacity Development	None			
Prof. A Matthee	Executive Director: Transformation	None			
Dr M Mdhluli	Chief Research Operation Officer	None			
Prof M Mulder	Executive Director:	The Biologicals and Vaccine Institute of Southern Africa		√ till 31/03/22	
Adv. M Popo	Legal Counsel	None			
Prof. L Zulke	Vice President	None			

OTHER NOTABLE RELATIONSHIPS (CONTINUED)

SAMRC staff members who are directors of suppliers or debtors

Staff member	Entity	Director
Dr. R Maharaj	Lumbombo Spatial Development Initiative 2	√

	2023				2022			
	Trade receivables	Trade payables	Deferred income	Commit-ments	Trade receivables	Trade payables	Deferred income	Commit-ments
Dept. of Science and Innovation (DSI)	–	–	192 350 052	–	–	–	138 386 539	–
African Health Research Institute	–	1 725 000	–	–	–	–	–	–
Caprisa	624 127	–	–	–	–	–	–	–
GARDP	1 346 200	–	–	–	1 719 350	–	–	–
Lubombo Spatial development	–	–	–	–	1 111 371	–	–	–
National Research Foundation	–	1 340 000	3 288 920	–	–	–	3 666 427	–
North West University	–	722 615	–	–	–	575 000	–	–
Public Health Association of South Africa	–	–	748 108	–	–	–	–	–
Tertiary Education and Research Network of South Africa	–	–	–	–	–	264 308	–	–
University of Cape Town	394 892	18 600 911	395 073	–	124 655	26 721 252	265 444	600
UCT Lung Institute	–	373 842	–	–	–	–	–	–
University of Fort Hare	906 216	350 000	–	–	–	–	–	–
University of Kwazulu-Natal	12 200	1 673 410	–	–	–	–	–	–
University of Limpopo	–	–	–	–		–	–	–
University of Pretoria	–	3 156 467	–	–	–	645 294	1 754 717	–
University of Stellenbosch	1 089 271	1 803 583	–	–	294 067	1 706 072	–	–
University of South Africa	–	–	–	–	20 287	230 000	–	–
University of Witwatersrand	–	8 336 511	17 378	–	–	7 171 913	117 330	–
WITS Health Consortium	679 871	15 883 304	–	–	500 148	27 085 652	–	–
	5 052 777	**53 965 643**	**196 799 531**	**-**	**3 769 878**	**64 399 491**	**144 190 457**	**600**

OTHER NOTABLE RELATIONSHIPS (CONTINUED)

Revenue	2023	2022
Dept. of Science and Innovation (DSI)	188 162 351	183 443 155
Dept. of Social Development	287 500	218 500
CAPRISA	624 127	-
GARDP	7 109 171	1 719 350
Lubombo Spatial development	1 707 783	1 341 203
National Research Foundation	6 726 731	5 200 508
North West University	104 153	39 652
University of Cape Town	1 798 423	2 012 045
UCT Lung Institute	120 000	-
University of Fort Hare	788 014	9 913
University of KwaZulu- Natal	12 200	-
University of Limpopo	233 709	349 544
University of Pretoria	69 283	2 478
Univeristy of South Africa	343 498	929 255
University of Stellenbosch	7 350 088	4 835 994
University of Witwatersrand	215 130	436 087
WITS Health Consortium	1 761 585	4 039 211
	217 413 746	**204 576 895**

Expenditure such as grants awarded, extra-mural unit grants and collaborative research grants incurred with notable parties	2023	2022
African Health Research Institute	3 683 907	-
CAPRISA	5 724 903	-
DNDI GARDP	-	3 882 609
Hutchinson Centre	13 039 291	5 097 081
National Research Foundation (NRF)	1 540 000	1 340 000
North West University	4 800 451	3 893 770
PHASA	-	227 513
Sefako University	-	1 000 000
The Biologicals and Vaccine	-	225 000
University of Cape Town	87 289 327	66 097 129
University of Fort Hare	2 545 285	4 186 656
University of KwaZulu-Natal	6 863 903	-
University of Limpopo	13 011 496	12 694 937
University of Pretoria	8 118 065	10 077 989
University of South Africa	4 422 271	5 751 637
University of Stellenbosch	52 229 767	36 080 348
Univ of Witwatersrand	22 761 735	25 595 641
Univ of Zululand	500 000	1 356 261
Wits Health Consortium	80 162 944	126 344 965
	306 693 345,00	**303 851 536**

IRREGULAR EXPENDITURE REPORT

Description	2022/2023 R'000	2021/2022 R'000
Opening balance	0.00	0.00
Add: Irregular expenditure confirmed	0.00	0.00
Less: Irregular expenditure condoned	0.00	0.00
Less: Irregular expenditure not condoned and removed	0.00	0.00
Less: Irregular expenditure recoverable	0.00	0.00
Less: Irregular expenditure not recovered and written off	0.00	0.00
Closing balance	0.00	0.00
Irregular expenditure that was under assessment	0.00	0.00
Irregular expenditure that relates to 2021/2022 and identified in 2022/2023	0.00	0.00
Irregular expenditure incurred	0.00	0.00
Total	**0.00**	**0.00**

Details of current and previous year irregular expenditure

Description	2022/2023 R'000	2021/2022 R'000
Irregular expenditure that was under assessment	0.00	0.00
Irregular expenditure under determination	0.00	0.00
Irregular expenditure under investigation	0.00	0.00
Total	**0.00**	**0.00**

Details of current and previous year irregular expenditure condoned

Description	2022/2023 R'000	2021/2022 R'000
Irregular expenditure condoned	0.00	0.00
Total	**0.00**	**0.00**

Details of current and previous year irregular expenditure removed – (not condoned)

Description	2022/2023 R'000	2021/2022 R'000
Irregular expenditure not condoned and removed	0.00	0.00
Total	**0.00**	**0.00**

Details of current and previous year irregular expenditure recovered

Description	2022/2023 R'000	2021/2022 R'000
Irregular expenditure recovered	0.00	0.00
Total	**0.00**	**0.00**

Details of current and previous year irregular expenditure written off (irrecoverable)

Description	2022/2023 R'000	2021/2022 R'000
Irregular expenditure written off	0.00	0.00
Total	**0.00**	**0.00**

Details of non-compliance cases where an institution is involved in an inter institutional arrangement (where such institution is not responsible for the non-compliance)

Description	2022/2023	2021/2022
N/A	0.00	0.00
N/A	0.00	0.00
N/A	0.00	0.00
N/A	0.00	0.00
Total	**0.00**	**0.00**

Details of non compliance cases where an institution is involved in an inter institutional arrangement (where such institution is responsible for the non compliance)

Description	2022/2023 R'000	2021/2022 R'000
N/A	0.00	0.00
N/A	0.00	0.00
N/A	0.00	0.00
N/A	0.00	0.00
Total	**0.00**	**0.00**

Details of current and previous year disciplinary or criminal steps taken as a result of irregular expenditure

There were no disciplinary or criminal steps taken during 2021/2022 and 2022/2023 financial year due to irregular expenditure.

RECONCILIATION OF FRUITLESS AND WASTEFUL EXPENDITURE

Fruitless and Wasteful Expenditure (FWE)

Reconciliation of fruitless and wasteful expenditure

Description	2022/2023 R'000	2021/2022 R'000
Opening balance	2	1
Add: Fruitless and wasteful expenditure confirmed	4	19
Less: Fruitless and wasteful expenditure written off	-3	-18
Less: Fruitless and wasteful expenditure recoverable	-3	0
Closing balance	**0**	**2**

Reconciling notes

Description	2022/2023 R'000	2021/2022 R'000
Fruitless and wasteful expenditure that was under assessment	0	0
Fruitless and wasteful expenditure that relates to 2021/2022 and identified in 2022/2023	0	0
Fruitless and wasteful expenditure for the current year	4	0
Total	**4**	**0**

Details of current and previous year Fruitless and wasteful expenditure

Description	2022/2023 R'000	2021/2022 R'000
Fruitless and wasteful expenditure under assessment	0	0 -
Fruitless and wasteful expenditure under determination	0	0
Fruitless and wasteful expenditure under investigation	3	0
Total	**3**	**0 -**

Description	2022/2023 R'000	2021/2022 R'000
Fruitless and wasteful expenditure recovered	3	0
Total	**3**	**0**

Description	2022/2023 R'000	2021/2022 R'000
Fruitless and wasteful expenditure written off	3	18
Total	**3**	**18**

Details of current and previous year disciplinary or criminal steps taken because of fruitless and wasteful expenditure

No disciplinary or criminal steps have been taken for the current and previous year.

PART D:
HUMAN RESOURCES MANAGEMENT

SAMRC ORGANOGRAM

The SAMRC Act No. 58 of 1991 mandates the Board to designate an Executive Management Committee, consisting of the President and other members who are employees of the SAMRC. The SAMRC Board has, in line with the SAMRC Act, appointed Professor Glenda Gray as the Chief Executive Officer of the SAMRC, and she occupies the post of President of the SAMRC. The President is the chairperson of the Executive Management Committee (EMC), and together with other members of the EMC designated by – and under directives and control of the Board, are responsible for the management of the affairs of the SAMRC in accordance with the objects and policies of the SAMRC. The President and EMC members reports on affairs of the SAMRC to the Board as may be required from time-to-time. Members of the EMC and their portfolios are indicated in the diagram below.

Executive Management Committee

Prof Glenda Gray

SAMRC President & CEO

Prof Liesl Zűhlke

Vice President Extramural Research & Internal Portfolio

Dr Mongezi Mdhluli

Chief Research Operations Officer

Dr Michelle Mulder

Executive Director: Grants, Innovation And Product Development

Ms Ntoza Bam

Executive Director: Human Resources

Mr Nick Buick

Chief Financial Officer

Mr Mzimhle Popo

General Counsel

Prof Angela Mathee

Executive Director: Transformation

Executive summary

In the emerging age of wisdom and digitised 21st century, SAMRC delivers impactful science through its people, to serve as a national asset to support existing and new research areas, initiatives and capacity development in the health research and innovation arena in line with the SAMRC mandate.

To this end, human capital-enhancing HR strategy adds value in developing resilience in the SAMRC's most important asset, its people. The integrated Talent Management Framework recently adopted by SAMRC coherently and holistically spearheads transformation and capacity building.

Figure 1 below depicts SAMRC's Integrated Talent Management Framework. The Human Resources Directorate has made significant strides in organically integrating and operationalising the key components of the framework.

Figure 1: Integrated Talent Management Framework of SAMRC

The framework aims to enhance and embed a talent-driven culture that promotes a conducive and supportive working environment through a range of HR activities associated with attracting, appointing, developing, and retaining employees for the purposes of optimising the performance of the SAMRC, while transforming the equity profile to reflect the demographics of the country. The success of this approach is dependent on HR strategically partnering with SAMRC community and proactive management of talent data.

Below outlines progress achieved, during the reporting period, in terms of embedding the integrated talent management posture:

People/workforce planning

SAMRC, in its quest to plan for fit-for-purpose workforce, embarked on a process of analysing, forecasting, and planning employee supply and demand, assessing gaps, and determining target talent management interventions to ensure that the SAMRC has the right people – with the right skills in the right places at the right time – to fulfil its mandate and strategic objectives.

To this end, the Scarce and Critical Skills (SCS) list committee was established by the Executive Management Committee (EMC). The process entailed HR facilitating sessions with key stakeholders, including considering the updated National Scarce Skills List provided by the Department of Labour (Aug 2022).

In addition, a Joint Consultative Employment Equity and Skills Development Committee was reviewed, and new terms of reference and a critical governance structure have been put in place to ensure achievement of employment equity targets and staff development. The outcomes and goals set by this structure will further inform the cascading and implementation of people/workforce planning initiatives within Units and Divisions of the SAMRC.

Recruitment and Selection Policy was reviewed during the reporting period, to ensure alignment with the integrated talent management framework and more specifically, implementation of the people/workforce planning within SAMRC that promotes a three-pronged approach:

i) Generic recruitment, which is mainly concerned with filling immediate vacancies, ensuring operational efficiencies and effectiveness.

ii) Talent Acquisition, which is consistent with the collective set of customised and tailored talent acquisition strategies and tactics. This process focuses on acquiring critical and/or scarce skills (including executive roles) in alignment with the SAMRC's strategic goals, regardless of immediate vacancies. It prioritises internal mobility and potential.

iii) Transformation, to ensure that everyone enjoys equal opportunity and fair treatment in the workplace.

Competency frameworks

A competency framework sets out the types of behaviours (behavioural indicators) one would expect to see in successful performance in different types and levels of jobs. Such a framework provides a common language or understanding of the behaviours required. A competency is an ability, skill, attitude, attribute, trait, or behaviour that is needed for the successful performance of a job. It is most often described as a behaviour, or 'how' the person does the job.

This is work in progress, as part of the first phase of implementation, a review and consideration of various data sets in the SAMRC were assessed to develop an initial competency framework document for further input from key stakeholders. The SAMRC competency framework includes:

Core Competencies	Required by all staff at all levels in the organisation. This set of competencies is informed by the mission, vision and strategic goals of SAMRC; the feedback of the Culture Survey conducted in 2022; together with current best practice in a world of work characterised by volatility, uncertainty, complexity and ambiguity.
Leadership Competencies	Required by staff in formal leadership positions, as well as those informally leading their circle of influence. The set of competencies that hold the leadership lens of the SAMRC.
Functional Competencies	Also known as the technical competencies generically required within the various job families and career streams of the SAMRC.
Behavioural Competencies	Required to enable or support job performance, drawn from the approved career streams, Individual Development Plans, together with the feedback of the Culture Survey conducted in 2022.

These competencies will be required in varying combinations, at differing levels, for various jobs at SAMRC. During the next phase of competency framework implementation, these competencies will be the starting point for a conversation around expected levels of performance. The demonstration of these competencies will be necessary for a staff member to be deemed performing the job at the required standard. However, these descriptors will not be used as rigid and absolute performance measures, but rather as generic guidelines for what effective performance would look like.

Performance engagement and development

An inclusive approach during the 2022/23 performance cycle was adopted through HR facilitating workshops with all staff to enhance the performance management process, while identifying areas of improvement. Moreover, the outcome of these workshops allowed an opportunity to review and co-create the philosophy of the SAMRC that encourages a culture of continuous performance engagement and development.

Capacity building – learning and development

Staff development and support remains a priority for the SAMRC. This was evident in the 2022 Culture Survey as staff across the organisation identified it as top value and behaviour they experience within the SAMRC. This strength is optimised to embed the integrated talent management framework and support individual, team, and organisational performance. In addition to the study support of formal qualifications and programmes, various modalities and tools were enhanced and/or introduced during the reporting period, including:

Competency assessment for development

While competency assessment for development purposes formed an integral part of the recruitment process of senior leadership appointments, the strategic management of the feedback to successfully appointed candidates was reviewed and strengthened during the reporting period, as the basis to identify individualised areas for development and customised support plans. This value-add assessment is planned to be rolled out in other occupational levels to enhance staff development initiatives.

Communities of Practice (CoP)

Communities of Practice (CoP) were identified as a strategic lever to pull to facilitate staff engagements in a process of collective learning in the shared domain of interest. A CoP for SAMRC Deputy Directors was convened during the reporting period. This CoP is the first for many staff in pursuing career development and optimising institutional knowledge for superior performance. The CoP approach open spaces for SAMRC communities to engage in joint activities and discussions, problem solving and information sharing. Members of the first CoP value their collective competence and regard it as an opportunity to build relationships that will enable them to learn from each other.

Customised Management Development Programme (MDP)

A customised Management Development Programme (MDP) in partnership with the Stellenbosch Business School was introduced as a pilot during the reporting period. The strategic objective of the customised approach is to develop and support the required SAMRC management and leadership skill set and citizenship to lead teams to high performance. The cohort of this programme include twenty-five middle leaders across the SAMRC career streams, including deputy directors, managers, coordinators, supervisors, project, and team leaders, who are responsible for leading, supervising, managing their teams and supporting research.

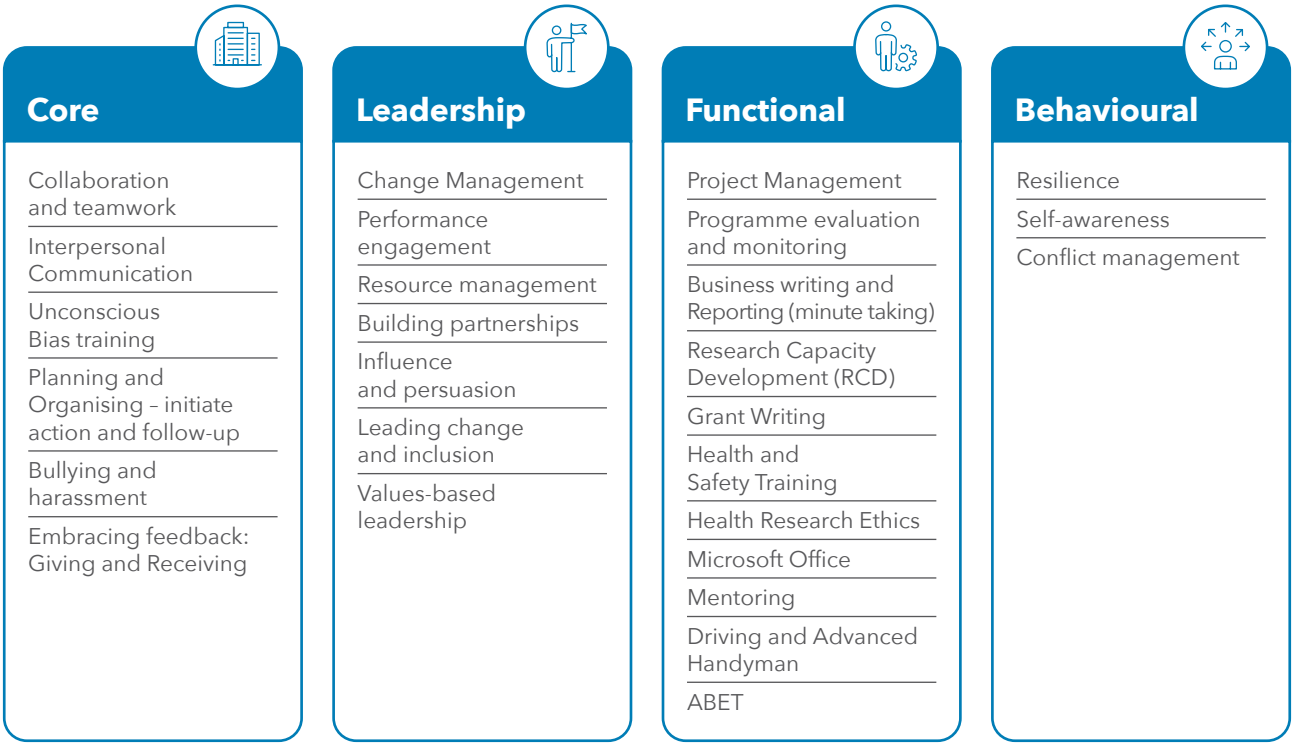
The customised MDP aims to:

- Re-enforce the need for managers to ensure that they do not perform their management roles in isolation and encourage collaboration.
- Encourage a heightened sense of curiosity and a willingness to drive a culture of innovation, learning, and continuous improvement.
- Promote diversity and employee engagement through an improved understanding of leadership and organisational policies/practices.
- Enable active career management support.
- Allow SAMRC management level to feed into the leadership succession pipeline.

Centralised Training and Development Manual

A centralised approach to strengthen the initiatives to develop and support staff in a coherent manner to realise return on investment. An initial Training and Development Manual was completed, with the aim to implement during the next performance cycle 2023/24. Again, various data sets were considered to compile the first draft of the manual, including the vision and mission of the SAMRC; the Annual Performance Plan goals; the 2022 Culture Survey; current best practice; together with an assessment of individual development plans.

A snapshot of the centralised training and development manual, which is informed by the Competency Framework of SAMRC includes, but not limited to the following topics:



The review and continuous update of the centralised training manual will be required in the next performance cycle.

Coaching

Both individual and team coaching continued as a strategic intervention to achieve the goals and objectives of the SAMRC. While the coaching approach adopted by the SAMRC aims to ensure higher levels of self-awareness, the approach further enabled teams to identify and co-create initiatives and actions for high performance.

Career progression and succession planning

Career progression and succession planning structures are fundamental for the integrated talent management approach of the SAMRC to ensure the career streams and talent pipelines are appropriately maintained to achieve the strategic goals and objectives of the organisation. While career progression and advancement require staff to actively manage their personal development by developing competencies that lead to career growth, succession planning is concerned with ensuring that the organisation has continuity and mitigates the risk of losing key talent without a suitable talent pool. A suitable talent pool is created by proactively acquiring talent within qualified, competent, experienced, and motivated staff. Talent pools contribute to the achievement of SAMRC Employment Equity Plan.

As a first step, the workforce data have been assessed and considered during the reporting period. This includes an assessment of staff that will retire in the next five years, those eligible for early retirement, the scarce and critical skills of the SAMRC, together with those positions occupied by foreign nationals. The use of talent analytics helps to identify appropriate talent acquisition strategies while tracking progress and developing suitably qualified talent pools.

Enabling organisational culture

A values-based Culture Survey was successfully implemented during the reporting period – with more than 500 responses, including permanent and contract staff, brought the participation rate to 60%. The high participation rate can be attributed to the comprehensive awareness campaign that preceded the launch of the survey, to clarify the purpose and process of the survey. This comprehensive awareness phase was an important change management intervention to ensure proper understanding of the survey parameters to create, amongst other things, fertile ground for sharing the results.

It was important to ensure that the implementation of the survey was inclusive, thus paper-based questionnaires were administered for staff members with limited access to e-mail or online platforms. The questionnaire was made available in four official languages – English, isiXhosa, isiZulu, and Afrikaans, while translators were available to attend to any further questions. The data was then synthesized and analysed by an external service provider. The decision to outsource the survey was primarily to guarantee confidentiality. Data reports were shared and not individual response, to understand the views and experiences through the diverse lenses, including identities and roles in the SAMRC.

The SAMRC appreciates that building community takes thoughtful care and work by all staff. One of the most important tasks is listening to the experiences of others. Therefore, as a critical step, the EMC set time aside to immerse themselves in the results. The process of sharing and unpacking the survey narrative, while co-creating the initiatives and actions for change, commenced during the reporting period.

As an organisation, we recognise the respective strengths and challenges in units and departments will require a customised approach to support the experiences, unique context, and complexities in our environment. Units and divisions are therefore required to review the results and agree on individualized action plans to help monitor and track progress. The outcomes of the 2022 culture survey will serve as baseline data for re-assessment as we embrace our journey of culture change and transformation.

Th enabling organisational culture is further underpinned by enhancing the health promotion of the SAMRC Employee Wellness Programme. The SAMRC appointed two service providers namely, ICAS and Alexander Forbes. The appointment of these two service providers creates an opportunity for the delivery of substantially more services to our employees, and serve as proactive employee wellness interventions. The Service Providers submit regular reports with statistics, observations, and trends to monitor and evaluate the impact of employee wellness programme on staff across all regions. This helps the SAMRC to determine focus areas and assist staff with wellness issues where it is needed the most. This is furthermore supported by promotion of the programme through information sessions and training.

HUMAN RESOURCE STATISTICS

Remuneration

The SAMRC provides a total cost to company package. Tables 1A, 1B and 1C below summarise the personnel expenditure related to guaranteed remuneration packages. Table 1D below summarises the allowances (non-guaranteed) that were paid to employees during the reporting period. Table 2A summarises personnel expenditure for overtime work.

Table 1 A: Personnel expenditure by Occupational Category, 2021/22 (excluding personnel highlighted in tables 1 B and 1 C)

Public Sector Salary levels	SAMRC Equivalent Occupational Category	Personnel expenditure (R)	Personnel expenditure (%)	No of posts filled	Average remuneration expenditure per employee (R)
Lower skilled (Levels 1-2)	Unskilled and defined decision making (Paterson A)	4,814,573.92	1.1	36	133,738.16
Skilled (Level 3-5)	Semi-skilled & discretionary decision making (Paterson B)	25,916,750.46	5.9	126	205,688.50
Highly skilled production (levels 6-8)	Skilled technical & academically qualified (Paterson C)	120,197,907.52	27.4	289	415,909.71
Highly skilled supervision (Levels 9-12)	Professionally qualified & specialists (Paterson D)	186,516,654.06	42.6	207	901,046.64
Senior Management (Levels 13-16)	Senior and Top Management (Paterson E & F)	100,793,156.84	23.0	60	1,679,885.95
Total		**438,239,042.80**	**100**	**718**	**3,336,268.96**

Table 1 B: Personnel expenditure for Postdocs, Interns, European and Developing Countries Clinical Trials Partnership (EDCTP) and Post retirement contracts 2022/23

Function/area/status	Personnel expenditure (R)	Personnel expenditure (%)	No of employees	Average remuneration expenditure per employee (R)
Postdocs/Interns	8,673,562.30	39.3	35	247,816.07
European and Developing Countries Clinical Trials Partnership (EDCTP)	6,329,056.90	28.6	5	1,265,811.38
Post retirement contracts	7,096,852.84	32.1	7	1,013,836.12
Total	**22,099,472.04**	**100**	**47**	**2,527,463.57**

Table 1 C: Personnel expenditure for Temporary employees, 2021/22

Temporary employees	Personnel expenditure (R)
Total	**24,336,010.57**

Table 1 D: Personnel expenditure: Allowances 2022/23

	Total (R)
Allowances	3,670,889.74

Table 2 A: Personnel expenditure: Overtime by Occupational Category, 2021/22

Public Sector Salary levels	SAMRC Equivalent Occupational Category	Overtime	
		Amount (R)	Overtime as a % of personnel expenditure
Lower skilled (Levels 1-2)	Unskilled and defined decision making (Paterson A)	10,522.86	0.8
Skilled (Level 3-5)	Semi-skilled & discretionary decision making (Paterson B)	381,807.26	30.3
Highly skilled production (levels 6-8)	Skilled technical & academically qualified (Paterson C)	606,242.14	48.1
Highly skilled supervision (Levels 9-12)	Professionally qualified & specialists (Paterson D)	233,959.28	18.6
Senior Management (Levels 13-16)	Senior and Top Management (Paterson E & F)	27,387.92	2.2
Total		**1,259,919.46**	**100.00**

Employment

Table 3: Employment and vacancies by occupational categories as at 31 March 2023 (includes permanent and contract staff)

Public Sector Salary levels	SAMRC Equivalent Occupational Category	Number of posts	Number of posts filled	No of Vacant posts	Vacancy rate (%) (No of vacant posts/no of posts x 100)
Lower skilled (Levels 1-2)	Unskilled and defined decision making (Paterson A)	38	36	2	5.3
Skilled (Levels 3-5)	Semi-skilled & discretionary decision making (Paterson B)	127	126	1	0.8
Highly skilled production (Levels 6-8)	Skilled technical & academically qualified (Paterson C)	297	289	8	2.7
Highly skilled supervision (Levels 9-12)	Professionally qualified & specialists (Paterson D)	216	207	9	4.2
Senior Management (Levels 13-16)	Senior and Top Management (Paterson E & F)	66	60	6	9.1
Total		**744**	**718**	**26**	**3.5**

Employment equity

Table 4 A: Total number of employees (including employees with disabilities) in each of the following occupational levels as at 31 March 2023

Occupational Levels	Male				Female				Foreign Nationals		Total
	African	Coloured	Indian	White	African	Coloured	Indian	White	Male	Female	
Top Management	2	0	0	1	1	2	0	2	0	0	8
Senior Management	3	6	3	9	5	5	6	10	3	2	52
Professionally qualified and experienced specialists and mid-management	20	11	7	3	56	38	27	26	6	13	207
Skilled technical and academically qualified workers, junior management, supervisors, foremen, and superintendents	45	21	10	2	135	43	27	5	1	0	289
Semi-skilled and discretionary decision making	43	10	1	0	60	9	2	1	0	0	126
Unskilled and defined decision making	9	1	0	0	16	10	0	0	0	0	36
Total	**122**	**49**	**21**	**15**	**273**	**107**	**62**	**44**	**10**	**15**	**718**

Table 4 B: Total number of employees with disabilities only as at 31 March 2023

Occupational Levels	Male				Female				Foreign Nationals		Total
	African	Coloured	Indian	White	African	Coloured	Indian	White	Male	Female	
Top Management	0	0	0	0	0	0	0	0	0	0	0
Senior Management	0	1	0	2	0	0	0	0	0	0	3
Professionally qualified and experienced specialists and mid-management	0	0	0	0	0	0	2	2	0	0	4
Skilled technical and academically qualified workers, junior management, supervisors, foremen, and superintendents	0	0	0	0	0	0	0	0	0	0	0
Semi-skilled and discretionary decision making	0	0	0	0	1	0	0	0	0	0	1
Unskilled and defined decision making	0	0	0	0	0	1	0	0	0	0	1
Total	**0**	**1**	**0**	**2**	**1**	**1**	**2**	**2**	**0**	**0**	**9**

Note: 2 Disabled employees appointed during this reporting period (1 Coloured male appointed at Senior Management Level and 1 White female appointed at Professional level). Our recruitment process encourages people with disabilities to apply and staff in the employ are requested to declare their disabilities, some of which may not be obviously visible or physical.

Table 5: Recruitment (new recruits), 1 April 2022 to 31 March 2023

Occupational Level	Male				Female				Foreign Nationals		Total
	African	Coloured	Indian	White	African	Coloured	Indian	White	Male	Female	
Top Management	0	0	0	0	0	0	0	0	0	0	0
Senior Management	1	1	0	0	0	0	0	0	0	0	2
Professionally qualified and experienced specialists and mid-management	5	0	0	0	15	5	3	4	0	0	32
Skilled technical and academically qualified workers, junior management, supervisors, foreman and superintendents	14	0	1		32	5	3	2	0	0	57
Semi-skilled and discretionary decision making	20	1	0	0	31	2	1	0	0	0	55
Unskilled and defined decision making	1	0	0	0	1	1	0	0	0	0	3
Total	**41**	**2**	**1**	**0**	**79**	**13**	**7**	**6**	**0**	**0**	**149**

Note: The table above excludes postdocs, interns and EDCTP.

Career progression and advancement

Table 6: Career Progression and Advancement by race and gender, 1 April 2022 to 31 March 2023

Occupational Category	Male				Female				Foreign National		Total
	African	Coloured	Indian	White	African	Coloured	Indian	White	Male	Female	
Lower skilled (Levels 1-2) – Pat A	1	1	0	0	0	0	0	0	0	0	2
Skilled (Levels 3-5) – Pat B	2	0	0	0	0	0	0	0	0	0	2
Highly skilled production – Pat C (Levels 6-8)	1	1	0	0	5	2	0	0	0	0	9
Highly skilled supervision (Levels 9-12) – Pat D	0	1	1	0	3	3	5	1	0	3	17
Senior Management – Pat E & F	1	0	0	0	1	2	1	0	0	0	5
Total	**5**	**3**	**1**	**0**	**9**	**7**	**6**	**1**	**0**	**3**	**35**

Job evaluation

Table 7: Job evaluation, 1 April 2022 to 31 March 2023

Public Sector Salary levels	SAMRC Equivalent Occupational Category	Number of posts filled	Number of posts evaluated	% of posts evaluated by salary levels	Posts evaluated	
					Number	% of total posts evaluated
Lower skilled (Levels 1-2)	Unskilled and defined decision making (Paterson A)	36	0	0.0	0	0.0
Skilled (Levels 3-5)	Semi-skilled & discretionary decision making (Paterson B)	126	0	0.0	0	0.0
Highly skilled production (Levels 6-8)	Skilled technical & academically qualified (Paterson C)	289	17	5.0	17	54.8
Highly skilled supervision (Levels 9-12)	Professionally qualified and specialists (Paterson D)	207	10	4.8	10	32.3
Senior management	Senior and Top Management (Paterson E & F)	60	4	6.0	4	12.9
Total		**718**	**31**	**4.3**	**31**	**100**

Note: Posts were evaluated for recruitment purposes and Career Advancement for 2022/23.

Employee exits

Table 8 A: Exits by race, gender, and occupational level (including people with disabilities), 1 April 2022 to 31 March 2023

	Male				Female				Foreign National		Total
Occupational Level	African	Coloured	Indian	White	African	Coloured	Indian	White	Male	Female	
Top Management	0	0	0	0	0	0	0	0	0	0	0
Senior Management	0	0	1	0	0	0	0	0	1	1	3
Professionally qualified and experienced specialists and mid-management	6	0	0	0	10	0	3	5	0	3	27
Skilled technical and academically qualified workers, junior management, supervisors, foreman and superintendents	10	3	0	0	23	5	8	0	0	0	49
Semi-skilled and discretionary decision making	12	1	1	0	12	0	1	0	0	0	27
Unskilled and defined decision making	1	1	0	0	0	1	0	0	0	0	3
Total	**29**	**5**	**2**	**0**	**45**	**6**	**12**	**5**	**1**	**4**	**109**

Table 8 B: Reasons why staff are leaving the organisation, 1 April 2022 to 31 March 2023

Termination type	Number of terminations	% of total terminations
Death	3	2.7
Resignation	63	57.8
Expiry of contract	29	26.6
Retrenchment – operational requirements	0	0.0
Dismissal: Misconduct	5	4.6
Poor performance	0	0.0
Discharged due to ill-health	0	0.0
Retirement	9	8.3
Transfers to tertiary institution	0	0.0
Total	**109**	**100.0**
Total number of employees who left as a % of the total employment. **Formula used: terminations/total no of employees x 100 = turnover rate (%) for organisation**		15.2
Total number of employees who left excluding natural end of contract as a % of the total employment. **Formula used: terminations/total no of employees x 100 = turnover rate (%) for organisation**		11.1

Learning and development

This section highlights the strides made by the organisation to improve the development of skills.

Table 9 A: Training needs identified, 1 April 2022 to 31 March 2023 (WSP)

Occupational Category	Gender	Number of employees as at 1 April 2022	Training needs identified at start of reporting period			
			Learnerships	Skills programmes & other short courses	Other forms of training	Total
Legislators, senior officials, and managers	Female	32	0	9	11	20
	Male	27	0	4	0	4
Professionals	Female	147	0	30	3	33
	Male	44	0	9	3	12
Technicians and associate professionals	Female	205	0	27	27	54
	Male	78	0	6	1	7
Clerks	Female	59	0	7	0	7
	Male	53	0	8	0	8
Service and sales workers	Female	0	0	0	0	0
	Male	0	0	0	0	0
Skilled agriculture and fishery workers	Female	0	0	0	0	0
	Male	0	0	0	0	0
Craft and related trades workers	Female	0	0	0	0	0
	Male	0	0	0	0	0
Plant and machine operators and assemblers	Female	0	0	0	0	0
	Male	0	0	0	0	0
Elementary occupations	Female	24	0	0	2	2
	Male	12	0	1	1	2
Sub Total	Female	467	0	73	43	116
	Male	214	0	28	5	33
Total		**681**	**0**	**101**	**48**	**149**

Table 9 B: Training provided – number of interventions,
1 April 2022 to 31 March 2023 (ATR)

Occupational Category	Gender	Number of employees as at 01 April 2022	Training provided within the reporting period			
			Learnerships	Skills programmes & other short courses	Other forms of training	Total
Legislators, senior officials and managers	Female	32	0	4	4	8
	Male	27	0	4	0	4
Professionals	Female	147	0	66	86	152
	Male	44	0	14	16	30
Technicians and associate professionals	Female	205	0	77	376	453
	Male	78	0	32	122	154
Clerks	Female	59	0	15	18	33
	Male	53	0	11	11	22
Service and sales workers	Female	0	0	0	0	0
	Male	0	0	0	0	0
Skilled agriculture and fishery workers	Female	0	0	0	0	0
	Male	0	0	0	0	0
Craft and related trades workers	Female	0	0	0	0	0
	Male	0	0	0	0	0
Plant and machine operators and assemblers	Female	0	0	0	0	0
	Male	0	0	0	0	0
Elementary occupations	Female	24	0	1	4	5
	Male	12	0	3	2	5
Sub Total	Female	467	0	163	488	651
	Male	214	0	64	151	215
Total		**681**	**0**	**227**	**639**	**866**

Table 9 C: Skills development, the number of staff (including people with disabilities) who are in receipt of SAMRC study support and training, 1 April 2022 to 31 March 2023

	Male				Female				
Occupational Levels	African	Coloured	Indian	White	African	Coloured	Indian	White	Total
Top management	0	0	0	0	0	0	0	0	0
Senior management	3	1	0	1	2	2	1	1	11
Professionally qualified and experienced specialists and mid-management	9	2	2	1	20	6	18	7	65
Skilled technical and academically qualified workers, junior management, supervisors, foremen, and superintendents	33	4	1	0	91	3	20	2	154
Semi-skilled and discretionary decision making	27	1	0	0	11	1	0	0	40
Unskilled and defined decision making	2	1	0	0	3	4	0	0	10
Total	**74**	**9**	**3**	**2**	**127**	**16**	**39**	**10**	**280**

Table 9 D: Customised Management Development Programme implement as pilot, 1 April 2022 to 31 March 2023

	Male				Female				
Career Streams	African	Coloured	Indian	White	African	Coloured	Indian	White	Total
Science	4	0	0	0	1	4	1	0	10
Research Management and Support – including GIPD	1	0	0	0	6	0	1	0	8
Corporate Support	1	1	0	1	1	2	0	1	7
Total	**6**	**1**	**0**	**1**	**8**	**6**	**2**	**1**	**25**

Performance rewards

Table 10: Performance Bonuses by Occupational Category, 1 April 2022 to 31 March 2023

Public Sector Salary levels	SAMRC Equivalent Occupational Category	Beneficiary profile			Expenditure		
		Number of beneficiaries	Number of posts filled	% Of total staff within salary bands	Total (R)	Average per employee (R)	Total bonus expenditures a % of the total personnel expenditure in the band
Lower Skilled (Levels 1-2)	Unskilled and defined decision making (Paterson A)	28	36	77.00	60,481.04	2,160.03	1.0
Skilled (Levels 3-5)	Semi-skilled & Discretionary decision making (Paterson B)	55	126	43.65	200,536.92	3,646.12	3.4
Highly Skilled Production (Levels 6-8)	Skilled technical and academically qualified (Paterson C)	198	289	68.51	1,471,178.06	7,430.19	25.1
Highly skilled supervision (Levels 9-12)	Professionally qualified & specialists (Paterson D)	139	207	67.14	2,272,957.49	16,352.21	38.8
Senior Management Band E&F	Senior Management and Top Management (Paterson E & F)	60	60	100.00	1,851,167.49	30,852.79	31.7
Total		**480**	**718**	**58.75**	**5,856,321.00**	**12,200.67**	**100.00**

Foreign national workers

The tables below summarise the employment of foreign nationals in the organisation by salary bands and major occupation. The tables also summarise changes in the total number of foreign nationals in each salary band and by each major occupation.

Table 11: Foreign Nationals by Occupational Category as at 31 March 2023

Public Sector Salary levels	SAMRC Equivalent Occupational Category	Number	% of total no of employees (718)
Lower skilled (Levels 1-2)	Unskilled and defined decision making (Paterson A)	0	0.00%
Skilled (Levels 3-5)	Semi-skilled & discretionary decision making (Paterson B)	1	0.14%
Highly skilled production (Levels 6-8)	Skilled technical & academically qualified (Paterson C)	0	0.00%
Highly skilled supervision (Levels 9-12)	Professionally qualified & specialists (Paterson D)	19	2.65%
Senior Management (Levels 13-16)	Senior and Top Management (Paterson E & F)	5	0.70%
Total		**25**	**3.49%**

Table 12: Foreign Nationals by Job Title as at 31 March 2023

Job Title	SAMRC Equivalent Occupational Category	Number	% of total no of employees (718)
Unit Director	Senior and Top Management (Paterson E & F)	1	0.14%
Interim Senior Director	Senior and Top Management (Paterson E & F)	1	0.14%
Chief Specialist Scientist	Senior and Top Management (Paterson E & F)	2	0.28%
Senior Specialist Scientist	Senior and Top Management (Paterson E & F)	1	0.14%
Senior Research Manager	Professionally qualified & specialists (Paterson D)	1	0.14%
Specialist Scientist	Professionally qualified & specialists (Paterson D)	7	0.97%
Senior Scientist	Professionally qualified & specialists (Paterson D)	3	0.42%
Senior Data Manager	Professionally qualified & specialists (Paterson D)	1	0.14%
Research Clinician	Professionally qualified & specialists (Paterson D)	1	0.14%
Research Manager	Professionally qualified & specialists (Paterson D)	1	0.14%
Deputy Director	Professionally qualified & specialists (Paterson D)	1	0.14%
Division Manager	Professionally qualified & specialists (Paterson D)	1	0.14%

Job Title	SAMRC Equivalent Occupational Category	Number	% of total no of employees (718)
Project Leader	Professionally qualified & specialists (Paterson D)	2	0.28%
Senior Research Technologist	Skilled technical & academically qualified (Paterson C)	1	0.14%
Pharmacist	Skilled technical & academically qualified (Paterson C)	1	0.14%
Total		**25**	**3.49%**

Leave utilisation

Table 13: Sick leave utilization, 1 April 2022 to 31 March 2023

Public Sector Salary level	SAMRC Equivalent Occu-pational Category	Total sick leave days taken	No of sick leave days taken requiring a medical certificate >2 days	% days with medical certifi-cation	Number of Employees using sick leave	No of posts filled	% of total employees using sick leave	Average days sick leave per employee	Value (R)
Lower skilled (Levels 1-2)	Unskilled and defined decision making (Paterson A)	207	74	35.74	33	36	91.66	6.27	89 137.86
Skilled (Level 3-5)	Semi-skilled & Discretionary decision making (Paterson B)	680	263	38.67	114	126	90.47	5.96	544 432.23
Highly skilled production (Levels 6-8)	Skilled technical & academically qualified (Paterson C)	1561	667	42.72	256	289	88.58	6.09	2 645 865.01
Highly skilled supervision (Levels 9-12)	Professionally qualified & specialists (Paterson D)	879	443	50.00	153	207	73.91	5.74	3 114 370.79
Senior Management	Senior and Top Management (Paterson E & F)	174	98	56.32	27	60	45.00	6.44	1 066 533.98
Total		**3501**	**1545**	**44.13**	**583**	**718**	**81.19**	**6.00**	**7 460 339.87**

Table 14: Special sick leave (temporary), 1 April 2022 to 31 March 2023

Public Sector Salary Level	SAMRC Equivalent Occupational Category	Total Days Taken	% Days with Medical Certification	Number of Employees using disability Leave	No of posts filled	% of Total employee for this band using disability leave	Average special sick leave days taken per employee (Total Days taken/No Employees using sick leave)	Value (R)
Lower skilled (Levels 1-2)	Unskilled and defined decision making (Paterson A)	0	0	0	36	0	0	0
Skilled (Levels 3-5)	Semi-skilled & discretionary decision making (Paterson B)	0	0	0	126	0	0	0
Highly skilled production (Levels 6-8)	Skilled technical & academically qualified (Paterson C)	0	0	0	289	0	0	0
Highly skilled supervision (Levels 9-12)	Professionally qualified & specialists (Paterson D)	13	100	1	207	0.48	13	41 471.95
Senior Management	Senior and Top Management (Paterson E & F)	0	0	0	60	0	0	0
Total		**13**	**100**	**1**	**718**	**0.48**	**13**	**41 471.95**

Note: special sick leave refers to additional sick leave awarded for major incidents or illness in addition to normal sick leave allocation

Table 15: Annual Leave, 1 April 2022 to 31 March 2023

Public Sector Salary level	SAMRC Equivalent Occupational Category	No of posts filled	Total days taken	Average annual leave days taken per employee
Lower skilled (Levels 1-2)	Unskilled and defined decision making (Paterson A)	36	836	23.22
Skilled (Levels 3-5)	Semi-skilled & discretionary decision making (Paterson B)	126	2276	18.06
Highly skilled production (Levels 6-8)	Skilled technical & academically qualified (Paterson C)	289	6381	22.07
Highly skilled supervision (Levels 9-12)	Professionally qualified & specialists (Paterson D)	207	4380	21.15
Senior Management	Senior and Top Management (Paterson E & F)	60	1620	27.00
Total		**718**	**15493**	**21.57**

Note: The above table includes the leave encashment days

Table 16: Forfeited leave, 1 April 2022 to 31 March 2023

Public Sector Salary levels	SAMRC Equivalent Occupational Category	No of employees who forfeited leave	Total days of leave forfeited	Value (R)
Lower skilled (Level 1-2)	Unskilled and defined decision making (Paterson A)	0	0	0
Skilled (Levels 3-5)	Semi-skilled & discretionary decision making (Paterson B)	5	43	31 149.92
Highly skilled production (Levels 6-8)	Skilled technical & academically qualified (Paterson C)	13	55	127 226.91
Highly skilled supervision (Levels 9-12)	Professionally qualified & specialists (Paterson D)	9	38	289 793.49
Senior Management	Senior and Top Management (Paterson E & F)	4	45	117 060.69
Total		**31**	**181**	**565 231.01**

Table 17: Leave pay outs, 1 April 2022 to 31 March 2023

Reason	Number of employees	Total amount (R)
Terminations (all exits)	69	3,010,342.12
Encashment in service approved by Board	478	7 194 144.60
Total	**547**	**10,204,486.72**

Employee wellness programme

Details of Health Promotion via the SAMRC Employee Wellness Programme

During this reporting period:

- Wellness days were held in all the regions, during the reporting period, diabetes, smoking, hypertension, cardiovascular and weight management were detected as areas of concern.
- Counselling services for staff is on-going via different mediums.
- The employee assistance sessions include HIV counselling assistance, trauma debriefing, individual counselling, life management and work-life balance matters. The call centre remains operational 24/7.
- During the July to December 2022 period a total of 77 cases were managed, yielding an annualised utilisation rate of 22.99% compared to 70 cases in the previous bi-annual period, yielding an annualised utilisation rate of 20.90%.
- As per the previous financial period, HR collaborated with other SAMRC units and held Pap, breast, HIV, blood sugar and PSA Health screenings in all the regions, and they were very well attended.

Labour relations

Table 18: Disciplinary actions considered by a formal disciplinary hearing, 1 April 2022 to 31 March 2023

	Male				Female				Foreign National		
	African	Coloured	Indian	White	African	Coloured	Indian	White	Male	Female	Total
Disciplinary action	4	0	1	0	3	0	0	0	0	0	8

Table 19: Misconduct and disciplinary hearings finalised, 1 April 2022 to 31 March 2023

Outcome of disciplinary hearings	Number
Verbal warning	0
Written warning	0
Final written warning	0
Suspended without pay	1
Fine	0
Demotion	0
Dismissal	5
Not guilty	1
Case withdrawn	0
Other (e.g., resignation prior to conclusion of hearing)	1
Total	**8**

Table 20: Types of misconduct addressed at disciplinary hearings.

Type of misconduct	Number of employees
• Harassment • Workplace Bullying • Dishonesty • Rudeness, and injury of Human Dignity	3
• Persistent continued late coming • Not following proper channels of communication when running late or not coming to work • Failure to adhere to reasonable instructions. • Failing to register with HPCSA	2
Theft of cell phones from site	1
Dishonesty due to misrepresentation.	1
Sexual Harassment/or inappropriate behaviour	1
Total	**8**

Table 21: Grievances lodged, 1 April 2022 to 31 March 2023

	Number
Number of grievances resolved	2
Number of grievances not resolved	1
Total number of grievances lodged	**3**

Table 22: Disputes pending before the CCMA, 1 April 2022 to 31 March 2023

	Number
Number of disputes in progress	1
Number of disputes settled/concluded	5

Table 23: Strike actions, 1 April 2022 to 31 March 2023

	Number
Total number of employees working days lost	0
Total cost (R) of working days lost	
Amount (R) recovered as a result of no work no pay	

Table 24: Precautionary suspensions, 1 April 2022 to 31 March 2023

	Number
Number of people suspended	2
Average number of days suspended	21.67
Cost (R) of suspensions	R18 179.52

Injury on duty

Table 25: Injury on duty, 1 April 2022 to 31 March 2023

Nature of injury on duty	Number
Required basic medical attention only	4
Temporary total disablement	1
Permanent disablement	0
Fatal	0
Total	**5**

PART E: FINANCIAL INFORMATION

INDEX

The reports and statements set out in this part of the annual report comprise the audited annual financial statements by the Auditor General – South Africa and presented to parliament.

	Page
Nature of Business and Principal Activities	312
Report of the Chief Executive Officer & President	313
Report of the Auditor General to Parliament on the South African Medical Research Council	314
Annexure-Auditor General's Responsibility for the Audit	317
Accounting Authority's Responsibilities and Approval	320
Audit committee Report	323
Statement of Financial Position	321
Statement of Financial Performance	324
Statement of Changes in Net Assets	325
Cash Flow Statement	326
Statement of Comparison of Budget and Actual Amounts	327
Accounting Policies	328
Notes to the Annual Financial Statements	357
Detailed Income statement	391

NATURE OF BUSINESS AND PRINCIPAL ACTIVITIES

The South African Medical Research Council (SAMRC) is a section 3A public entity, it is accountable to Parliament for its performance and budget. The mandate of the SAMRC, in terms of the MRC Act 58, 1991 (as amended), is to improve the health and quality of life of South Africans. This needs to be realised through research, capacity development and technology transfer. SAMRC focuses on the top ten causes of death and disability associated risk factors. SAMRC acquires the most accurate healthcare information and provides policy makers with tools to enhance the quality of life for the people in South Africa. The address of the SAMRC's principal place of business is Francie Van Zijl Drive, Parow Valley, Cape Town.

REPORT OF THE CHIEF EXECUTIVE OFFICER & PRESIDENT

General financial review

(All figures R'000, prior year in parenthesis.)

Revenue for the year showed an increase of 0.2% to R1 270 637 (R1 267 979). This consists of a decrease in government grants of 8.5% to R677 264 (R740 057) offset by an increase in contract income of 12.4% to R593 373 (R527 921).

Other income has increased significantly by 59.1% to R28 030 (R17 613) driven by exchange gains generated on foreign currency grant income of R8 459.

Operating expenses reflected an increase of 2.05% to R1 333 008 (R1 306 199). This is mainly the result of continued increased research activities following the relaxation of Covid 19 lockdown restrictions.

This has resulted in an operating deficit of R34 340 for the year compared to an operating deficit of R20 608 in 2021/22. A significant increase in investment income of 65.4% to R42 546 (R25 730) due to an increase in the average balance of investments during the year under review as well as an increase in interest rates resulted in a net surplus for the year of R7 545 compared to a net surplus of R6 021 in 2021/2022.

The organisation remains financially strong with accumulated reserves of R434 315 (R426 770).

Total assets have increased by 10.4% to R1 171 837 (R1 061 674) due mainly to an increase in cash and cash equivalents of R24 087 as well as an increase of R66 400 in receivables from exchange transactions. Property, Plant and Equipment has increased by R22 143 due to increased capital expenditure on Infrastructure and Information Technology.

Deferred income has increased by R99 130 to R549 633 due to additional funds received for research activities not yet performed.

The SAMRC generated a positive operating cashflow of R75 981 compared to a positive operating cashflow of R146 813 in the prior period due mainly to an increase in receivables from exchange transactions.

Net cash flows from investing activities were negative due mainly to capital expenditure of R52 981 (R48 943).

The net impact of the above is an increase of R24 087 in cash and cash equivalents compared to an increase of R94 241 in cash and cash equivalents in the prior year.

Spending trends

Operating expenses reflected an increase of 2.05% to R1 333 008 (R1 306 199). This is mainly the result of continued increased research activities following the relaxation of Covid 19 lockdown restrictions and includes increases in employee costs of R47 261, travel and subsistence of R20 262, and collaborative research costs of R9 843. This is offset by the one-off cost of R58 982 for the donation of vaccines to the National Department of Health in the prior year.

Employee related costs have increased by 10.8% to R484 065 (R436 775) driven mainly by basic salary costs which have increased by 13.9% to R399 495 (R350 753). Employee related costs include net bonus provision costs of R6 391 (R5 876). The net asset pertaining to the Pension Fund and Post-Retirement medical aid obligations has increased by R2 428 compared to a reduction of R2 775 in the prior year.

The net surplus for the year of R7 545 compared to a final budget deficit of R 105 904. Revenue was R118 319 over budget while expenditure was R4 870 over budget. This was due to higher than anticipated contract income recognised of R85 524 due to the increase in research activity as well foreign exchange gains of R8 459 and interest income of R14 346 over budget.

Collaborative research costs were R54 715 below budget due mainly to completion of Covid 19 research projects later than anticipated offsetting the general increase in research expenditure over budget.

Requests for roll over of funds

The organisation remains financially strong with accumulated reserves of R434 315 (R426 770). The necessary approvals will be sought for the rollover of funds received from Government but not yet spent.

Supply chain management

There were no unsolicited bid proposals received during the year. The revised Materiality Framework was approved by the Minister.

Audit report matters

There were no matters to report.

Events after the reporting date

No significant events were identified after the reporting date that may have an impact on the financial statements.

Economic viability

Funding allocations of R693 563 for 2023/24 have been approved by Government. This together with accumulated reserves of R434 315 and the increase anticipated in the value of grants received will ensure that the SAMRC will continue to operate as a going concern.

REPORT OF THE AUDITOR-GENERAL TO PARLIAMENT ON THE SOUTH AFRICAN MEDICAL RESEARCH COUNCIL

Report on the audit of the financial statements

Opinion

1. I have audited the financial statements of the South African Medical Research Council set out on pages 323 to 390, which comprise the statement of financial position as at 31 March 2023, the statement of financial performance, statement of changes in net assets, cash flow statement and statement of comparison of budget and actual amounts for the year then ended, as well as notes to the financial statements, including a summary of significant accounting policies.
2. In my opinion, the financial statements present fairly, in all material respects, the financial position of the South African Medical Research Council as at 31 March 2023, and its financial performance and cash flows for the year then ended in accordance with the Standards of Generally Recognised Accounting Practice (GRAP) and the requirements of the Public Finance Management Act 1 of 1999 (PFMA).

Basis for opinion

3. I conducted my audit in accordance with the International Standards on Auditing (ISAs). My responsibilities under those standards are further described in the responsibilities of the auditor-general for the audit of the financial statements section of my report.
4. I am independent of the public entity in accordance with the *International Ethics Standards Board for Accountants' International code of ethics for professional accountants (including International Independence Standards)* (IESBA code) as well as other ethical requirements that are relevant to my audit in South Africa. I have fulfilled my other ethical responsibilities in accordance with these requirements and the IESBA code.
5. I believe that the audit evidence I have obtained is sufficient and appropriate to provide a basis for my opinion.

Other matters

6. I draw attention to the matters below. My opinion is not modified in respect of these matters.

Unaudited supplementary schedule

7. The supplementary information set out on page 391 does not form part of the financial statements and is presented as additional information. I have not audited this schedule and, accordingly, I do not express an opinion on it.

National Treasury Instruction No. 4 of 22/2023: PFMA Compliance and Reporting Framework

8. On 23 December 2022, the National Treasury issued Instruction Note No. 4: PFMA compliance and reporting framework of 2022-23 in terms of section 76(1)(b), (e) and (f), 2(e) and (4)(a) and (c) of the PFMA, which came into effect on 3 January 2023. The PFMA Compliance and Reporting Framework also addresses the disclosure of unauthorised expenditure, irregular expenditure and fruitless and wasteful expenditure. Among the effects of this framework is that any irregular and fruitless and wasteful expenditure incurred in previous financial years and not addressed is no longer disclosed in the disclosure notes of the annual financial statements, only the current year and prior year figures are disclosed in note 36 to the financial statements. The movements in respect of any irregular expenditure and fruitless and wasteful expenditure are no longer disclosed in the notes to the annual financial statements of the South African Medical Research Council. The disclosure of these movements (e.g. condoned, recoverable, removed, written off, under assessment, under determination and under investigation) are now required to be included as part of other information in the annual report of the auditees. I do not express an opinion on the disclosure of irregular expenditure and fruitless and wasteful expenditure in the annual report.

Responsibilities of the accounting authority for the financial statements

9. The board, which constitutes the accounting authority, is responsible for the preparation and fair presentation of the financial statements in accordance with GRAP and the requirements of the PFMA; and for such internal control as the accounting authority determines is necessary to enable the preparation of financial statements that are free from material misstatement, whether due to fraud or error.

10. In preparing the financial statements, the accounting authority is responsible for assessing the entity's ability to continue as a going concern; disclosing, as applicable, matters relating to going concern; and using the going concern basis of accounting unless the appropriate governance structure either intends to liquidate the entity or to cease operations or has no realistic alternative but to do so.

Responsibilities of the auditor-general for the audit of the financial statements

11. My objectives are to obtain reasonable assurance about whether the financial statements as a whole are free from material misstatement, whether due to fraud or error; and to issue an auditor's report that includes my opinion. Reasonable assurance is a high level of assurance but is not a guarantee that an audit conducted in accordance with the ISAs will always detect a material misstatement when it exists. Misstatements can arise from fraud or error and are considered material if, individually or in aggregate, they could reasonably be expected to influence the economic decisions of users taken on the basis of these financial statements.
12. A further description of my responsibilities for the audit of the financial statements is included in the annexure to this auditor's report.

Report on the audit of the annual performance report

13. In accordance with the Public Audit Act 25 of 2004 (PAA) and the general notice issued in terms thereof, I must audit and report on the usefulness and reliability of the reported performance against predetermined objectives for the selected programmes presented in the annual performance report. The accounting authority is responsible for the preparation of the annual performance report.
14. I selected the following programmes presented in the annual performance report for the year ended 31 March 2023 for auditing. I selected programmes that measure the public entity's performance on its primary mandated functions and that are of significant national, community or public interest.

PROGRAMME	PAGE NUMBERS	PURPOSE
Programme 2: core research	26 to 27	Lead the generation of new knowledge.
Programme 3: innovation and technology	28 to 29	To build an innovation community, developing life changing health solutions for South Africa, Africa and beyond.

15. I evaluated the reported performance information for the selected programmes against the criteria developed from the performance management and reporting framework, as defined in the general notice. When an annual performance report is prepared using these criteria, it provides useful and reliable information and insights to users on the public entity's planning and delivery on its mandate and objectives.
16. I performed procedures to test whether:

    - the indicators used for planning and reporting on performance can be linked directly to the public entity's mandate and the achievement of its planned objectives
    - the indicators are well defined and verifiable to ensure that they are easy to understand and apply consistently and that I can confirm the methods and processes to be used for measuring achievements
    - the targets can be linked directly to the achievement of the indicators and are specific, time bound and measurable to ensure that it is easy to understand what should be delivered and by when, the required level of performance as well as how performance will be evaluated
    - the indicators and targets reported on in the annual performance report are the same as what was committed to in the approved initial or revised planning documents
    - the reported performance information is presented in the annual performance report in the prescribed manner
    - there is adequate supporting evidence for the achievements reported and for the reasons provided for any over- or underachievement of targets.

17. I performed the procedures for the purpose of reporting material findings only; and not to express an assurance opinion.
18. I did not identify any material findings on the reported performance information for the selected programmes.

Report on compliance with legislation

19. In accordance with the PAA and the general notice issued in terms thereof, I must audit and report on compliance with applicable legislation relating to financial matters, financial management and other related matters. The accounting authority is responsible for the entity's compliance with legislation.

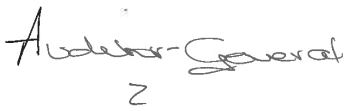
20. I performed procedures to test compliance with selected requirements in key legislation in accordance with the findings engagement methodology of the Auditor-General of South Africa (AGSA). This engagement is not an assurance engagement. Accordingly, I do not express an assurance opinion or conclusion.
21. Through an established AGSA process, I selected requirements in key legislation for compliance testing that are relevant to the financial and performance management of the entity, clear to allow consistent measurement and evaluation, while also sufficiently detailed and readily available to report in an understandable manner. The selected legislative requirements are included in the annexure to this auditor's report.
22. I did not identify any material non-compliance with the selected legislative requirements.

Other information in the annual report

23. The accounting authority is responsible for the other information included in the annual report, which includes the audit committee's report. The other information referred to does not include the financial statements, the auditor's report and those selected programmes presented in the annual performance report that have been specifically reported on in this auditor's report.
24. My opinion on the financial statements, the report on the audit of the annual performance report and the report on compliance with legislation, do not cover the other information included in the annual report and I do not express an audit opinion or any form of assurance conclusion on it.
25. My responsibility is to read this other information and, in doing so, consider whether it is materially inconsistent with the financial statements and the selected programmes presented in the annual performance report, or my knowledge obtained in the audit, or otherwise appears to be materially misstated.
26. I have nothing to report in this regard.

Internal control deficiencies

27. I considered internal control relevant to my audit of the financial statements, annual performance report and compliance with applicable legislation; however, my objective was not to express any form of assurance on it.
28. I did not identify any significant deficiencies in internal control.



Cape Town
31 July 2023

AUDITOR-GENERAL
SOUTH AFRICA

ANNEXURE TO THE AUDITOR'S REPORT

The annexure includes the following:

- the auditor-general's responsibility for the audit
- the selected legislative requirements for compliance testing.

Auditor-general's responsibility for the audit

Professional judgement and professional scepticism

As part of an audit in accordance with the ISAs, I exercise professional judgement and maintain professional scepticism throughout my audit of the financial statements and the procedures performed on reported performance information for selected programmes and on the entity's compliance with selected requirements in key legislation.

Financial statements

In addition to my responsibility for the audit of the financial statements as described in this auditor's report, I also:

- identify and assess the risks of material misstatement of the financial statements, whether due to fraud or error; design and perform audit procedures responsive to those risks; and obtain audit evidence that is sufficient and appropriate to provide a basis for my opinion. The risk of not detecting a material misstatement resulting from fraud is higher than for one resulting from error, as fraud may involve collusion, forgery, intentional omissions, misrepresentations or the override of internal control
- obtain an understanding of internal control relevant to the audit in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the entity's internal control
- evaluate the appropriateness of accounting policies used and the reasonableness of accounting estimates and related disclosures made
- conclude on the appropriateness of the use of the going concern basis of accounting in the preparation of the financial statements. I also conclude, based on the audit evidence obtained, whether a material uncertainty exists relating to events or conditions that may cast significant doubt on the ability of the entity to continue as a going concern. If I conclude that a material uncertainty exists, I am required to draw attention in my auditor's report to the related disclosures in the financial statements about the material uncertainty or, if such disclosures are inadequate, to modify my opinion on the financial statements. My conclusions are based on the information available to me at the date of this auditor's report. However, future events or conditions may cause an entity to cease operating as a going concern
- evaluate the overall presentation, structure and content of the financial statements, including the disclosures, and determine whether the financial statements represent the underlying transactions and events in a manner that achieves fair presentation.

Communication with those charged with governance

I communicate with the accounting authority regarding, among other matters, the planned scope and timing of the audit and significant audit findings, including any significant deficiencies in internal control that I identify during my audit.

I also provide the accounting authority with a statement that I have complied with relevant ethical requirements regarding independence and to communicate with them all relationships and other matters that may reasonably be thought to bear on my independence and, where applicable, actions taken to eliminate threats or safeguards applied.

ANNEXURE TO THE AUDITOR'S REPORT (CONTINUED)

Compliance with legislation – selected legislative requirements

The selected legislative requirements are as follows:

Legislation	Sections or regulations
South African Medical Research Council Act 58 of 1991	Regulations and instructions issued in terms of the act
Treasury Regulations (TR), 2005, issued in terms of the PFMA	TR 28.2.2 TR 30.1.1 TR 30.1.3(g)
Public Finance Management Act No.1 of 1999 (PFMA)	Section 51(1)(a)(iv); 51(1)(b)(i); 51(1)(b)(ii); 51(1)(e)(iii) Section 53(4) Section 54(2)(c'); 54(2)(d) Section 55(1)(a); 55(1)(b); 55(1)(c)(i) Section 56(1); 56(2) Section 57(b)
Treasury Regulations for departments, trading entities, constitutional institutions and public entities (TR)	Treasury Regulation 8.2.1; 8.2.2 Treasury Regulation 16A 3.1; 16A 3.2; 16A 3.2(a); 16A 6.1; 16A6.2(a) & (b); 16A6.2(e);16A 6.3(a); 16A 6.3(a)(i); 16A 6.3(b); 16A 6.3(c); 16A 6.3(d); 16A 6.3(e); 16A 6.4; 16A 6.5; 16A 6.6; TR 16A.7.1; 16A.7.3; 16A.7.6; 16A.7.7; 16A 8.2(1); 16A 8.2(2); 16A 8.3; 16A 8.3(d); 16A 8.4; 16A9.1 16A9; 16A9.1(b)(ii); 16A9.1(c); 16A 9.1(d); 16A 9.1(e); 16A9.1(f); 16A 9.2; 16A 9.2(a)(ii); TR 16A 9.2(a)(iii) Treasury Regulation 30.1.1; 30.1.3(a); 30.1.3(b); 30.1.3(d); 30.2.1 Treasury Regulation 31.1.2(c') Treasury Regulation 31.2.1 Treasury Regulation 31.3.3 Treasury Regulation 33.1.1; 33.1.3
Prevention and Combating of Corrupt Activities Act No.12 of 2004 (PRECCA)	Section 34(1)
Construction Industry Development Board Act No.38 of 2000 (CIDB)	Section 18(1)
CIDB Regulations	CIDB regulation 17; 25(1); 25 (5) & 25(7A)
PPPFA	Section 1(i); 2.1(a); 2.1(b); 2.1(f)
PPR 2017	Paragraph 4.1; 4.2 Paragraph 5.1; 5.3; 5.6; 5.7 Paragraph 6.1; 6.2; 6.3; 6.5; 6.6; 6.8 Paragraph 7.1; 7.2; 7.3; 7.5; 7.6; 7.8 Paragraph 8.2; 8.5 Paragraph 9.1; 9.2 Paragraph 10.1; 10.2 Paragraph 11.1; 11.2 Paragraph 12.1 and 12.2
PPR 2022	Paragraph 3.1 Paragraph 4.1; 4.2; 4.3; 4.4 Paragraph 5.1; 5.2; 5.3; 5.4

Legislation	Sections or regulations
PFMA SCM Instruction no. 09 of 2022/2023	Paragraph 3.1; 3.3 (b); 3.3 (c); 3.3 (e); 3.6
National Treasury Instruction No.1 of 2015/16	Paragraph 3.1; 4.1; 4.2
NT SCM Instruction Note 03 2021/22	Paragraph 4.1; 4.2 (b); 4.3; 4.4; 4.4 (a); 4.4 (c) – (d); 4.6 Paragraph 5.4 Paragraph 7.2; 7.6
NT SCM Instruction 4A of 2016/17	Paragraph 6
NT SCM Instruction Note 03 2019/20	Par 5.5.1(vi); Paragraph 5.5.1(x);
NT SCM Instruction Note 11 2020/21	Paragraph 3.1; 3.4 (a) and (b); 3.9; 6.1;6.2;6.7
NT SCM Instruction note 2 of 2021/22	Paragraph 3.2.1; 3.2.2; 3.2.4(a) and (b) ; 3.3.1; 3.2.2 Paragraph 4.1
PFMA SCM Instruction 04 of 2022/23	Paragraph 4(1); 4(2); 4(4)
Practice Note 5 of 2009/10	Paragraph 3.3
PFMA SCM instruction 08 of 2022/23	Paragraph 3.2 Par. 4.3.2; 4.3.3
NT instruction note 4 of 2015/16	Paragraph 3.4
Second amendment of NTI 05 of 2020/21	Paragraph 4.8; 4.9 ; 5.1 ; 5.3
Erratum NTI 5 of 202/21	Paragraph 1
Erratum NTI 5 of 202/21	Paragraph 2
Practice note 7 of 2009/10	Paragraph 4.1.2
Practice note 11 of 2008/9	Paragraph 3.1 Paragraph 3.1 (b)
NT instruction note 1 of 2021/22	Paragraph 4.1

ACCOUNTING AUTHORITY'S RESPONSIBILITIES AND APPROVAL

The Accounting Authority is required by the Public Finance Management Act (Act 1 of 1999), to maintain adequate accounting records and is responsible for the content and integrity of the annual financial statements and related financial information included in this report. It is the responsibility of the Accounting Authority to ensure that the annual financial statements fairly present the state of affairs of the entity as at the end of the financial year and the results of its operations and cash flows for the period then ended. The external auditors are engaged to express an independent opinion on the annual financial statements and were given unrestricted access to all financial records and related data.

The annual financial statements have been prepared in accordance with Standards of Generally Recognised Accounting Practice (GRAP) including any interpretations, guidelines and directives issued by the Accounting Standards Board.

The annual financial statements are based upon appropriate accounting policies consistently applied and supported by reasonable and prudent judgements and estimates. On a quarterly basis the Accounting Authority approved revised estimates in response to additional income received and progress with research projects.

The Accounting Authority acknowledges that it is ultimately responsible for the system of internal financial control established by the entity and places considerable importance on maintaining a strong control environment. To enable the Accounting Authority to meet these responsibilities, the Accounting Authority sets standards for internal control aimed at reducing the risk of error or in a cost effective manner. The standards include the proper delegation of responsibilities within a clearly defined framework, effective accounting procedures and adequate segregation of duties to ensure an acceptable level of risk. These controls are monitored throughout the entity and all employees are required to maintain the highest ethical standards in ensuring the entity's business is conducted in a manner that in all reasonable circumstances is above reproach. The focus of risk management in the entity is on identifying, assessing, managing and monitoring all known forms of risk across the entity. While operating risk cannot be fully eliminated, the entity endeavours to minimise it by ensuring that appropriate infrastructure, controls, systems and ethical behaviour are applied and managed within predetermined procedures and constraints.

The Accounting Authority is of the opinion, based on the information and explanations given by management, that the system of internal control provides reasonable assurance that the financial records may be relied on for the preparation of the annual financial statements. However, any system of internal financial control can provide only reasonable, and not absolute, assurance against material misstatement.

The Accounting Authority has reviewed the entity's cash flow forecast for the year ended to March 31, 2023 and, in the light of this review and the current financial position, is satisfied that the entity has or has access to adequate resources to continue in operational existence for the foreseeable future.

Although the Accounting Authority is primarily responsible for the financial affairs of the entity, they are supported by the entity's external auditors.

The external auditors are responsible for independently reviewing and reporting on the entity's annual financial statements. The annual financial statements have been examined by the entity's external auditors and their report is presented on pages 314 to 317.

The annual financial statements set out on pages 321 to 390, which have been prepared on the going concern basis, were approved by the Accounting Authority on 31 July 2023 and were signed on its behalf by:

Professor J Mahlangu
Chairperson of the Board

ANNUAL FINANCIAL STATEMENTS FOR THE YEAR ENDED MARCH 31, 2023

AUDIT COMMITTEE REPORT

We are pleased to present our report for the financial year ended March 31, 2023.

Audit committee members and attendance

The audit committee consists of the members listed hereunder and should meet at least 4 times per annum as per its approved terms of reference. During the current year 6 meetings were held. The unaudited annual financial statements were reviewed and discussed at a meeting held on 25 May 2023.

NAME OF MEMBER	NUMBER OF MEETINGS ATTENDED
Professor B Shaw (Chairperson till 31 October 2022)	4
Ms D Dondur (Chairperson from 1 November 2022)	2
Doctor M Madikizela (appointed 1 November 2019)	6
Professor T Mavundla (appointed 1 November 2019)	6
Professor E Mukwevho (appointed 1 November 2022)	2
Associate Professor T Naledi (appointed 1 November 2022)	2
Professor L Skaal (term ended 31 October 2022)	4
Ms J Williams (Board term ended 31 October 2022, independent audit committee member from 1 November 2022)	6
Mr. J Watson (independent audit committee member from 1 October 2020)	5

Audit committee responsibility

The audit committee reports that it has complied with its responsibilities arising from section 55(1)(a) of the PFMA and Treasury Regulation 27.1.

The audit committee also reports that it has adopted appropriate formal terms of reference as its audit committee charter, has regulated its affairs in compliance with this charter and has discharged all its responsibilities as contained therein.

The effectiveness of internal control

The system of internal controls applied by the entity over financial and risk management is effective, efficient and transparent. In line with the PFMA and the King IV Report on Corporate Governance requirements, Internal Audit provides the audit committee and management with assurance that the internal controls are appropriate and effective. This is achieved by means of the risk management process, as well as the identification of corrective actions and suggested enhancements to the controls and processes. From the various reports of the Internal Auditors, the Audit Report on the annual financial statements, and the management report of the Auditor-General South Africa, it was noted that no matters were reported that indicate any material deficiencies in the system of internal control or any deviations therefrom.

Accordingly, we can report that the system of internal control over financial reporting for the period under review was efficient and effective.

The audit committee is satisfied with the content and quality of monthly and quarterly reports prepared and issued by the of the entity during the year under review.

Evaluation of annual financial statements

The audit committee has:

- reviewed and discussed the audited annual financial statements to be included in the annual report, with the Auditor- General and the Accounting Authority;
- reviewed the Auditor-General of South Africa's management report and management's response thereto;
- reviewed changes in accounting policies and practices;
- reviewed the entity's compliance with legal and regulatory provisions;

The audit committee concurs with and accepts the Auditor-General of South Africa's report on the annual financial statements and is of the opinion that the audited annual financial statements should be accepted and read together with the report of the Auditor-General of South Africa.

AUDIT COMMITTEE REPORT (CONTINUED)

Internal audit

The audit committee is satisfied that the internal audit function is operating effectively and that it has addressed the risks pertinent to the entity and its audits.

Auditor-General of South Africa

The audit committee has met with the Auditor-General of South Africa to ensure that there are no unresolved issues.

Risk Management

The risk management activity has received corporate endorsement and risk management processes have been formalised and adopted. Risk management activities are reported on a quarterly basis.

Information Systems

During the year under review hardware and infrastructural upgrades were implemented. Additional functionality was implemented on the research management platform. Security processes were reviewed during the period under review.

Chairperson of the Audit Committee
Date: 31 August 2023

ANNUAL FINANCIAL STATEMENTS FOR THE YEAR ENDED MARCH 31, 2023

STATEMENT OF FINANCIAL POSITION AS AT MARCH 31, 2023

	NOTE(S)	2023 31 MARCH R	2022 31 MARCH R
Assets			
Current Assets			
Financial assets at fair value	3	9,149,013	9,294,786
Receivables from exchange transactions	4	112,677,459	46,276,937
Receivables from non-exchange transactions	5	5,517,069	3,129,990
VAT receivable	6	16,208,647	19,985,200
Prepayments	7	11,019,539	12,537,734
Cash and cash equivalents	8	719,684,368	695,596,899
		874,256,095	**786,821,546**
Non-Current Assets			
Biological assets that form part of an agricultural activity	9	25,000	50,000
Property, plant and equipment	10	275,676,596	253,533,751
Intangible assets	11	14,223,042	15,029,685
Living Resources	12	1,162,147	1,356,897
Investments in controlled entities	13	2	2
Employee benefit asset	17	6,494,000	4,882,000
		297,580,787	**274,852,335**
Total Assets		**1,171,836,882**	**1,061,673,881**
Liabilities			
Current Liabilities			
Payables from exchange transactions	14	166,490,447	162,849,587
Provisions	15	11,073,721	10,651,420
Deferred Income	16	549,632,730	450,502,887
		727,196,898	**624,003,894**
Non-Current Liabilities			
Employee benefit obligation	17	5,527,000	6,343,000
Earmarked funds	18	4,797,766	4,556,898
		10,324,766	**10,899,898**
Total Liabilities		**737,521,664**	**634,903,792**
Net Assets		**434,315,218**	**426,770,089**
Accumulated surplus	19	434,315,218	426,770,089

STATEMENT OF FINANCIAL PERFORMANCE

	NOTE(S)	2023 31 MARCH R	2022 31 MARCH R
Revenue	20	1,270,637,434	1,267,978,551
Other income	21	28,030,495	17,612,723
Operating expenses	23	(1,333,008,032)	(1,306,199,153)
Operating deficit	30	**(34,340,103)**	**(20,607,879)**
Investment income	22	42,545,875	25,729,929
Fair value adjustments	28	(367,464)	1,103,297
Finance costs	25	(293,179)	(204,087)
Surplus for the period		**7,545,129**	**6,021,260**

ANNUAL FINANCIAL STATEMENTS FOR THE YEAR ENDED MARCH 31, 2023

STATEMENT OF CHANGES IN NET ASSETS

	TOTAL NET ASSETS
Balance at April 1, 2021	**420,748,829**
Changes in net assets	
Surplus for the year	6,021,260
Total changes	6,021,260
Balance at April 1, 2022	**426,770,089**
Changes in net assets	
Surplus for the year	7,545,129
Total changes	7,545,129
Balance at March 31, 2023	**434,315,218**

CASH FLOW STATEMENT

	NOTE(S)	2023 31 MARCH R	2022 31 MARCH R
Cash flows from operating activities			
Receipts			
Interest income	22	42,317,948	25,584,537
Dividends received	22	227,927	145,392
Cash received from customers and grants		1,329,664,509	1,415,021,124
		1,372,210,384	1,440,751,053
Payments			
Suppliers		(1,295,936,093)	(1,293,733,832)
Finance costs		(293,179)	(204,087)
		(1,296,229,272)	(1,293,937,919)
Net cash flows from operating activities	31	**75,981,112**	**146,813,134**
Cash flows from investing activities			
Purchase of property, plant and equipment	10	(52,981,179)	(48,943,298)
Proceeds from sale of property, plant and equipment		216,144	48,062
Proceeds from sale of financial assets	3	4,330	–
Purchase of other intangible assets	11	(1,913,572)	(3,820,064)
Net cash flows from investing activities		**(54,674,277)**	**(52,715,300)**
Cash flows from financing activities			
Movement in earmarked funds	18	240,868	142,856
Net (decrease) increase in cash and cash equivalents		**21,547,703**	**94,240,690**
Cash and cash equivalents at the beginning of the year		695,596,899	601,037,366
Effect of exchange rate movement on cash balances		2,539,766	318,843
Cash and cash equivalents at the end of the period	8	**719,684,368**	**695,596,899**

An amount of R549,632,730 (March 2022: R450,502,887) included in cash and cash equivalents is due to cash received from funders for research projects in progress or not yet commenced.

ANNUAL FINANCIAL STATEMENTS FOR THE YEAR ENDED MARCH 31, 2023

STATEMENT OF COMPARISON OF BUDGET AND ACTUAL AMOUNTS

Budget on Accrual Basis

	APPROVED BUDGET	ADJUSTMENTS	FINAL BUDGET	ACTUAL AMOUNTS ON COMPARABLE BASIS	DIFFERENCE BETWEEN FINAL BUDGET AND ACTUAL	REFERENCE
Statement of Financial Performance						
Revenue						
Non-tax revenue						
Sale of goods and services	499,669,000	8,179,676	**507,848,676**	593,373,086	**85,524,410**	39
Other non-tax revenue	45,380,000	(8,180,000)	**37,200,000**	70,576,370	**33,376,370**	39
Transfers received	779,523,000	(101,676,916)	**677,846,084**	677,264,348	**(581,736)**	
Total revenue	**1,324,572,000**	**(101,677,240)**	**1,222,894,760**	**1,341,213,804**	**118,319,044**	
Expenditure						
Compensation of employees	(435,977,000)	(42,664,507)	**(478,641,507)**	(484,065,156)	**(5,423,649)**	
Goods and services	(781,406,000)	(43,751,565)	**(825,157,565)**	(823,516,138)	**1,641,427**	
Depreciation	(24,450,000)	(550,000)	**(25,000,000)**	(26,087,381)	**(1,087,381)**	
Transfers and subsidies	(101,727,000)	101,727,000	**–**	–	**–**	
Total expenditure	**(1,343,560,000)**	**14,760,928**	**(1,328,799,072)**	**(1,333,668,675)**	**(4,869,603)**	
Surplus/(deficit)	**(18,988,000)**	**(86,916,312)**	**(105,904,312)**	**7,545,129**	**113,449,441**	
Actual Amount on Comparable Basis as Presented in the Budget and Actual Comparative Statement	**(18,988,000)**	**(86,916,312)**	**(105,904,312)**	**7,545,129**	**113,449,441**	

The accounting policies on pages 326 to 354 and the notes on pages 355 to 388 form an integral part of the annual financial statements.

ACCOUNTING POLICIES

1. Presentation of Annual Financial Statements

The annual financial statements have been prepared in accordance with the Standards of Generally Recognised Accounting Practice (GRAP), issued by the Accounting Standards Board in accordance with Section 91(1) of the Public Finance Management Act (Act 1 of 1999)

These annual financial statements have been prepared on an accrual basis of accounting and are in accordance with historical cost convention as the basis of measurement, unless specified otherwise. They are presented in South African Rand, which is also the functional currency. The amounts presented in the annual financial statements are rounded to the nearest Rand.

In the absence of an issued and effective Standard of GRAP, accounting policies for material transactions, events or conditions were developed in accordance with paragraphs 8, 10 and 11 of GRAP 3 as read with Directive 5.

Assets, liabilities, revenues and expenses were not offset, except where offsetting is either required or permitted by a Standard of GRAP.

A summary of the significant accounting policies, which have been consistently applied in the preparation of these annual financial statements, are disclosed below.

These accounting policies are consistent with the previous period.

1.1 Going concern assumption

These annual financial statements have been prepared based on the expectation that the entity will continue to operate as a going concern for at least the next 12 months.

1.2 Materiality

Material omissions or misstatements of items are material if they could, individually or collectively, influence the decisions or assessments of users made on the basis of the financial statements. Materiality depends on the nature or size of the omission or misstatement judged in the surrounding circumstances. The nature or size of the information item, or a combination of both, could be the determining factor.

Assessing whether an omission or misstatement could influence decisions of users, and so be material, requires consideration of the characteristics of those users. The Framework for the Preparation and Presentation of Financial Statements states that users are assumed to have a reasonable knowledge of government, its activities, accounting and a willingness to study the information with reasonable diligence. Therefore, the assessment takes into account how users with such attributes could reasonably be expected to be influenced in making and evaluating decisions.

1.3 Significant judgements and sources of estimation uncertainty

In preparing the annual financial statements, management is required to make estimates and assumptions that affect the amounts represented in the annual financial statements and related disclosures. Use of available information and the application of judgement is inherent in the formation of estimates. Actual results in the future could differ from these estimates which may be material to the annual financial statements. Significant judgements include:

ACCOUNTING POLICIES (CONTINUED)

1.3 Significant judgements and sources of estimation uncertainty (continued)

Trade receivables and loans and receivables

The entity assesses its trade receivables and loans and receivables for impairment at the end of each reporting period. In determining whether an impairment loss should be recorded in surplus or deficit, the entity makes judgements as to whether there is observable data indicating a measurable decrease in the estimated future cash flows from a financial asset.

The impairment for trade receivables and loans and receivables is calculated on a portfolio basis, based on a review of the full trade debtors book, adjusted for national and industry-specific economic conditions and other indicators present at the reporting date that correlate with defaults on the portfolio.

Fair value estimation

The fair value of financial instruments traded in active markets (such as trading) is based on quoted market prices at the end of the reporting period. The quoted market price used for financial assets held by the entity is the current bid price.

The fair value of financial instruments that are not traded in an active market (for example, over-the-counter derivatives) is determined by using valuation techniques. The entity uses a variety of methods and makes assumptions that are based on market conditions existing at the end of each reporting period. Quoted market prices or dealer quotes for similar instruments are used for financial assets. Other techniques, such as estimated discounted cash flows, are used to determine fair value for the remaining financial instruments.

The carrying value less impairment provision of trade receivables and payables are assumed to approximate their fair values. The fair value of financial liabilities for disclosure purposes is estimated by discounting the future contractual cash flows at the current market interest rate that is available to the entity for similar financial instruments.

Impairment testing

The entity reviews and tests the carrying value of current and non-current assets when events or changes in circumstances suggest that the carrying amount may not be recoverable. Assets are grouped at the lowest level for which identifiable cash flows are largely independent of cash flows of other assets and liabilities. If there are indications that impairment may have occurred, estimates are prepared of expected future cash flows for each group of assets. Expected future cash flows used to determine the value in use of tangible assets are inherently uncertain and could materially change over time. They are significantly affected by a number of factors including supply demand, together with economic factors such as research units closed as part of the revitalisation process.

Provisions

Provisions were raised and management determined an estimate based on the information available. Additional disclosure of these estimates of provisions are included in note 15 – Provisions.

Post retirement benefits

The present value of the post retirement obligation depends on a number of factors that are determined on an actuarial basis using a number of assumptions. The assumptions used in determining the net cost (income) include the discount rate. Any changes in these assumptions will impact on the carrying amount of post retirement obligations.

ACCOUNTING POLICIES
(CONTINUED)

1.3 Significant judgements and sources of estimation uncertainty (continued)

The entity determines the appropriate discount rate at the end of each year. This is the interest rate that should be used to determine the present value of estimated future cash outflows expected to be required to settle the pension obligations. In determining the appropriate discount rate, the entity considers the interest rates of high-quality corporate bonds that are denominated in the currency in which the benefits will be paid, and that have terms to maturity approximating the terms of the related pension liability.

Other key assumptions for pension obligations are based on current market conditions. Additional information is disclosed in Note 17.

Useful lives of property, plant and equipment and Intangible assets

Management assesses the appropriateness of the useful lives of property, plant and equipment and Intangible assets at the end of each reporting period. The useful lives of motor vehicles; furniture and office equipment; computer equipment; laboratory equipment; certain components of buildings and intangible assets are determined based on the entity's replacement practices for the various assets and factors such as technological innovation.

When the estimated useful life of an asset differs from previous estimates, the change is accounted for as a change in estimate.

Biological assets

The fair value of biological assets is determined by the last selling price per biological animal type.

Inventory

The SAMRC recognises inventory when it is controlled by the entity; as a result of a past event; from which it is probable that future economic benefits or service potential associated with the item will flow to the entity and the cost (or fair value) of the inventory can be measured reliably. Inventory is also recognised when control of the inventory is transferred to the entity.

Inventory is also recognised as an asset when it is in the form of materials or supplies to be consumed or distributed in the rendering of service.

Where inventory is acquired at no cost it is recognised at fair value at the date of acquisition.

Budget judgements

Variance amounts above materiality will be disclosed in note 39.

Disclosure of items

Where the deemed fair value of services in-kind was below materiality the note is not included in the annual financial statements.

1.4 Biological assets that form part of an agricultural activity

The entity recognises biological assets or agricultural produce when, and only when:

- the entity controls the asset as a result of past events;
- it is probable that future economic benefits or service potential associated with the asset will flow to the entity; and
- the fair value or cost of the asset can be measured reliably.

ACCOUNTING POLICIES (CONTINUED)

1.4 Biological assets that form part of an agricultural activity (continued)

Biological assets are measured at their fair value less costs to sell.

Agricultural produce harvested from an entity's biological assets shall be measured at its fair value less estimated costs to sell at point of harvest.

A gain or loss arising on initial recognition of biological assets at fair value less costs to sell and from a change in fair value less estimated costs to sell biological assets is included in surplus or deficit for the period in which it arises.

Where biological assets are acquired at no cost, or for a nominal cost, the cost is determined to be its fair value less costs to sell as at the date of acquisition.

Where fair value cannot be measured reliably, biological assets are measured at cost less any accumulated impairment losses.

Horses are classified as biological assets.

1.5 Property, plant and equipment

Property, plant and equipment are tangible non-current assets (including infrastructure assets) that are held for use in the production or supply of goods or services, rental to others, or for administrative purposes, and are expected to be used during more than one period.

The cost of an item of property, plant and equipment is recognised as an asset when:

- it is probable that future economic benefits or service potential associated with the item will flow to the entity; and
- the cost or fair value of the item can be measured reliably.

Property, plant and equipment is initially measured at cost.

The cost of an item of property, plant and equipment is the purchase price and other costs attributable to bring the asset to the location and condition necessary for it to be capable of operating in the manner intended by management. Trade discounts and rebates are deducted in arriving at the cost. Subsequent costs of replacing part of an item of property, plant and equipment is recognised in the carrying amount of the asset if it is probable that the future economic benefits embodied within the part will flow to the entity and its costs can be measured reliably. The cost of the replaced part is derecognised. The costs of day to day servicing of property, plant and equipment are recognised in the surplus or deficit.

Where an asset is acquired through a non-exchange transaction, its cost is its fair value as at the date of acquisition.

When significant components of an item of property, plant and equipment have different useful lives, they are accounted for as separate items (major components) of property, plant and equipment.

The entity identified the following major components of buildings as generators; buildings; prefabricated buildings; borehole tanks and pumps; water meters; water pipes and air conditioners.

The entity identified the following major components of laboratory equipment as laboratory equipment and irrigation equipment.

ACCOUNTING POLICIES
(CONTINUED)

1.5 Property, plant and equipment (continued)

The entity identified the following major components of furniture and office equipment as furniture and office equipment and signage.

Property, plant and equipment is carried at cost less accumulated depreciation and any impairment losses.

Property, plant and equipment are depreciated on the straight line basis over their expected useful lives to their estimated residual value.

The useful lives of items of property, plant and equipment have been assessed as follows:

ITEM	DEPRECIATION METHOD	AVERAGE USEFUL LIFE
Land (including boreholes)	Not depreciated	Indefinite
Buildings	Straight line	40 – 50 years
Vehicles and containers	Straight line	5 – 10 years
Furniture and office equipment	Straight line	3 – 15 years
Computer equipment	Straight line	5 – 10 years
Generators	Straight line	20 – 30 years
Borehole tanks and pumps	Straight line	10 – 15 years
Air conditioners	Straight line	10 – 15 years
Irrigation equipment	Straight line	10 – 15 years
Signage	Straight line	10 – 15 years
Prefabricated buildings	Straight line	20 – 30 years
Water pipes	Straight line	20 – 30 years
Water meters	Straight line	10 – 15 years
Laboratory equipment	Straight line	5 – 30 years

The items listed above are grouped in land; buildings; vehicles and containers; furniture and office equipment; computer equipment and laboratory equipment classes.

The residual value, the useful life and depreciation method of each asset is reviewed at the end of each reporting date. If the expectations differ from previous estimates, the change is accounted for as a change in accounting estimate. The useful lives of assets are based on management's estimation. The actual useful lives of assets and residual values are assessed annually and may vary depending on a number of factors. In re-assessing asset useful lives, factors such as technology, innovation, product life cycles and maintenance programmes are taken into account. The estimation of residual values of assets determines whether they will be sold or used to the end of their useful lives and what their condition would be like at that time. Residual value assessments consider issues such as, the remaining life of the asset and the estimated amount which the entity would currently obtain.

Each part of an item of property, plant and equipment with a cost that is significant in relation to the total cost of the item is depreciated separately.

The depreciation charge for each period is recognised in surplus or deficit unless it is included in the carrying amount of another asset.

Items of property, plant and equipment are derecognised when the asset is disposed of or when there are no further economic benefits or service potential expected from the use of the asset.

ANNUAL FINANCIAL STATEMENTS FOR THE YEAR ENDED MARCH 31, 2023

ACCOUNTING POLICIES (CONTINUED)

1.5 Property, plant and equipment (continued)

The gain or loss arising from the derecognition of an item of property, plant and equipment is included in surplus or deficit when the item is derecognised. The gain or loss arising from the derecognition of an item of property, plant and equipment is determined as the difference between the net disposal proceeds, if any, and the carrying amount of the item.

Assets which the entity sells via auction when it is obsolete or can no longer be used by the entity, are not accounted for as current assets held for sale. Proceeds from sales of these assets are recognised as profit or loss on disposal of assets. All cash flows on these assets are included in cash flows from investing activities in the cash flow statement.

Reviewing the impairment of assets is performed on an annual basis. Assets impaired as a result of restructuring are not accounted for as non-current assets held for sale as these assets will be transferred to institutions of higher learning.

The entity separately discloses expenditure to repair and maintain property, plant and equipment in the notes to the financial statements (see note 10).

1.6 Intangible assets

An asset is identifiable if it either:

- is separable, i.e. is capable of being separated or divided from an entity and sold, transferred, licensed, rented or exchanged, either individually or together with a related contract, identifiable assets or liability, regardless of whether the entity intends to do so; or
- arises from contractual rights or other legal rights, regardless of whether those rights are transferable or separable from the entity or from other rights and obligations.

An intangible asset is recognised when:

- it is probable that the expected future economic benefits or service potential that are attributable to the asset will flow to the entity; and
- the cost or fair value of the asset can be measured reliably.

Intangible assets are initially recognised at cost.

Where an intangible asset is acquired through a non-exchange transaction, its initial cost at the date of acquisition is measured at its fair value as at that date.

Intangible assets are carried at cost less any accumulated amortisation and any impairment losses. For all intangible assets amortisation is provided on a straight line basis over their useful life.

The amortisation period and the amortisation method for intangible assets are reviewed at each reporting date and any change is accounted for as a change in estimate.

ACCOUNTING POLICIES
(CONTINUED)

1.6 Intangible assets (continued)

Amortisation is provided to write down the intangible assets, on a straight line basis, to their residual values. The estimated useful lives for current and comparative periods are as follows:

ITEM	DEPRECIATION METHOD	AVERAGE USEFUL LIFE
Computer software	Straight line	3 – 10 years

Intangible assets are derecognised:

- on disposal; or
- when no future economic benefits or service potential are expected from its use or disposal.

The gain or loss arising from the derecognition of intangible assets is included in surplus or deficit when the asset is derecognised (unless the Standard of GRAP on leases requires otherwise on a sale and leaseback).

1.7 Investments in controlled entities

Investments in controlled entities are carried at cost less any accumulated impairment. The financial statements of the entity is not consolidated with those of the controlled entities, as the entities have had no trading activities and they are not material.

1.8 Financial instruments

A financial instrument is any contract that gives rise to a financial asset of one entity and a financial liability or a residual interest of another entity.

A concessionary loan is a loan granted to or received by an entity on terms that are not market related.

Credit risk is the risk that one party to a financial instrument will cause a financial loss for the other party by failing to discharge an obligation.

Currency risk is the risk that the fair value or future cash flows of a financial instrument will fluctuate because of changes in foreign exchange rates.

Derecognition is the removal of a previously recognised financial asset or financial liability from an entity's statement of financial position.

The effective interest method is a method of calculating the amortised cost of a financial asset or a financial liability (or group of financial assets or financial liabilities) and of allocating the interest income or interest expense over the relevant period. The effective interest rate is the rate that exactly discounts estimated future cash payments or receipts through the expected life of the financial instrument or, when appropriate, a shorter period to the net carrying amount of the financial asset or financial liability. When calculating the effective interest rate, an entity shall estimate cash flows considering all contractual terms of the financial instrument (for example, prepayment, call and similar options) but shall not consider future credit losses. The calculation includes all fees and amounts paid or received between parties to the contract that are an integral part of the effective interest rate, transaction costs, and all other premiums or discounts. There is a presumption that the cash flows and the expected life of a group of similar financial instruments can be estimated reliably. However, in those rare cases when it is not possible to reliably estimate the cash flows or the expected life of a financial instrument (or group of financial instruments), the entity shall use the contractual cash flows over the full contractual term of the financial instrument (or group of financial instruments).

Fair value is the amount for which an asset could be exchanged, or a liability settled, between knowledgeable willing parties in an arm's length transaction.

ACCOUNTING POLICIES (CONTINUED)

1.8 Financial instruments (continued)

A financial asset is:

- cash;
- a contractual right to:
  - receive cash or another financial asset from another entity; or
  - exchange financial assets or financial liabilities with another entity under conditions that are potentially favourable to the entity.

A financial liability is any liability that is a contractual obligation to:

- deliver cash or another financial asset to another entity; or
- exchange financial assets or financial liabilities under conditions that are potentially unfavourable to the entity.

Interest rate risk is the risk that the fair value or future cash flows of a financial instrument will fluctuate because of changes in market interest rates.

Liquidity risk is the risk encountered by an entity in the event of difficulty in meeting obligations associated with financial liabilities that are settled by delivering cash or another financial asset.

Loan commitment is a firm commitment to provide credit under pre-specified terms and conditions.

Market risk is the risk that the fair value or future cash flows of a financial instrument will fluctuate because of changes in market prices. Market risk comprises three types of risk: currency risk, interest rate risk and other price risk.

Other price risk is the risk that the fair value or future cash flows of a financial instrument will fluctuate because of changes in market prices (other than those arising from interest rate risk or currency risk), whether those changes are caused by factors specific to the individual financial instrument or its issuer, or factors affecting all similar financial instruments traded in the market.

A financial asset is past due when a counterparty has failed to make a payment when contractually due.

Transaction costs are incremental costs that are directly attributable to the acquisition, issue or disposal of a financial asset or financial liability. An incremental cost is one that would not have been incurred if the entity had not acquired, issued or disposed of the financial instrument.

Financial instruments at amortised cost are non-derivative financial assets or non-derivative financial liabilities that have fixed or determinable payments, excluding those instruments that:

- the entity designates at fair value at initial recognition; or
- are held for trading.

Financial instruments at cost are investments in residual interests that do not have a quoted market price in an active market, and whose fair value cannot be reliably measured.

Financial instruments at fair value comprise financial assets or financial liabilities that are:

- derivatives;
- combined instruments that are designated at fair value;
- instruments held for trading. A financial instrument is held for trading if:
  - it is acquired or incurred principally for the purpose of selling or repurchasing it in the near-term; or
  - on initial recognition it is part of a portfolio of identified financial instruments that are managed together and for which there is evidence of a recent actual pattern of short term profit-taking;

ACCOUNTING POLICIES
(CONTINUED)

1.8 Financial instruments (continued)

- non-derivative financial assets or financial liabilities with fixed or determinable payments that are designated at fair value at initial recognition; and
- financial instruments that do not meet the definition of financial instruments at amortised cost or financial instruments at cost.

Classification

The entity has the following types of financial assets (classes and category) as reflected on the face of the statement of financial position or in the notes thereto:

CLASS	CATEGORY
Trade debtors	Financial asset measured at amortised cost
Shares	Held for trading at fair value
Unit trusts	Held for trading at fair value
Cash and cash equivalents	Financial asset measured at amortised cost
Loans and receivables	Financial asset measured at amortised cost
Employee costs in advance	Financial asset measured at amortised cost
Deposits	Financial asset measured at amortised cost

The entity has the following types of financial liabilities (classes and category) as reflected on the face of the statement of financial position or in the notes thereto:

CLASS	CATEGORY
Trade payables	Financial liabilities measured at amortised cost

Initial recognition

The entity recognises a financial asset or a financial liability in its statement of financial position when the entity becomes a party to the contractual provisions of the instrument.

The entity recognises financial assets using trade date accounting.

Initial measurement of financial assets and financial liabilities

The entity measures a financial asset and financial liability initially at its fair value plus, in the case of a financial asset or a financial liability not subsequently measured at fair value, transaction costs that are directly attributable to the acquisition or issue of the financial asset or financial liability.

Subsequent measurement of financial assets and financial liabilities

The entity measures all financial assets and financial liabilities after initial recognition using the following categories:

- Financial instruments at fair value.
- Financial instruments at amortised cost.

All financial assets measured at amortised cost, or cost, are subject to an impairment review. The factors taken into account when considering impairment are solvency and whether the account holder is a slow payer.

ACCOUNTING POLICIES (CONTINUED)

1.8 Financial instruments (continued)

Impairment and uncollectability of financial assets

The entity assesses at the end of each reporting period whether there is any objective evidence that a financial asset or group of financial assets is impaired.

Financial assets are measured at amortised cost:

If there is objective evidence that an impairment loss on financial assets measured at amortised cost has been incurred, the amount of the loss is measured as the difference between the asset's carrying amount and the present value of estimated future cash flows (excluding future credit losses that have not been incurred) discounted at the financial asset's original effective interest rate. The carrying amount of the asset is reduced through the use of an allowance account. The amount of the loss is recognised in surplus or deficit.

If, in a subsequent period, the amount of the impairment loss decreases and the decrease can be related objectively to an event occurring after the impairment was recognised, the previously recognised impairment loss is reversed by adjusting an allowance account. The reversal does not result in a carrying amount of the financial asset that exceeds what the amortised cost would have been had the impairment not been recognised at the date the impairment is reversed. The amount of the reversal is recognised in surplus or deficit.

If there is objective evidence that an impairment loss has been incurred on an investment in a residual interest that is not measured at fair value because its fair value cannot be measured reliably, the amount of the impairment loss is measured as the difference between the carrying amount of the financial asset and the present value of estimated future cash flows discounted at the current market rate of return for a similar financial asset. Such impairment losses are not reversed.

Presentation

Interest relating to a financial instrument is recognised as revenue in surplus or deficit.

Dividends or similar distributions relating to a financial instrument or a component that is a financial liability is recognised as revenue or expense in surplus or deficit.

Losses and gains relating to a financial instrument or a component that is a financial liability is recognised as revenue or expense in surplus or deficit.

1.9 Statutory receivables

Identification

Statutory receivables are receivables that arise from legislation, supporting regulations, or similar means, and require settlement by another entity in cash or another financial asset.

Carrying amount is the amount at which an asset is recognised in the statement of financial position.

The cost method is the method used to account for statutory receivables that requires such receivables to be measured at their transaction amount, plus any accrued interest or other charges (where applicable) and, less any accumulated impairment losses and any amounts derecognised.

The transaction amount (for purposes of this Standard) for a statutory receivable means the amount specified in, or calculated, levied or charged in accordance with, legislation, supporting regulations, or similar means.

ACCOUNTING POLICIES (CONTINUED)

1.9 Statutory receivables (continued)

Recognition

The entity recognises statutory receivables as follows:

- if the transaction is an exchange transaction, using the policy on Revenue from exchange transactions;
- if the transaction is a non-exchange transaction, using the policy on Revenue from non-exchange transactions (Taxes and transfers); or
- if the transaction is not within the scope of the policies listed in the above or another Standard of GRAP, the receivable is recognised when the definition of an asset is met and, when it is probable that the future economic benefits or service potential associated with the asset will flow to the entity and the transaction amount can be measured reliably.

Initial measurement

The entity initially measures statutory receivables at their transaction amount.

Subsequent measurement

The entity measures statutory receivables after initial recognition using the cost method. Under the cost method, the initial measurement of the receivable is changed subsequent to initial recognition to reflect any:

- interest or other charges that may have accrued on the receivable (where applicable);
- impairment losses; and
- amounts derecognised.

Derecognition

The entity derecognises a statutory receivable, or a part thereof, when:

- the rights to the cash flows from the receivable are settled, expire or are waived;
- the entity transfers to another party substantially all of the risks and rewards of ownership of the receivable; or
- the entity, despite having retained some significant risks and rewards of ownership of the receivable, has transferred control of the receivable to another party and the other party has the practical ability to sell the receivable in its entirety to an unrelated third party, and is able to exercise that ability unilaterally and without needing to impose additional restrictions on the transfer. In this case, the entity:
  - derecognise the receivable; and
  - recognise separately any rights and obligations created or retained in the transfer.

The carrying amounts of any statutory receivables transferred are allocated between the rights or obligations retained and those transferred on the basis of their relative fair values at the transfer date. The entity considers whether any newly created rights and obligations are within the scope of the Standard of GRAP on Financial Instruments or another Standard of GRAP. Any difference between the consideration received and the amounts derecognised and, those amounts recognised, are recognised in surplus or deficit in the period of the transfer.

1.10 Taxes

The SAMRC is exempt from income tax in terms of section 10 (1) (cA) (i) of the Income Tax Act (Act No. 58 of 1962).

ANNUAL FINANCIAL STATEMENTS FOR THE YEAR ENDED MARCH 31, 2023

ACCOUNTING POLICIES (CONTINUED)

1.11 Leases

Operating leases – lessor

Operating lease revenue is recognised as revenue on a straight-line basis over the lease term.

Initial direct costs incurred in negotiating and arranging operating leases are added to the carrying amount of the leased asset and recognised as an expense over the lease term on the same basis as the lease revenue.

Income for leases is disclosed under revenue in the statement of financial performance.

Operating leases – lessee

Operating lease payments are recognised as an expense on a straight-line basis over the lease term. The difference between the amounts recognised as an expense and the contractual payments are recognised as a prepayment or liability.

1.12 Impairment of cash-generating assets

Cash-generating assets are assets managed with the objective of generating a commercial return. An asset generates a commercial return when it is deployed in a manner consistent with that adopted by a profit-oriented entity.

Impairment is a loss in the future economic benefits or service potential of an asset, over and above the systematic recognition of the loss of the asset's future economic benefits or service potential through depreciation (amortisation).

Carrying amount is the amount at which an asset is recognised in the statement of financial position after deducting any accumulated depreciation and accumulated impairment losses thereon.

A cash-generating unit is the smallest identifiable group of assets managed with the objective of generating a commercial return that generates cash inflows from continuing use that are largely independent of the cash inflows from other assets or groups of assets.

Costs of disposal are incremental costs directly attributable to the disposal of an asset, excluding finance costs and income tax expense.

Depreciation (Amortisation) is the systematic allocation of the depreciable amount of an asset over its useful life.

Fair value less costs to sell is the amount obtainable from the sale of an asset in an arm's length transaction between knowledgeable, willing parties, less the costs of disposal.

Recoverable amount of an asset or a cash-generating unit is the higher of its fair value less costs to sell and its value in use.

Useful life is either:

(a) the period of time over which an asset is expected to be used by the entity; or

(b) the number of production or similar units expected to be obtained from the asset by the entity.

ACCOUNTING POLICIES
(CONTINUED)

1.13 Impairment of non-cash-generating assets

Cash-generating assets are assets managed with the objective of generating a commercial return. When an asset is deployed in a manner consistent with that adopted by a profit-oriented entity, it generates a commercial return.

Non-cash-generating assets are assets other than cash-generating assets.

Impairment is a loss in the future economic benefits or service potential of an asset, over and above the systematic recognition of the loss of the asset's future economic benefits or service potential through depreciation (amortisation).

Carrying amount is the amount at which an asset is recognised in the statement of financial position after deducting any accumulated depreciation and accumulated impairment losses thereon.

Depreciation (Amortisation) is the systematic allocation of the depreciable amount of an asset over its useful life.

Fair value less costs to sell is the amount obtainable from the sale of an asset in an arm's length transaction between knowledgeable, willing parties, less the costs of disposal.

Recoverable service amount is the higher of a non-cash-generating asset's fair value less costs to sell and its value in use.

Useful life is either:

(a) the period of time over which an asset is expected to be used by the entity; or

(b) the number of production or similar units expected to be obtained from the asset by the entity.

Criteria developed by the annual financial statements to distinguish non-cash-generating assets from cash-generating assets are as follows:

Assets used for administration and in daily operation of the entity is classified as non-cash-generating assets. Where a substantial part of the asset is hired out, the asset is classified as cash generating assets.

Identification

When the carrying amount of a non-cash-generating asset exceeds its recoverable service amount, it is impaired.

The entity assesses at each reporting date whether there is any indication that a non-cash-generating asset may be impaired. If any such indication exists, the entity estimates the recoverable service amount of the asset.

This impairment test is performed at the same time every year. If an intangible asset was initially recognised during the current reporting period, that intangible asset was tested for impairment before the end of the current reporting period.

Value in use

Value in use of non-cash-generating assets is the present value of the non-cash-generating assets remaining service potential.

The present value of the remaining service potential of non-cash-generating assets is determined using the following approach:

ACCOUNTING POLICIES (CONTINUED)

1.13 Impairment of non-cash-generating assets (continued)

Restoration cost approach

Restoration cost is the cost of restoring the service potential of an asset to its pre-impaired level. The present value of the remaining service potential of the asset is determined by subtracting the estimated restoration cost of the asset from the current cost of replacing the remaining service potential of the asset before impairment. The latter cost is determined as the depreciated reproduction or replacement cost of the asset, whichever is lower.

Recognition and measurement

If the recoverable service amount of a non-cash-generating asset is less than its carrying amount, the carrying amount of the asset is reduced to its recoverable service amount. This reduction is an impairment loss.

An impairment loss is recognised immediately in surplus or deficit.

When the amount estimated for an impairment loss is greater than the carrying amount of the non-cash-generating asset to which it relates, the entity recognises a liability only to the extent that is a requirement in the Standards of GRAP.

After the recognition of an impairment loss, the depreciation (amortisation) charge for the non-cash-generating asset is adjusted in future periods to allocate the non-cash-generating asset's revised carrying amount, less its residual value (if any), on a systematic basis over its remaining useful life.

Reversal of an impairment loss

The entity assesses at each reporting date whether there is any indication that an impairment loss recognised in prior periods for a non-cash-generating asset may no longer exist or may have decreased. If any such indication exists, the entity estimates the recoverable service amount of that asset.

An impairment loss recognised in prior periods for a non-cash-generating asset is reversed if there has been a change in the estimates used to determine the asset's recoverable service amount since the last impairment loss was recognised. The carrying amount of the asset is increased to its recoverable service amount. The increase is a reversal of an impairment loss. The increased carrying amount of an asset attributable to a reversal of an impairment loss does not exceed the carrying amount that would have been determined (net of depreciation or amortisation) had no impairment loss been recognised for the asset in prior periods.

A reversal of an impairment loss for a non-cash-generating asset is recognised immediately in surplus or deficit.

After a reversal of an impairment loss is recognised, the depreciation (amortisation) charge for the non-cash-generating asset is adjusted in future periods to allocate the non-cash-generating asset's revised carrying amount, less its residual value (if any), on a systematic basis over its remaining useful life.

1.14 Employee benefits

Employee benefits are all forms of consideration given by SAMRC in exchange for service rendered by employees. An annual valuation of the SAMRC Pension Fund and Post Retirement Medical Aid is performed.

ACCOUNTING POLICIES (CONTINUED)

1.14 Employee benefits (continued)

A qualifying insurance policy is an insurance policy issued by an insurer that is not a related party (as defined in the Standard of GRAP on Related Party Disclosures) of the reporting entity, if the proceeds of the policy can be used only to pay or fund employee benefits under a defined benefit plan and are not available to the reporting entity's own creditors (even in liquidation) and cannot be paid to the reporting entity, unless either:

- the proceeds represent surplus assets that are not needed for the policy to meet all the related employee benefit obligations; or
- the proceeds are returned to the reporting entity to reimburse it for employee benefits already paid.

Termination benefits are employee benefits payable as a result of either:

- an entity's decision to terminate an employee's employment before the normal retirement date; or
- an employee's decision to accept voluntary redundancy in exchange for those benefits.

Short-term employee benefits

Short-term employee benefits are employee benefits (other than termination benefits) that are due to be settled within twelve months after the end of the period in which the employees render the related service.

When an employee has rendered service to the entity during a reporting period, the entity recognises the undiscounted amount of short-term employee benefits expected to be paid in exchange for that service:

- as a liability (accrued expense), after deducting any amount already paid. If the amount already paid exceeds the undiscounted amount of the benefits, the entity recognises that excess as an asset (prepaid expense) to the extent that the prepayment will lead to, for example, a reduction in future payments or a cash refund.

The expected cost of compensated absences is recognised as an expense as the employees render services that increase their entitlement or, in the case of non-accumulating absences, when the absence occurs. The entity measures the expected cost of accumulating compensated absences as the additional amount that the entity expects to pay as a result of the unused entitlement that has accumulated at the reporting date.

The entity recognises the expected cost of bonus, incentive and performance related payments when the entity has a present legal or constructive obligation to make such payments as a result of past events and a reliable estimate of the obligation can be made. A present obligation exists when the entity has no realistic alternative but to make the payments.

Post-employment benefits

Post-employment benefits are employee benefits (other than termination benefits) which are payable after the completion of employment.

SAMRC offers its employees post-employee benefits to the SAMRC Pension Fund.

Post-employment benefits: Defined contribution plans

Defined contribution plans are post-employment benefit plans under which an entity pays fixed contributions into a separate entity (a fund) and will have no legal or constructive obligation to pay further contributions if the fund does not hold sufficient assets to pay all employee benefits relating to employee service in the current and prior periods.

ANNUAL FINANCIAL STATEMENTS FOR THE YEAR ENDED MARCH 31, 2023

ACCOUNTING POLICIES (CONTINUED)

1.14 Employee benefits (continued)

When an employee has rendered service to the entity during a reporting period, the entity recognises the contribution payable to a defined contribution plan in exchange for that service:

- as a liability (accrued expense), after deducting any contribution already paid. If the contribution already paid exceeds the contribution due for service before the reporting date, an entity recognises that excess as an asset (prepaid expense) to the extent that the prepayment will lead to, for example, a reduction in future payments or a cash refund; and
- as an expense, unless another Standard requires or permits the inclusion of the contribution in the cost of an asset.

Where contributions to a defined contribution plan do not fall due wholly within twelve months after the end of the reporting period in which the employees render the related service, they are discounted. The rate used to discount reflects the time value of money. The currency and term of the financial instrument selected to reflect the time value of money is consistent with the currency and estimated term of the obligation.

Post-employment benefits: Defined benefit plans

Defined benefit plans are post-employment benefit plans other than defined contribution plans.

Actuarial gains and losses comprise experience adjustments (the effects of differences between the previous actuarial assumptions and what has actually occurred) and the effects of changes in actuarial assumptions. In measuring its defined benefit liability, the entity recognises actuarial gains and losses in surplus or deficit in the reporting period in which they occur.

Assets held by a long-term employee benefit fund are assets (other than non-transferable financial instruments issued by the reporting entity) that are held by an entity (a fund) that is legally separate from the reporting entity and exists solely to pay or fund employee benefits and are available to be used only to pay or fund employee benefits, are not available to the reporting entity's own creditors (even in liquidation), and cannot be returned to the reporting entity, unless either:

- the remaining assets of the fund are sufficient to meet all the related employee benefit obligations of the plan or the reporting entity; or
- the assets are returned to the reporting entity to reimburse it for employee benefits already paid.

Current service cost is the increase in the present value of the defined benefit obligation resulting from employee service in the current period.

Interest cost is the increase during a period in the present value of a defined benefit obligation which arises because the benefits are one period closer to settlement.

Past service cost is the change in the present value of the defined benefit obligation for employee service in prior periods, resulting in the current period from the introduction of, or changes to, post-employment benefits or other long-term employee benefits. Past service cost may be either positive (when benefits are introduced or changed so that the present value of the defined benefit obligation increases) or negative (when existing benefits are changed so that the present value of the defined benefit obligation decreases). In measuring its defined benefit liability, the entity recognises past service cost as an expense in the reporting period in which the plan is amended.

Plan assets comprise assets held by a long-term employee benefit fund and qualifying insurance policies.

The present value of a defined benefit obligation is the present value, without deducting any plan assets, of expected future payments required to settle the obligation resulting from employee service in the current and prior periods.

ACCOUNTING POLICIES (CONTINUED)

1.14 Employee benefits (continued)

The return on plan assets is interest, dividends or similar distributions and other revenue derived from the plan assets, together with realised and unrealised gains or losses on the plan assets, less any costs of administering the plan (other than those included in the actuarial assumptions used to measure the defined benefit obligation) and less any tax payable by the plan itself.

The entity account not only for its legal obligation under the formal terms of a defined benefit plan, but also for any constructive obligation that arises from the entity's informal practices. Informal practices give rise to a constructive obligation where the entity has no realistic alternative but to pay employee benefits. An example of a constructive obligation is where a change in the entity's informal practices would cause unacceptable damage to its relationship with employees.

The amount recognised as a defined benefit liability is the net total of the following amounts:

- the present value of the defined benefit obligation at the reporting date;
- minus the fair value at the reporting date of plan assets (if any) out of which the obligations are to be settled directly;
- plus any liability that may arise as a result of a minimum funding requirement.

The amount determined as a defined benefit liability may be negative (an asset). The entity measures the resulting asset at the lower of:

- the amount determined above; and
- the present value of any economic benefits available in the form of refunds from the plan or reductions in future contributions to the plan. The present value of these economic benefits is determined using a discount rate which reflects the time value of money.

Any adjustments arising from the limit above is recognised in surplus or deficit.

The entity determines the present value of defined benefit obligations and the fair value of any plan assets with sufficient regularity such that the amounts recognised in the annual financial statements do not differ materially from the amounts that would be determined at the reporting date.

The entity recognises the net total of the following amounts in surplus or deficit, except to the extent that another Standard requires or permits their inclusion in the cost of an asset:

- current service cost;
- interest cost;
- the expected return on any plan assets and on any reimbursement rights;
- actuarial gains and losses;
- past service cost;
- the effect of any curtailments or settlements; and
- the effect of applying the limit on a defined benefit asset (negative defined benefit liability).

The entity uses the Projected Unit Credit Method to determine the present value of its defined benefit obligations and the related current service cost and, where applicable, past service cost. The Projected Unit Credit Method (sometimes known as the accrued benefit method pro-rated on service or as the benefit/years of service method) sees each period of service as giving rise to an additional unit of benefit entitlement and measures each unit separately to build up the final obligation.

Actuarial valuations for GRAP 25 purposes are conducted on an annual basis by independent actuaries separately for each plan. The results of the valuation are updated for any material transactions and other material changes in circumstances (including changes in market prices and interest rates) up to the reporting date.

ANNUAL FINANCIAL STATEMENTS FOR THE YEAR ENDED MARCH 31, 2023

ACCOUNTING POLICIES (CONTINUED)

1.14 Employee benefits (continued)

The entity recognises gains or losses on the curtailment or settlement of a defined benefit plan when the curtailment or settlement occurs. The gain or loss on a curtailment or settlement comprises:

- any resulting change in the present value of the defined benefit obligation; and
- any resulting change in the fair value of the plan assets.

Before determining the effect of a curtailment or settlement, the entity re-measure the obligation (and the related plan assets, if any) using current actuarial assumptions (including current market interest rates and other current market prices).

When it is virtually certain that another party will reimburse some or all of the expenditure required to settle a defined benefit obligation, the right to reimbursement is recognised as a separate asset. The asset is measured at fair value. In all other respects, the asset is treated in the same way as plan assets. In surplus or deficit, the expense relating to a defined benefit plan is not presented as the net of the amount recognised for a reimbursement.

The entity offsets an asset relating to one plan against a liability relating to another plan when the entity has a legally enforceable right to use a surplus in one plan to settle obligations under the other plan and intends either to settle the obligations on a net basis, or to realise the surplus in one plan and settle its obligation under the other plan simultaneously.

Actuarial assumptions

Actuarial assumptions are unbiased and mutually compatible.

Financial assumptions are based on market expectations, at the reporting date, for the period over which the obligations are to be settled.

The rate used to discount post-employment benefit obligations (both funded and unfunded) reflect the time value of money. The currency and term of the financial instrument selected to reflect the time value of money is consistent with the currency and estimated term of the post-employment benefit obligations.

Post-employment benefit obligations are measured on a basis that reflects:

- estimated future salary increases;
- the benefits set out in the terms of the plan (or resulting from any constructive obligation that goes beyond those terms) at the reporting date; and
- estimated future changes in the level of any state benefits that affect the benefits payable under a defined benefit plan, if, and only if, either:
- those changes were enacted before the reporting date; or
- past history, or other reliable evidence, indicates that those state benefits will change in some predictable manner, for example, in line with future changes in general price levels or general salary levels.

Assumptions about medical costs take account of estimated future changes in the cost of medical services, resulting from both inflation and specific changes in medical costs.

Post retirement medical aid obligations

The SAMRC provides post-retirement health care benefits, to some of its employees and their legitimate spouses. The major portion of the liability is funded by an investment policy.

ACCOUNTING POLICIES (CONTINUED)

1.14 Employee benefits (continued)

The entitlement to post-retirement health care benefits is based on the employee remaining in service up to retirement age and the completion of a minimum service period. The expected costs of these benefits are accrued over the period of employment. Independent qualified actuaries carry out valuations of these obligations.

The amount recognised as a liability for other long-term employee benefits is the net total of the following amounts:

- the present value of the defined benefit obligation at the reporting date;
- minus the fair value at the reporting date of plan assets (if any) out of which the obligations are to be settled directly.

The entity shall recognise the net total of the following amounts as expense or revenue, except to the extent that another Standard requires or permits their inclusion in the cost of an asset:

- current service cost;
- interest cost;
- the expected return on any plan assets and on any reimbursement right recognised as an asset;
- actuarial gains and losses, which shall all be recognised immediately;
- past service cost, which shall all be recognised immediately; and
- the effect of any curtailments or settlements.

Termination benefits

The entity recognises termination benefits as a liability and an expense when the entity is demonstrably committed to either:

- terminate the employment of an employee or group of employees before the normal retirement date; or
- provide termination benefits as a result of an offer made in order to encourage voluntary redundancy.

The entity is demonstrably committed to a termination when the entity has a detailed formal plan for the termination and is without realistic possibility of withdrawal. The detailed plan includes [as a minimum]:

- the location, function, and approximate number of employees whose services are to be terminated;
- the termination benefits for each job classification or function; and
- the time at which the plan will be implemented.

Termination benefits are payable whenever an employee's employment is terminated before normal retirement date or whenever an employee accepts voluntary redundancy in exchange for these benefits. The SAMRC recognises termination benefits as an expense when it is demonstrably committed to either terminate the employment of current employees according to a detailed formal plan without the possibility of withdrawal or to provide termination benefits as a result of an offer made to encourage voluntary redundancy. Benefits falling due more than 12 months after reporting date are discounted to present value.

Pension Plan

Contributions to a pension plan in respect of service in a particular period are included in the total cost of employment and are charged to the statement of financial performance in the year in which they relate as part of the cost of employment. The amount recognised in the surplus or deficit for the period under defined benefit plans represents the movement in the present value of the defined benefit obligation and the fair value of the plan assets, after adjusting for contributions paid to the fund, as well as any unrecognised past service costs. Actuarial gains or losses are recognised in the surplus or deficit in the period in which it occurs.

ACCOUNTING POLICIES (CONTINUED)

1.15 Provisions and contingencies

Provisions are recognised when:

- the entity has a present obligation as a result of a past event;
- it is probable that an outflow of resources embodying economic benefits or service potential will be required to settle the obligation; and
- a reliable estimate can be made of the obligation.

The amount of a provision is the best estimate of the expenditure expected to be required to settle the present obligation at the reporting date.

Provisions are measured at the present value of the expenditures expected to be made to settle the obligation using the pre-tax rate that reflects the current market assessments of the time value of money and the risks specific to the obligation. The increase in the provision due to the passage of time is recognised as finance charges.

Where some or all of the expenditure required to settle a provision is expected to be reimbursed by another party, the reimbursement is recognised when, and only when, it is virtually certain that reimbursement will be received if the entity settles the obligation. The reimbursement is treated as a separate asset. The amount recognised for the reimbursement does not exceed the amount of the provision.

Provisions are reviewed at each reporting date and adjusted to reflect the current best estimate. Provisions are reversed if it is no longer probable that an outflow of resources embodying economic benefits or service potential will be required, to settle the obligation.

A provision is used only for expenditures for which the provision was originally recognised.

Provisions are not recognised for future operating deficits.

A constructive obligation to restructure arises only when an entity:

- has a detailed formal plan for the restructuring, identifying at least:
  - the activity/operating unit or part of an activity/operating unit concerned;
  - the principal locations affected;
  - the location, function, and approximate number of employees who will be compensated for services being terminated;
  - the expenditures that will be undertaken; and
  - when the plan will be implemented; and
- has raised a valid expectation in those affected that it will carry out the restructuring by starting to implement that plan or announcing its main features to those affected by it.

Contingent assets and contingent liabilities are not recognised. Contingencies are disclosed in note 41.

1.16 Commitments

Items are classified as commitments when an entity has committed itself to future transactions that will normally result in the outflow of cash.

Commitments for which disclosure is necessary to achieve a fair presentation is disclosed in a note to the financial statements, if both the following criteria are met:

- Contracts should be non-cancelable or only cancelable at significant cost (for example, contracts for computer or building maintenance services); and
- Contracts should relate to something other than the routine, steady, state business of the entity – therefore salary commitments relating to employment contracts commitments are excluded.

ACCOUNTING POLICIES
(CONTINUED)

1.17 Revenue from exchange transactions

Revenue is the gross inflow of economic benefits or service potential during the reporting period when those inflows result in an increase in net assets, other than increases relating to contributions from owners.

An exchange transaction is one in which the entity receives assets or services, or has liabilities extinguished, and directly gives approximately equal value (primarily in the form of goods, services or use of assets) to the other party in exchange.

Fair value is the amount for which an asset could be exchanged, or a liability settled, between knowledgeable, willing parties in an arm's length transaction.

Measurement

Revenue is measured at the fair value of the consideration received or receivable.

Sale of goods

Revenue from the sale of goods is recognised when all the following conditions have been satisfied:

- the entity has transferred to the purchaser the significant risks and rewards of ownership of the goods;
- the entity retains neither continuing managerial involvement to the degree usually associated with ownership nor effective control over the goods sold;
- the amount of revenue can be measured reliably;
- it is probable that the economic benefits or service potential associated with the transaction will flow to the entity; and
- the costs incurred or to be incurred in respect of the transaction can be measured reliably.

Revenue derived from the sale of animal blood; dietary assessment kits and nutritional textbooks and sale of biological assets are classified as sale of goods.

Rendering of services

When the outcome of a transaction involving the rendering of services can be estimated reliably, revenue associated with the transaction is recognised by reference to the stage of completion of the transaction at the reporting date. The outcome of a transaction can be estimated reliably when all the following conditions are satisfied:

- the amount of revenue can be measured reliably;
- it is probable that the economic benefits or service potential associated with the transaction will flow to the entity;
- the stage of completion of the transaction at the reporting date can be measured reliably; and
- the costs incurred for the transaction and the costs to complete the transaction can be measured reliably.

When services are performed by an indeterminate number of acts over a specified time frame, revenue is recognised on a straight line basis over the specified time frame unless there is evidence that some other method better represents the stage of completion. When a specific act is much more significant than any other acts, the recognition of revenue is postponed until the significant act is executed.

When the outcome of the transaction involving the rendering of services cannot be estimated reliably, revenue is recognised only to the extent of the expenses recognised that are recoverable.

Consulting and research service revenue is recognised by reference to the stage of completion of the transaction at the reporting date. Stage of completion is determined by the proportion that costs incurred to date bear to the total estimated costs of the transaction.

ACCOUNTING POLICIES (CONTINUED)

1.17 Revenue from exchange transactions (continued)

Interest, royalties and dividends

Revenue arising from the use by others of entity assets yielding interest, royalties and dividends or similar distributions is recognised when:

- It is probable that the economic benefits or service potential associated with the transaction will flow to the entity, and
- The amount of the revenue can be measured reliably.

Interest is recognised, in surplus or deficit, using the effective interest rate method.

Royalties are recognised as they are earned in accordance with the substance of the relevant agreements.

Dividends or their equivalent distributions are recognised, in surplus or deficit, when the entity's right to receive payment has been established.

Service fees included in the price of the product are recognised as revenue over the period during which the service is performed.

1.18 Revenue from non-exchange transactions

Revenue comprises gross inflows of economic benefits or service potential received and receivable by an entity, which represents an increase in net assets, other than increases relating to contributions from owners.

Conditions on transferred assets are stipulations that specify that the future economic benefits or service potential embodied in the asset is required to be consumed by the recipient as specified or future economic benefits or service potential must be returned to the transferor.

Control of an asset arise when the entity can use or otherwise benefit from the asset in pursuit of its objectives and can exclude or otherwise regulate the access of others to that benefit.

Exchange transactions are transactions in which one entity receives assets or services, or has liabilities extinguished, and directly gives approximately equal value (primarily in the form of cash, goods, services, or use of assets) to another entity in exchange.

Non-exchange transactions are transactions that are not exchange transactions. In a non-exchange transaction, an entity either receives value from another entity without directly giving approximately equal value in exchange, or gives value to another entity without directly receiving approximately equal value in exchange.

Stipulations on transferred assets are terms in laws or regulation, or a binding arrangement, imposed upon the use of a transferred asset by entities external to the reporting entity.

Recognition

An inflow of resources from a non-exchange transaction recognised as an asset is recognised as revenue, except to the extent that a liability is also recognised in respect of the same inflow.

As the entity satisfies a present obligation recognised as a liability in respect of an inflow of resources from a non-exchange transaction recognised as an asset, it reduces the carrying amount of the liability recognised and recognises an amount of revenue equal to that reduction.

Measurement

Revenue from a non-exchange transaction is measured at the amount of the increase in net assets recognised by the entity.

ACCOUNTING POLICIES
(CONTINUED)

1.18 Revenue from non-exchange transactions (continued)

When, as a result of a non-exchange transaction, the entity recognises an asset, it also recognises revenue equivalent to the amount of the asset measured at its fair value as at the date of acquisition, unless it is also required to recognise a liability. Where a liability is required to be recognised it will be measured as the best estimate of the amount required to settle the obligation at the reporting date, and the amount of the increase in net assets, if any, recognised as revenue. When a liability is subsequently reduced, because the taxable event occurs or a condition is satisfied, the amount of the reduction in the liability is recognised as revenue.

Gifts and donations, including goods in-kind

Gifts and donations, including goods in-kind, are recognised as assets and revenue when it is probable that the future economic benefits or service potential will flow to the entity and the fair value of the assets can be measured reliably.

Services in-kind

The entity recognise services in-kind that are significant to its operations and/or service delivery objectives as assets and recognise the related revenue when it is probable that the future economic benefits or service potential will flow to the entity and the fair value of the assets can be measured reliably.

Where services in-kind are not significant to the entity's operations and/or service delivery objectives and/or do not satisfy the criteria for recognition, the entity has not disclosed the nature and type of services in-kind received during the reporting period.

1.19 Revenue recognition for exchange and non-exchange transactions

Revenue represents the parliamentary grant from government as well as external income.

Parliamentary grant (Revenue from non-exchange transactions)

Government grants are recognised when it is probable that the future economic benefit will flow to the SAMRC and these benefits can be measured reliably. The grant is recognised to the extent that there are no further obligations arising from the receipt of the grant. Government grants are assistance by government in the form of transfer of resources in return for compliance with conditions related to operating activities. Grants that compensate the SAMRC for expenses incurred are recognised in surplus or deficit in the same periods in which the expense is recognised.

Revenue other than grants, donations, project revenue and council activities (Revenue from exchange transactions).

Revenue is recognised on the accrual basis. Revenue is recognised when significant risks and rewards of ownership have been transferred.

Research revenue

Revenue is recognised only to the extent of research costs incurred and is probable that it will be recoverable. Advance income received in respect of which no work has been done, is treated as deferred income until such time the expenditure is incurred or the conditions of the grant/contract are met.

Rental income

Rental income from tenants is recognised in the statement of financial performance on a straight line basis over the term of the lease. Lease incentives granted are recognised as an integral part of the total rental income, over the term of the lease.

ACCOUNTING POLICIES (CONTINUED)

1.19 Revenue recognition for exchange and non-exchange transactions (continued)

Deferred income

Deferred income is recognised as revenue to the extent that expenses are incurred and that conditions of the grant are met.

Social outcomes based contracts

Income received from the social investor is recognised in the statement of financial performance when all the contractual commitments are met.

A liability will be recognised once the social outcomes have been verified by the verification agent.

1.20 Borrowing costs

Borrowing costs are interest and other expenses incurred by an entity in connection with the borrowing of funds.

Borrowing costs are recognised as an expense in the period in which they are incurred.

1.21 Translation of foreign currencies

Foreign currency transactions

A foreign currency transaction is recorded, on initial recognition in Rand's, by applying to the foreign currency amount the spot exchange rate between the functional currency and the foreign currency at the date of the transaction.

At each reporting date:

- foreign currency monetary items are translated using the closing rate;
- non-monetary items that are measured in terms of historical cost in a foreign currency are translated using the exchange rate at the date of the transaction; and
- non-monetary items that are measured at fair value in a foreign currency are translated using the exchange rates at the date when the fair value was determined.

Exchange differences arising on the settlement of monetary items or on translating monetary items at rates different from those at which they were translated on initial recognition during the period or in previous annual financial statements are recognised in surplus or deficit in the period in which they arise.

When a gain or loss on a non-monetary item is recognised directly in net assets, any exchange component of that gain or loss is recognised directly in net assets. When a gain or loss on a non-monetary item is recognised in surplus or deficit, any exchange component of that gain or loss is recognised in surplus or deficit.

Cash flows arising from transactions in a foreign currency are recorded in Rands by applying to the foreign currency amount the exchange rate between the Rand and the foreign currency at the date of the cash flow.

1.22 VAT

The SAMRC accounts for VAT on the invoice basis.

The net amount of VAT recoverable, or payable to SARS is reflected on the Statement of Financial Position.

ACCOUNTING POLICIES
(CONTINUED)

1.23 Comparative figures

Where necessary, comparative figures have been reclassified to conform to changes in presentation in the current year.

1.24 Fruitless and wasteful expenditure

Fruitless and wasteful expenditure means expenditure which was made in vain and would have been avoided had reasonable care been exercised.

National Treasury instruction note no. 4 of 2022/2023 which was issued in terms of sections 76(2)(e) to 76(4)(a) and (c) of the PFMA (effective from 3 January 2023).

All expenditure relating to fruitless and wasteful expenditure is recognised as an expense in the statement of financial performance in the year that the expenditure was incurred. The expenditure is classified in accordance with the nature of the expense and where recovered, it is subsequently accounted for as revenue in the statement of financial performance. The entity records the details of all alleged fruitless and wasteful expenditure in the register; investigates the incidents and where appropriate raise a debt. Fruitless and wasteful expenditure is reported monthly to National Treasury and quarterly to the Accounting Authority.

1.25 Irregular expenditure

Irregular expenditure as defined in section 1 of the PFMA is expenditure other than unauthorised expenditure, incurred in contravention of or that is not in accordance with a requirement of any applicable legislation, including –

(a) this Act; or

(b) the State Tender Board Act, 1968 (Act No. 86 of 1968), or any regulations made in terms of the Act; or

(c) any provincial legislation providing for procurement procedures in that provincial government.

National Treasury practice note no. 4 of 2008/2009 and instruction note no. 4 of 2022/2023 which was issued in terms of sections 76(1)(b), (e) and (f), 76(2)(e) and 76(4)(a) and (c) of the PFMA requires the following:

Irregular expenditure that was incurred and identified during the current financial year and which was condoned before year end and/or before finalisation of the financial statements is recorded appropriately in the irregular expenditure register. In such an instance, no further action is required with the exception of updating the note to the annual report.

Irregular expenditure that was incurred and confirmed during the current financial year is recorded in the annual financial statements.

The Accounting Authority may condone irregular expenditure emanating from non-compliance with sections 44 and 56 of the PFMA and in a case where an employee of an entity listed in Schedule 3A to the PFMA, was responsible for exceeding the budget of the public entity.

Irregular expenditure that was identified and confirmed during the current financial year and which was not condoned must be recorded appropriately in the irregular expenditure register. If liability for the irregular expenditure can be attributed to a person, a debt account must be created if such a person is liable in law. Immediate steps will be taken to recover the amount from the person concerned. If recovery is not possible, the accounting authority may write off the amount as debt impairment and disclose such in the annual report. The irregular expenditure register will be updated accordingly.

ACCOUNTING POLICIES (CONTINUED)

1.26 Budget information

General purpose financial reporting by entity shall provide information on whether resources were obtained and used in accordance with the legally adopted budget.

The approved budget is prepared on an accrual basis and presented by functional classification linked to performance outcome objectives.

The approved budget covers the fiscal period from 01/04/2022 to 31/03/2023.

The annual financial statements and the budget are on the same basis of accounting therefore a comparison with the budgeted amounts for the reporting period have been included in the Statement of comparison of budget and actual amounts.

The Statement of comparative and actual information has been included in the annual financial statements as the recommended disclosure when the annual financial statements and the budget are on the same basis of accounting as determined by National Treasury. The Statement of comparison of budget and actual amounts is presented for the revenue and expenses as this is the information submitted to the Executive Authority. The Annual Performance Plan (APP) on the SAMRC intranet reflect the 2022/2023 approved budget.

Comparative information is not required.

1.27 Related parties

The entity operates in a sector currently dominated by entities directly or indirectly owned by the South African Government. As a consequence of the constitutional independence of the three spheres of government in South Africa, only entities within the national sphere of government and are in the same economic entity (having the same executive authority) are considered to be related parties.

Management are those persons responsible for planning, directing and controlling the activities of the entity, including those charged with the governance of the entity in accordance with legislation, in instances where they are required to perform such functions.

Close members of the family of a person is considered to be those family members who may be expected to influence, or be influenced by, that management in their dealings with the entity.

Transactions with related parties are disclosed.

Where those charged with governance are employed by an entity receiving funding or doing business with SAMRC which do not meet the definition of a related party in terms of GRAP 20 these relationships are separately disclosed in the Annual Report.

1.28 Living and non-living resources

Living resources are those resources that undergo biological transformation.

Non-living resources are those resources, other than living resources, that occur naturally and have not been extracted.

Agricultural activity is the management by an entity of the biological transformation and harvest of biological assets for:

(a) sale;

(b) distribution at no charge or for a nominal charge; or

(c) conversion into agriculture produce or into additional biological assets for sale or distribution at no charge or for a nominal charge.

ACCOUNTING POLICIES
(CONTINUED)

1.28 Living and non-living resources (continued)

Biological transformation (for purposes of this Standard) comprises the processes of growth, degeneration, production, and procreation that cause qualitative or quantitative changes in a living resource.

Carrying amount is the amount at which an asset is recognised after deducting any accumulated depreciation and accumulated impairment losses.

Cost is the amount of cash or cash equivalents paid or the fair value of the other consideration given to acquire an asset at the time of its acquisition or development and, where applicable, the amount attributed to the asset when initially recognised in accordance with the specific requirements of other Standards of GRAP.

Depreciation is the systematic allocation of the depreciable amount of an asset over its useful life.

Depreciable amount is the cost of an asset, or other amount substituted for cost, less its residual value.

Fair value is the amount for which an asset could be exchanged, or a liability settled, between knowledgeable, willing parties in an arm's length transaction.

Group of resources means a grouping of living or non-living resources of a similar nature or function in an entity's operations that is shown as a single item for the purpose of disclosure in the annual financial statements.

The residual value of an asset is the estimated amount that an entity would currently obtain from disposal of the asset, after deducting the estimated costs of disposal, if the asset was already of the age and in the condition expected at the end of its useful life.

Useful life is the period over which an asset is expected to be available for use by an entity, or the number of production or similar units expected to be obtained from the asset by an entity.

Recognition

A living resource is recognised as an asset if it is probable that future economic benefits or service potential associated with the asset will flow to the entity, and the cost or fair value of the asset can be measured reliably.

Where the entity holds a living resource that meets the definition of an asset, but which does not meet the recognition criteria, relevant information is disclosed in the notes to the annual financial statements. When the information about the cost or fair value of the living resource becomes available, the entity recognises, from that date, the living resource and apply the measurement principles.

Measurement at recognition

A living resource that qualifies for recognition as an asset is measured at its cost.

Where a living resource is acquired through a non-exchange transaction, its cost is measured at its fair value as at the date of acquisition.

The cost of a living resource comprises its purchase price, including import duties and non-refundable purchase taxes, and any costs directly attributable to bringing the living resource to the location and condition necessary for it to be capable of operating in the manner intended by management.

Cost model

After recognition as an asset, a group of living resources are carried at its cost less any accumulated depreciation and any accumulated impairment losses.

ACCOUNTING POLICIES (CONTINUED)

1.28 Living and non-living resources (continued)

Depreciation

Living resources are depreciated and the depreciation charge for each period is recognised in surplus or deficit unless it is included in the carrying amount of another asset, where appropriate.

The depreciable amount of a living resource is allocated on a systematic basis over its useful life.

The entity assesses at each reporting date whether there is any indication that the entity's expectations about the residual value and the useful life of a living resource have changed since the preceding reporting date. If any such indication exists, the entity revises the expected useful life and/or residual value accordingly. The change(s) is accounted for as a change in an accounting estimate.

In assessing whether there is any indication that the expected useful life of the living resource has changed, the entity considers the following indications:

(a) The use of the living resource has changed, because of the following:
- The entity has changed the manner in which the living resource is used.
- The entity has made a decision to dispose of the living resource in a future reporting period(s) such that this decision changes the expected period over which the living resource will be used.
- Legislation, government policy or similar means have been amended or implemented during the reporting period that have, or will, change the use of the living resource.
- The living resource was idle or retired from use during the reporting period.

(b) The living resource is approaching the end of its previously expected useful life.

(c) There is evidence that the condition of the living resource improved or declined based on assessments undertaken during the reporting period.

(d) The living resource is assessed as being impaired.

In assessing whether there is any indication that the expected residual value of the living resource has changed, the entity considers whether there has been any change in the expected timing of disposal of the living resource, as well as any relevant indicators as noted above.

The depreciation method used reflects the pattern in which the future economic benefits or service potential of the living resource is expected to be consumed by the entity.

The depreciation method applied to a living resource is reviewed at least at each reporting date and, if there has been a significant change in the expected pattern of consumption of the future economic benefits or service potential embodied in the living resource, the method is changed to reflect the changed pattern. Such a change is accounted for as a change in an accounting estimate.

The useful lives of items of living resources have been assessed as follows:

ITEM	DEPRECIATION METHOD	AVERAGE USEFUL LIFE
Rhesus monkeys	Straight-line	25 years
Vervet monkeys	Straight-line	30 years

ACCOUNTING POLICIES
(CONTINUED)

1.28 Living and non-living resources (continued)

Impairment

The entity assesses at each reporting date whether there is an indication that the living resource may be impaired. If any such indication exists, the entity estimates the recoverable amount or the recoverable service amount of the living resource.

Transfers

Transfers from living resources are made when the particular asset no longer meets the definition of a living resource and/or is no longer within the scope of this accounting policy.

Transfers to living resources are made when the asset meets the definition of a living resource.

Derecognition

The carrying amount of a living resource is derecognised on disposal, or when no future economic benefits or service potential are expected from its use or disposal.

The gain or loss arising from the derecognition of a living resource is included in surplus or deficit when the item is derecognised.

1.29 Earmarked funds

The Earmarked funds are donations; bequests from deceased estates or cash received for a limited period to be used for visiting eminent scientists; cancer research or tuberculosis research. The monies received have been allocated to a separate account. The monies are ring-fenced from the cash balance of the SAMRC.

ANNUAL FINANCIAL STATEMENTS FOR THE YEAR ENDED MARCH 31, 2023

NOTES TO THE ANNUAL FINANCIAL STATEMENTS

2. New standards and interpretations

2.1 Standards and interpretations effective and adopted in the current year

There were no new standards and interpretations that were effective in the current financial period.

2.2 Standards and interpretations not yet effective or relevant

The following standards and interpretations have been published and are mandatory for the entity's accounting periods beginning on or after April 1, 2023 or later periods but are not relevant to its operations:

Guideline The Application of Materiality to Financial Statements	Undetermined	Unable to reliably estimate the impact
GRAP 1 (amendments related to materiality) Presentation of Financial Statements	1 April 2023	Unable to reliably estimate the impact
GRAP 1 (amendments related to going concern) Presentation of Financial Statements	Undetermined	Unable to reliably estimate the impact
iGRAP 21 The Effect of Past Decisions on Materiality	1 April 2023	Not expected to impact results but may result in additional disclosure
GRAP 25 Employee Benefits	1 April 2023	Not expected to impact results but may result in additional disclosure
iGRAP 7 The Limit on a Defined Benefit Asset, Minimum Funding Requirements and their Interaction	1 April 2023	Not expected to impact results but may result in additional disclosure
GRAP 104 Financial Instruments (Revised)	1 April 2025	Unable to reliably estimate the impact
Improvements to the Standards of GRAP (2020)	1 April 2023	Unable to reliably estimate the impact

	2023 31 MARCH R	2022 31 MARCH R
3. Financial assets at fair value		
Designated at fair value		
Class 1 Listed shares	809,814	1,033,443
Sanlam demutualisation shares No. of shares 12715 (2022: 12715); Old Mutual demutualisation shares No. of shares 3682 (2022: 3682); Quilter shares No. of shares 924 (2022: 1079) and Nedbank Ltd shares No. of shares 150 (2022:150)		
Class 2 Unit trusts	8,339,199	8,261,343
SIM General Equity Fund R – 18098,19 units (2022: 17570,87 units) and SIM Balanced Fund R – 31602,34 (2022: 30769,78)		
	9,149,013	**9,294,786**
Current assets		
Designated at fair value	9,149,013	9,294,786

Fair value hierarchy of financial assets at fair value

For financial assets recognised at fair value, disclosure is required of a fair value hierarchy which reflects the significance of the inputs used to make the measurements. The fair value hierarchy has the following levels:

Level 1 represents those assets which are measured using unadjusted quoted prices in active markets for identical assets. Quoted selling price per share at 31 March 2023 (31 March 2022) is used.

NOTES TO THE ANNUAL FINANCIAL STATEMENTS (CONTINUED)

	2023 31 MARCH R	2022 31 MARCH R

3. Financial assets at fair value (continued)

Level 2 applies inputs other than quoted prices that are observable for the assets either directly (i.e. as prices) or indirectly (i.e. derived from prices). The valuation certificate received from Sanlam indicating the unit balance and price per unit and market value.

Level 3 applies inputs which are not based on observable market data.

Level 1		
Class 1 Listed shares	809,814	1,033,443
Class 2 Unit trusts	8,339,199	8,261,343
	9,149,013	**9,294,786**

The entity has not reclassified any financial assets from cost or amortised cost to fair value, or from fair value to cost or amortised cost during the current or prior period.

The number of Quilter was reduced by 155 shares due to the B Share Scheme and Share Consolidation that was implemented on 23 & 24 May 2022.

Reconciliation of financial assets at fair value through surplus or deficit measured in level 1
Reconciliation of financial assets at fair value through surplus or deficit measured in level 1 – March 2023

	OPENING BALANCE	GAINS OR LOSSES IN SURPLUS OR DEFICIT	PURCHASES	SALES	CLOSING BALANCE
Class 1 Listed shares	1,033,443	(219,299)	–	(4,330)	809,814
Class 2 Unit trusts	8,261,343	(148,165)	226,021	–	8,339,199
	9,294,786	**(367,464)**	**226,021**	**(4,330)**	**9,149,013**

Reconciliation of financial assets at fair value through surplus or deficit measured in level 1 – March 2022

	OPENING BALANCE	GAINS OR LOSSES IN SURPLUS OR DEFICIT	PURCHASES	CLOSING BALANCE
Class 1 Listed shares	852,840	172,601	8,002	1,033,443
Class 2 Unit trusts	7,194,864	930,696	135,783	8,261,343
	8,047,704	**1,103,297**	**143,785**	**9,294,786**

ANNUAL FINANCIAL STATEMENTS FOR THE YEAR ENDED MARCH 31, 2023

NOTES TO THE ANNUAL FINANCIAL STATEMENTS (CONTINUED)

	2023 31 MARCH R	2022 31 MARCH R
4. Receivables from exchange transactions		
Trade and research grant debtors	111,904,934	45,485,025
Employee costs in advance	225,864	48,787
Deposits	546,661	743,125
	112,677,459	**46,276,937**

The increase in receivables from exchange transactions is attributed to higher funder/grantor debtors. There is an increase in employee costs in advance and a decrease in deposits.

Credit quality of trade debtors

The credit quality of research grant debtors that are neither past nor due nor impaired can be assessed by reference to external credit ratings (if available) or to historical information about the specific debtor.

Trade and other receivables

Trade and research grant receivables which are less than one month past due are not considered to be impaired. At March 31, 2023: R 6,856,561 (2022: R5,507,303) were past due but not impaired.

The ageing of amounts past due but not impaired is as follows:

1 month past due	6,856,561	1,233,356
2 months past due	–	957
3 months past due	–	4,272,990

NOTES TO THE ANNUAL FINANCIAL STATEMENTS (CONTINUED)

	2023 31 MARCH R	2022 31 MARCH R
4. Receivables from exchange transactions (continued)		
Trade and other receivables impaired		
The amount of the provision was R626,312 as of March 31, 2023 (2022: R394,366). All debtor balances are reviewed for impairment. Impairment considerations include solvency of debtor and recoverability of amount owed. Employee costs in advance are not considered for impairment as these amounts are recovered/processed within 30 days.		
Aged as follows:		
1 month but less than 2 months past due	–	412
2 months but less than 3 months past due	–	412
More than 3 months past due	626,312	393,542
The carrying amount of trade debtors are denominated in the following currencies:		
Rand	104,469,514	31,446,510
US Dollar	7,435,420	13,626,092
Euro	–	412,423
	111,904,934	**45,485,025**
Reconciliation of provision for impairment of trade and other receivables		
Opening balance	394,366	128,592
Provision for impairment	626,312	394,366
Unused amounts reversed	(394,366)	(128,592)
	626,312	**394,366**

5. Receivables from non-exchange transactions

Research grant debtors	5,517,069	3,129,990

At March 31, 2023 there were funder/grantor non-exchange debtors and accrued income (March 31, 2022 there were funder/grantor non-exchange debtors and accrued income).

ANNUAL FINANCIAL STATEMENTS FOR THE YEAR ENDED MARCH 31, 2023

NOTES TO THE ANNUAL FINANCIAL STATEMENTS (CONTINUED)

	2023 31 MARCH R	2022 31 MARCH R
5. Receivables from non-exchange transactions (continued)		
Receivables from non-exchange transactions past due but not impaired		
Research grant receivables from non-exchange transactions which are less than one month past due are not considered to be impaired. At March 31, 2023, RNil (2022: R2,550,000) were past due but not impaired.		
1 month past due	–	2,550,000
Receivables from non-exchange transactions impaired		
The amount of the provision was RNil as at March 31, 2023 (2022: RNil), the amounts owing are considered fully recoverable.		
The carrying amount of other receivables from non-exchange transactions are denominated in the following currencies:		
Rand	2,008,529	3,129,990
Pound sterling	3,508,540	–
	5,517,069	**3,129,990**
6. VAT receivable		
VAT	16,208,647	19,985,200

7. Prepayments

Prepayments – other relate to expenditure paid in advance for subscriptions; membership fees; annual computer licenses; computer software updates and maintenance; computer warranties; insurance; conference registrations and advance payments for equipment.

Subsistence and travel advances	361,605	317,492
Prepayments – other	10,657,934	12,220,242
	11,019,539	**12,537,734**

The decrease in prepayments – other is mainly as a result of a decrease in computer software updates and maintenance and computer warranties paid during the period under review.

NOTES TO THE ANNUAL FINANCIAL STATEMENTS (CONTINUED)

	2023 31 MARCH R	2022 31 MARCH R
8. Cash and cash equivalents		
Cash and cash equivalents consist of:		
Cash on hand	35,203	27,964
Bank balances	719,649,165	695,568,935
	719,684,368	**695,596,899**
Analysis of bank balances		
ABSA and Standard Bank	9,410,213	5,289,539
ABSA funder accounts	13,427,279	30,252,335
First National Bank	112,792	254,583
Cash at the Reserve Bank	696,698,881	659,772,478
	719,649,165	**695,568,935**

The cash at the Reserve Bank includes funds for the Botha Trust; Bruhns Trust; Melville Douglas Trust; Q&S Abdool Karim Trust; FJ Kleynhans Trust and Motor vehicle reserve fund.

The Motor vehicle reserve fund was established to provide self-insurance of motor vehicles with a low market value.

Motor vehicle reserve fund		
Balance at beginning of year	4,609,242	4,359,922
Allocation for the year	245,570	249,320
	4,854,812	**4,609,242**

9. Biological assets that form part of an agricultural activity

	MARCH 2023		MARCH 2022	
	COST/ VALUATION	CARRYING VALUE	COST/ VALUATION	CARRYING VALUE
Bearer mature biological assets	25,000	25,000	50,000	50,000

Reconciliation of biological assets that form part of an agricultural activity – March 2023

	OPENING BALANCE	DISPOSALS	TOTAL
Bearer mature biological assets	50,000	(25,000)	25,000

ANNUAL FINANCIAL STATEMENTS FOR THE YEAR ENDED MARCH 31, 2023

NOTES TO THE ANNUAL FINANCIAL STATEMENTS (CONTINUED)

9. Biological assets that form part of an agricultural activity (continued)

Reconciliation of biological assets that form part of an agricultural activity – March 2022

	OPENING BALANCE	DISPOSALS	TOTAL
Bearer mature biological assets	80,000	(30,000)	50,000

SAMRC holds horses as biological assets, horse blood is sold to laboratories when required.

All activities are monitored and controlled to ensure humane treatment of animals.

The last selling price per biological animal type is used to determine fair value.

	2023 31 MARCH R	2022 31 MARCH R
Fair value less costs to sell of biological assets during the period	25,000	50,000

10. Property, plant and equipment

	MARCH 2023			MARCH 2022		
	COST/ VALUATION	ACCUMULATED DEPRECIATION AND ACCUMULATED IMPAIRMENT	CARRYING VALUE	COST/ VALUATION	ACCUMULATED DEPRECIATION AND ACCUMULATED IMPAIRMENT	CARRYING VALUE
Land	1,769,181	–	1,769,181	1,769,181	–	1,769,181
Buildings	192,865,534	(52,383,395)	140,482,139	177,073,498	(47,995,377)	129,078,121
Vehicles and containers	21,247,422	(13,892,295)	7,355,127	21,404,176	(13,611,570)	7,792,606
Furniture and office equipment	56,401,496	(26,508,378)	29,893,118	51,226,538	(24,617,575)	26,608,963
Computer equipment	84,118,622	(44,644,281)	39,474,341	86,634,386	(48,599,841)	38,034,545
Laboratory equipment	98,889,508	(42,186,818)	56,702,690	89,036,651	(38,786,316)	50,250,335
Total	**455,291,763**	**(179,615,167)**	**275,676,596**	**427,144,430**	**(173,610,679)**	**253,533,751**

Reconciliation of property, plant and equipment – March 2023

	OPENING BALANCE	ADDITIONS	DISPOSALS	DEPRE-CIATION	IMPAIRMENT LOSS	IMPAIRMENT REVERSAL	TOTAL
Land	1,769,181	–	–	–	–	–	1,769,181
Buildings	129,078,121	16,781,950	(281,356)	(4,929,685)	(247,490)	80,599	140,482,139
Vehicles and containers	7,792,606	552,805	(257,478)	(915,292)	(60,714)	243,200	7,355,127
Furniture and office equipment	26,608,963	6,404,921	(298,493)	(2,764,215)	(642,679)	584,621	29,893,118
Computer equipment	38,034,545	8,420,800	(592,477)	(7,977,236)	(309,430)	1,898,139	39,474,341
Laboratory equipment	50,250,335	13,558,522	(1,010,213)	(5,801,551)	(1,313,208)	1,018,805	56,702,690
	253,533,751	**45,718,998**	**(2,440,017)**	**(22,387,979)**	**(2,573,521)**	**3,825,364**	**275,676,596**

NOTES TO THE ANNUAL FINANCIAL STATEMENTS (CONTINUED)

10. Property, plant and equipment (continued)

Reconciliation of property, plant and equipment – March 2022

	OPENING BALANCE	ADDITIONS	DISPOSALS	DEPRECIATION	IMPAIRMENT LOSS	IMPAIRMENT REVERSAL	TOTAL
Land	1,769,181	–	–	–	–	–	1,769,181
Buildings	107,404,081	25,914,923	(186,057)	(4,117,903)	(82,717)	145,794	129,078,121
Vehicles and containers	6,261,731	2,724,919	(149,771)	(898,794)	(145,479)	–	7,792,606
Furniture and office equipment	21,076,873	8,474,881	(157,327)	(2,324,917)	(555,630)	95,083	26,608,963
Computer equipment	35,222,395	13,118,915	(378,430)	(7,926,103)	(2,025,674)	23,442	38,034,545
Laboratory equipment	49,740,420	8,499,695	(137,761)	(5,405,388)	(2,743,014)	296,383	50,250,335
	221,474,681	**58,733,333**	**(1,009,346)**	**(20,673,105)**	**(5,552,514)**	**560,702**	**253,533,751**

Other information

IMPAIRED ASSETS MARCH 2023	SAMRC INTRAMURAL UNITS
Property, plant and equipment – Laboratory equipment	4,140,374
Property, plant and equipment – Computer equipment	510,144
Property, plant and equipment – Furniture and office equipment	791,522
Property, plant and equipment – Buildings	256,581
Property, plant and equipment – Vehicles	189,177
	5,887,798

IMPAIRED ASSETS MARCH 2022	SAMRC INTRAMURAL UNITS
Property, plant and equipment – Laboratory equipment	3,845,971
Property, plant and equipment – Computer equipment	2,098,853
Property, plant and equipment – Furniture and office equipment	733,464
Property, plant and equipment – Buildings	89,689
Property, plant and equipment – Vehicles	371,664
	7,139,641

During the period under review various intra-mural units and platforms identified items of property, plant and equipment that would be used for future research projects, these items were impaired. The items are stored at a research site or at the unit/ platform.

All items of property, plant and equipment are owned by the entity.

There are no restrictions on the title of Property, plant and equipment.

ANNUAL FINANCIAL STATEMENTS FOR THE YEAR ENDED MARCH 31, 2023

NOTES TO THE ANNUAL FINANCIAL STATEMENTS (CONTINUED)

	2023 31 MARCH R	2022 31 MARCH R

10. Property, plant and equipment (continued)

Details of properties

Property, plant and equipment in the process of being constructed or developed

Cumulative expenditure recognised in the carrying value of property, plant and equipment

Buildings	6,069,528	14,965,309

Reconciliation of Work-in-Progress March 2023

	INCLUDED WITHIN INFRASTRUCTURE	TOTAL
Opening balance	14,965,309	14,965,309
Additions/capital expenditure	4,872,203	4,872,203
Other movements [costs capitalised]	(13,767,984)	(13,767,984)
	6,069,528	**6,069,528**

Reconciliation of Work-in-Progress March 2022

	INCLUDED WITHIN INFRASTRUCTURE	TOTAL
Opening balance	7,819,814	7,819,814
Additions/capital expenditure	7,145,495	7,145,495
	14,965,309	**14,965,309**

Expenditure incurred to repair and maintain property, plant and equipment

Expenditure incurred to repair and maintain property, plant and equipment included in Statement of Financial Performance

Contracted services	16,235,908	11,955,177

NOTES TO THE ANNUAL FINANCIAL STATEMENTS (CONTINUED)

11. Intangible assets

	MARCH 2023			MARCH 2022		
	COST/ VALUATION	ACCUMULATED AMORTISATION AND ACCUMULATED IMPAIRMENT	CARRYING VALUE	COST/ VALUATION	ACCUMULATED AMORTISATION AND ACCUMULATED IMPAIRMENT	CARRYING VALUE
Computer software	25,185,267	(10,962,225)	14,223,042	22,379,601	(7,349,916)	15,029,685

Reconciliation of intangible assets – March 2023

	OPENING BALANCE	ADDITIONS	AMORTISATION	TOTAL
Computer software	15,029,685	2,805,666	(3,612,309)	14,223,042

Reconciliation of intangible assets – March 2022

	OPENING BALANCE	ADDITIONS	DISPOSALS	AMORTISATION	TOTAL
Computer software	15,279,797	3,820,064	(882,173)	(3,188,003)	15,029,685

There are no restrictions on the title of intangible assets.

12. Living Resources

	MARCH 2023			MARCH 2022		
	COST/ VALUATION	ACCUMULATED DEPRECIATION AND ACCUMULATED IMPAIRMENT	CARRYING VALUE	COST/ VALUATION	ACCUMULATED DEPRECIATION AND ACCUMULATED IMPAIRMENT	CARRYING VALUE
Rhesus monkeys	939,805	(303,431)	636,374	1,005,705	(365,785)	639,920
Vervet monkeys	829,814	(304,041)	525,773	1,315,596	(598,619)	716,977
Total	**1,769,619**	**(607,472)**	**1,162,147**	**2,321,301**	**(964,404)**	**1,356,897**

Reconciliation of living resources – March 2023

	OPENING BALANCES	ADDITIONS	DISPOSALS	DEPRECIATION	TOTAL
Rhesus monkeys	639,920	114,401	(73,705)	(44,242)	636,374
Vervet monkeys	716,977	42,808	(191,161)	(42,851)	525,773
	1,356,897	**157,209**	**(264,866)**	**(87,093)**	**1,162,147**

Reconciliation of living resources – March 2022

	OPENING	ADDITIONS	DISPOSALS BALANCE	DEPRECIATION	TOTAL
Rhesus monkeys	700,813	76,267	(103,226)	(33,934)	639,920
Vervet monkeys	717,777	96,318	(56,372)	(40,746)	716,977
	1,418,590	**172,585**	**(159,598)**	**(74,680)**	**1,356,897**

The last selling price per animal type was used to determine the fair value as there is not an active market for these animals.

ANNUAL FINANCIAL STATEMENTS FOR THE YEAR ENDED MARCH 31, 2023

NOTES TO THE ANNUAL FINANCIAL STATEMENTS (CONTINUED)

13. Investments in controlled entities

NAME OF COMPANY	HELD BY	% HOLDING MARCH 2023	% HOLDING MARCH 2022	CARRYING AMOUNT MARCH 2023	CARRYING AMOUNT MARCH 2022
Medres (Pty) Ltd	SAMRC	100.00%	100.00%	1	1
Jirehsa Medical (Pty) Ltd	Medres (Pty) Ltd	42.00%	42.00%	1	1
				2	**2**

The carrying amounts of controlled entities are shown net of impairment losses.

The financial statements of Medres (Pty) Ltd and Jirehsa Medical (Pty) Ltd have not been consolidated with those of the SAMRC, as they are not considered material in the context of SAMRC.

Controlled entities with less than 50% voting powers held

Although the entity holds less than 50% of the voting powers in Jirehsa Medical (Pty) Ltd the investment is considered a controlled entity because SAMRC has the power to govern the financial and operating policies of Jirehsa Medical (Pty) Ltd.

14. Payables from exchange transactions

	2023 31 MARCH R	2022 31 MARCH R
Trade payables	78,405,009	107,123,293
Leave accrual	20,902,587	22,089,407
Accruals	67,013,717	33,506,709
Interest due to funders	169,134	130,178
	166,490,447	**162,849,587**

The increase in payables from exchange transactions is attributed to amounts due in respect of grants awarded.

The carrying amount of trade payables are denominated in the following currencies:

Rand	76,471,247	105,322,150
US Dollar	1,748,699	1,682,402
Pound Sterling	185,063	19,789
Euro	–	98,952
	78,405,009	**107,123,293**

Leave accrual		
Balance at the beginning of the year	22,089,407	26,404,111
Leave payouts	(9,202,628)	(9,454,826)
Movement recognised in surplus or deficit	8,015,808	5,140,122
	20,902,587	**22,089,407**

NOTES TO THE ANNUAL FINANCIAL STATEMENTS (CONTINUED)

15. Provisions

Reconciliation of provisions – March 2023

	OPENING BALANCE	ADDITIONS	UTILISED DURING THE YEAR	REVERSED DURING THE YEAR	TOTAL
Provision for legal fees	929,019	–	–	–	929,019
Provision for collaborative research	958,000	–	(958,000)	–	–
Provision for performance bonus	5,897,840	6,432,869	(5,856,321)	(41,519)	6,432,869
Other provisions	2,866,561	3,101,721	(2,256,449)	–	3,711,833
	10,651,420	**9,534,590**	**(9,070,770)**	**(41,519)**	**11,073,721**

Reconciliation of provisions – March 2022

	OPENING BALANCE	ADDITIONS	UTILISED DURING THE YEAR	REVERSED DURING THE YEAR	TOTAL
Provision for legal fees	929,019	–	–	–	929,019
Provision for collaborative research	327,500	958,000	(100,000)	(227,500)	958,000
Provision for performance bonus	5,048,064	5,897,840	(5,026,212)	(21,852)	5,897,840
Other provisions	2,092,893	2,082,369	(630,304)	(678,397)	2,866,561
	8,397,476	**8,938,209**	**(5,756,516)**	**(927,749)**	**10,651,420**

Collaborative research costs

At 31 March 2023 there is no provision for collaborative research grants. The grants were settled during the period under review. The March 2022 self initiated grants were paid during the period under review (March 2022: One grant was paid and two grants were cancelled. Self initiated grants were provided for as the institution has not submitted its audit report for the previous year or the institution did not respond to the request to submit the invoice).

Provision for legal fees

The legal fees provision relates to the estimated legal costs that is due to NEHAWU regarding a previous bonus dispute.

Other provisions

The other provisions at year-end relate to the repayment of unspent grant funds to the National Institute of Health and the Department of Labour assessment for the claim for occupational injury on duty assessment for 2023 (COIDA). The estimate for the Department of Labour assessment for the claim for occupational injury on duty assessment for 2022 was paid during the period under review and a portion of the retention held for building works was paid. The other provisions that relate to research units that closed during the rationalisation process were reversed during the period under review. (March 2022: The other provisions relate to research units that closed during the rationalisation process; the Department of Labour assessment for the claim for occupational injury on duty assessment for 2022 (COIDA) and repayment of grant / contract funds the National Institute of Health and retention payable on building works).

Provision for performance bonus

The performance bonus cycle was changed after discussions and agreement with the union. The Accounting Authority approved the change in bonus cycle which will result in payments being made after the financial year end. The amount reflected is the 2022/2023 provision for performance bonuses.

ANNUAL FINANCIAL STATEMENTS FOR THE YEAR ENDED MARCH 31, 2023

NOTES TO THE ANNUAL FINANCIAL STATEMENTS (CONTINUED)

	2023 31 MARCH R	2022 31 MARCH R
16. Deferred income		
The increase in deferred income can be attributed to the following contract funds received in advance: Department of Science and Technology; Department of Health; The Elma Philanthrope; Michelle & Susan Dell Foundation; Global Fund; MRC UK; EDCTP; The Chan – Soon Shiong Family Foundation and Bill & Melinda Gates Foundation.		
Deferred income	549,632,730	450,502,887
Summary of deferred income		
Research grants received in advance	549,433,333	450,188,137
Other funds received in advance	199,397	314,750
	549,632,730	**450,502,887**
17. Employee benefit obligations		
Post retirement medical aid obligation	5,527,000	6,343,000
Pension fund – Defined benefit (asset)	(6,494,000)	(4,882,000)
Net (asset) liability	**(967,000)**	**1,461,000**

Post retirement benefits

Post retirement medical aid plan

SAMRC took a compulsory insurance policy in order to fund post retirement medical obligations of its ex-employees. Given the nature of the policy, it is appropriate to treat this as a plan asset. Certain assets have been allocated specifically for the purpose of covering the post retirement medical aid defined benefit liability. The defined benefit medical liability has been recognised and accounted for under the requirements of GRAP 25 – Employee Benefits. The assets have been accounted for in terms of the requirements of the accounting standards to which they relate and not in terms of GRAP 25 because the plan is not registered. The relevant assets are included in the statement of financial position.

Pension funds

SAMRC personnel are members of the following pension funds:

- State Pension Fund (Associated institutions – AIPF) (Act No. 51 of 1963)
- State Pension fund for temporary employees (Act No. 75 of 1979)
- SAMRC Pension fund (since January 1994)

(a) The first two funds were established by Law and are regulated by the respective Acts.

(b) The last-named fund is regulated by the Pension Fund Act and is managed by an independent Board of Trustees. The SAMRC Pension fund was actuarially valued at 1 April 2020. Next statutory valuation for the fund is 1 April 2023.

(c) The first two funds offer defined benefits to staff. With regard to the SAMRC Pension fund, some members are on a defined benefit scheme, while the remainder are on a defined contribution scheme.

The SAMRC Pension Fund and the Post retirement Medical Aid Plan are valued annually in compliance with GRAP 25.

NOTES TO THE ANNUAL FINANCIAL STATEMENTS (CONTINUED)

	2023 31 MARCH R	2022 31 MARCH R
17. Employee benefit obligations (continued)		
Post retirement medical aid plan		
The amounts recognised in the statement of financial position are as follows:		
Carrying value		
Present value of the defined benefit obligation-wholly unfunded	(1,226,000)	(1,163,000)
Present value of the defined benefit obligation-partly or wholly funded	(18,436,000)	(19,219,000)
Fair value of plan assets	14,135,000	14,039,000
Net liability	**(5,527,000)**	**(6,343,000)**
Changes in the present value of the defined benefit obligation are as follows:		
Opening balance	20,382,000	21,488,000
Interest costs	1,881,000	1,964,000
Benefits paid	(2,227,000)	(2,337,000)
Actuarial (gains)	(374,000)	(733,000)
Closing balance	**19,662,000**	**20,382,000**
Net expense recognised in the statement of financial performance		
Interest cost	1,881,000	1,964,000
Expected return on plan assets	(1,267,000)	(1,319,000)
Contributions by employer	(1,044,000)	(584,000)
Recognised actuarial (gains)	(386,000)	(432,000)
Total included in employee related cost	**(816,000)**	**(371,000)**
Calculation of actuarial gains and losses		
Actuarial (gains) – Obligation	(374,000)	(733,000)
Actuarial losses (gains) – Plan assets	(12,000)	301,000
	(386,000)	**(432,000)**
Changes in the fair value of plan assets are as follows:		
Opening balance	14,039,000	14,774,000
Actuarial gains (losses)	12,000	(301,000)
Expected return on plan assets	1,267,000	1,319,000
Contributions by employer	1,044,000	584,000
Benefits paid	(2,227,000)	(2,337,000)
Closing balance	**14,135,000**	**14,039,000**

The entity expects to contribute RNil to its defined benefit plan in the following financial year.

The entity will investigate the options available to eliminate the net liability as far as possible.

ANNUAL FINANCIAL STATEMENTS FOR THE YEAR ENDED MARCH 31, 2023

NOTES TO THE ANNUAL FINANCIAL STATEMENTS (CONTINUED)

	2023 31 MARCH R	2022 31 MARCH R
17. Employee benefit obligations (continued)		
Key assumptions used		
Assumptions used at the reporting date:		
Discount rates used	10.10 %	9.80%
General increases to medical aid subsidy	7.00 %	7.50%
Expected rate of return on assets	10.10 %	9.80%
Proportion of continuing membership at retirement	100.00 %	100.00%
Proportion of retiring members who are married	80.00 %	80.00%
Retirement age for staff who joined prior to 1 May 1998	65	65
Retirement age for staff who joined after 1 May 1998	65	65

The valuation is based on the Projected Unit Credit valuation method.

The expected rate of return on plan assets is based on market expectations, at the beginning of the period, for returns over the entire life of the related obligation.

The discount rate has been determined by reference to market yields at the balance sheet date of South African long-term bonds.

Other assumptions

Assumed healthcare cost trends rates have a significant effect on the amounts recognised in surplus or deficit. A one percentage point change in assumed healthcare cost trends rates would have the following effects:

	IMPACT ON LIABILITY RM	% INCREASE/ DECREASE
March 2023		
Assumptions as above	19,662	
Discount rate – increase by 1% p.a.	18,452	(6)
Discount rate – decreases by 1% p.a.	21,033	7
Medical inflation – increases by 1% p.a.	20,958	7
Medical inflation – decreases by 1% p.a.	18,524	(6)
March 2022		
Assumptions as above	20,382	
Discount rate – increase by 1% p.a.	19,042	(7)
Discount rate – decreases by 1% p.a.	21,912	8
Medical inflation – increases by 1% p.a.	21,823	7
Medical inflation – decreases by 1% p.a.	19,100	(6)

Amounts for the current period and previous four years are as follows:

	2023	2022	2021	2020	2019
Defined benefit obligation – partially or wholly funded	18,436,000	19,219,000	20,320,000	21,314,000	24,753,000
Defined benefit obligation wholly unfunded	1,226,000	1,163,000	1,168,000	1,208,000	1,231,000
Plan assets	14,135,000	14,039,000	14,774,000	14,558,000	17,512,000
(Deficit) in the plan	(5,527,000)	(6,343,000)	(6,714,000)	(7,964,000)	(8,472,000)

NOTES TO THE ANNUAL FINANCIAL STATEMENTS (CONTINUED)

	2023 31 MARCH R	2022 31 MARCH R
17 Employee benefit obligations (continued)		
Pension funds		
Defined benefit obligation – Wholly funded		
Present value of obligation	(83,039,000)	(82,304,000)
Fair value of plan assets	89,533,000	87,186,000
Net Asset	**6,494,000**	**4,882,000**
Changes in the present value of the defined benefit obligation are as follows:		
Opening defined benefit obligation	82,304,000	85,789,000
Benefits paid	(7,314,000)	(17,566,000)
Service cost	2,493,000	2,626,000
Interest cost	8,816,000	8,982,000
Actuarial (gains) losses	(3,753,000)	1,913,000
Member contributions	925,000	1,019,000
Re-insurance premiums	(299,000)	(312,000)
Expenses	(133,000)	(147,000)
Closed defined benefit obligation closing balance	**83,039,000**	**82,304,000**
Changes in the fair value of plan assets are as follows:		
Opening fair value of plan assets after limitation	87,186,000	93,817,000
Contributions – Employer	2,654,000	2,926,000
Contributions – Plan participants	925,000	1,019,000
Benefits paid	(7,314,000)	(17,566,000)
Expected return on plan assets	9,191,000	9,719,000
Actuarial (losses)	(2,677,000)	(2,270,000)
Re-insurance premiums	(299,000)	(312,000)
Expenses	(133,000)	(147,000)
Closing fair value of plan assets	**89,533,000**	**87,186,000**
Calculation of actuarial gains and losses		
Actuarial losses (gains) – Obligation	(3,753,000)	1,913,000
Actuarial losses – Plan assets	2,677,000	2,270,000
	(1,076,000)	**4,183,000**
Staff costs includes the following in respect of the defined benefit pension plan:		
Current service cost	2,493,000	2,626,000
Interest cost	8,816,000	8,982,000
Expected return on plan assets	(9,191,000)	(9,719,000)
Net actuarial gains (losses) recognised in current year	(1,076,000)	4,183,000
Contributions paid	(2,654,000)	(2,926,000)
	(1,612,000)	**3,146,000**
The principal actuarial assumptions used in determining the pension plan per annum were:		
General inflation rate	6.20%	6.00%
Discount rate	11.70%	10.80%
Interest income on assets	11.70%	10.80%
Salary inflation – percentage plus merit increase	7.20%	7.00%

ANNUAL FINANCIAL STATEMENTS FOR THE YEAR ENDED MARCH 31, 2023

NOTES TO THE ANNUAL FINANCIAL STATEMENTS (CONTINUED)

17 Employee benefit obligations (continued)

The entity expects to contribute R2,743,000 to its defined benefit plan in the following financial year.

	2023	2022	2021	2020	2019
Defined benefit obligation	83,039,000	82,304,000	85,789,000	84,536,000	98,927,000
Plan assets	89,533,000	87,186,000	93,817,000	85,839,000	98,604,000
Surplus (deficit) in the plan	6,494,000	4,882,000	8,028,000	1,303,000	(323,000)

	2023 31 MARCH R	2022 31 MARCH R
18. Earmarked funds		
Botha trust	151,636	151,636
Bruhns trust	1,437,497	1,368,422
Melville Douglas trust	13,325	13,325
Q&S Abdool Karim trust	3,083,866	2,912,073
FJ Kleynhans trust	111,442	111,442
	4,797,766	**4,556,898**

The Earmarked funds are donations; bequests from deceased estates or cash received for a limited period to be used for visiting eminent scientists; cancer research or tuberculosis research.

The Earmarked funds are held at the Reserve Bank.

The monies are ring fenced separately from the cash balances of the SAMRC refer to note 8.

The Bruhns and Q & S Abdool Karim trust funds earned interest.

19. Accumulated surplus

Accumulated surplus	434,315,218	426,770,089

The policy of the SAMRC is to maintain a reserve of R50 million to provide for any unforeseen health emergencies. The accumulated surplus at the end of the reporting period is required to fund capital projects and other commitments as well as the maintenance of current funding levels of research projects over the MTEF period. The surplus will also be used to attract equivalent leverage funding from international funders.

20. Revenue

Income from contracts, grants and services rendered (exchange)	466,501,867	318,124,133
Rental income	6,661,641	6,751,129
Bad debt recovered	–	500
Other income	12,910,101	10,332,851
Interest received – investment	42,317,948	25,584,537
Dividends received	227,927	145,392
Fair value adjustments	–	1,103,297
Gain on foreign exchange	8,458,753	528,243
Government grants & subsidies	677,264,348	740,057,391
Income from contracts,and grants (non-exchange)	126,871,219	209,797,027
	1,341,213,804	**1,312,424,500**

NOTES TO THE ANNUAL FINANCIAL STATEMENTS (CONTINUED)

	2023 31 MARCH R	2022 31 MARCH R
20. Revenue (continued)		
The amount included in revenue arising from exchanges of goods or services are as follows:		
Income from contracts, grants and services rendered (exchange)	466,501,867	318,124,133
Rental income	6,661,641	6,751,129
Bad debt recovered	–	500
Gain on foreign exchange	8,458,753	528,243
Fair value adjustments	–	1,103,297
Other income	12,910,101	10,332,851
Interest received – investment	42,317,948	25,584,537
Dividends received	227,927	145,392
	537,078,237	**362,570,082**
The amount included in revenue arising from non-exchange transactions is as follows:		
Baseline grant	677,264,348	740,057,391
Income from contracts and grants (non-exchange)	126,871,219	209,797,027
	804,135,567	**949,854,418**
Revenue		
Income from contracts, grants and services rendered – exchange	466,501,867	318,124,133
Income from contracts, grants and services rendered – non-exchange	126,871,219	209,797,027
Government grants	677,264,348	740,057,391
	1,270,637,434	**1,267,978,551**
21. Other income		
Rental income	6,661,641	6,751,129
Debt impairment recovered	–	500
Gain on foreign exchange	8,458,753	528,243
Other income	12,910,101	10,332,851
	28,030,495	**17,612,723**

ANNUAL FINANCIAL STATEMENTS FOR THE YEAR ENDED MARCH 31, 2023

NOTES TO THE ANNUAL FINANCIAL STATEMENTS (CONTINUED)

	2023 31 MARCH R	2022 31 MARCH R
22. Investment income		
Dividend revenue		
Listed financial assets – Local	227,927	145,392
Interest revenue		
Unit trusts	32,068	20,908
Bank	335,706	129,246
Interest (reversed) charged on trade and other receivables	(17,155)	4,440
Corporation for public deposits	41,967,329	25,429,943
	42,317,948	**25,584,537**
	42,545,875	**25,729,929**
23. Operating expenses		
Depreciation and amortisation	26,087,381	23,935,788
Debt impairment	356,428	276,834
Employee costs	484,065,156	436,774,619
Loss on disposals	2,488,740	2,003,056
Impairment loss/ reversal of impairments on property, plant and equipment	(1,251,843)	4,991,812
General expenses	797,536,392	818,464,794
Lease rentals on operating lease	3,340,910	5,026,214
Repairs and maintenance	20,384,868	14,726,036
	1,333,008,032	**1,306,199,153**
24 Employee related costs		
Basic	399,495,406	350,753,455
Bonus	6,391,350	5,875,988
UIF	1,668,074	1,516,642
Leave payments	10,204,487	10,405,163
Movements in retirement benefit assets and liabilities	(2,428,000)	2,775,000
Other salary related costs	10,918,787	7,905,503
Defined pension benefit plan expense – current service cost	2,798,148	3,075,199
Overtime payments	1,259,919	1,530,039
Temporary staff	22,996,675	26,329,282
Defined pension contribution plan expense	29,715,870	26,024,504
Post retirement medical aid contribution	1,044,440	583,844
	484,065,156	**436,774,619**

The bonus amount includes the 2022/2023 provision for performance bonus of R 6,432,869 and an unutilised amount of R41,519 relating to the 2021/2022 provision that was reversed.

Basic salary includes other non pensionable allowances for the period under review.

Staff exercised the option to encash a maximum of ten days leave, the encashment of leave is included in the leave payment amount.

NOTES TO THE ANNUAL FINANCIAL STATEMENTS (CONTINUED)

	2023 31 MARCH R	2022 31 MARCH R
25. Finance costs		
Other interest paid	293,179	204,087

SAMRC had to refund interest due to its funders for monies received in advance (March 2023: R38,955; March 2022: R21,146), to the earmarked funds (March 2023: R 249,784; March 2022: R164,377). Interest paid to suppliers for late payments of account is not classified as fruitless and wasteful expenditure if the invoice is received late from the supplier (March 2023: R1,298; March 2022: R1,938). Interest charged on an excessive municipal bill amounting to R3,142 was paid, the water bills are being investigated by an appointed service provider. During the 2021/2022 financial year an incorrect amount was submitted in the monthly return, the refund was received in the same month the return was submitted. The matter was brought to the attention of SARS and the vat return was resubmitted. Interest amounting to R16,626 were levied on the overstated amount. Interest was earned by SAMRC on the amount refunded by SARS.

26. Debt impairment

Debt impairment	80,255	41,045
Provision for debt impairment	276,173	235,789
	356,428	**276,834**

The provision for debt impairment reflected above include the current periods provision for bad debt of R626,312 (including VAT of RNil and reversal of the previous year's provision (March 2022 provision for bad debts of R394,366 (including VAT of R44,227)).

The debt written off relates to amounts owed by rental tenants ZA Refractories (Pty) Ltd and The Leading Edge (March 2022: Express Clothing and an ex staff member K Ngoepe.)

ANNUAL FINANCIAL STATEMENTS FOR THE YEAR ENDED MARCH 31, 2023

NOTES TO THE ANNUAL FINANCIAL STATEMENTS (CONTINUED)

	2023 31 MARCH R	2022 31 MARCH R
27. General expenses		
Advertising	1,591,243	1,494,924
Auditors remuneration	2,962,152	3,544,976
Bank charges	515,003	444,659
Cleaning consumables	6,735,894	2,936,838
Computer expenses	30,612,248	29,344,057
Consulting and professional fees	14,331,644	18,820,322
Donations	824,119	58,982,792
Insurance	5,988,777	5,272,902
Personal Protective Equipment	126,500	500,356
Magazines, books and periodicals	8,255,250	6,990,594
Postage and courier	2,125,690	4,132,540
Printing, stationery and publication costs	11,781,967	9,436,502
Security	10,799,556	10,796,306
Subscriptions and membership fees	1,123,867	669,489
Telephone and fax	3,186,233	6,682,178
Training	4,700,729	2,286,061
Travel, subsistence and conference attendance	45,047,840	24,786,493
Utilities	20,166,184	17,013,397
Laboratory operating cost	53,157,116	55,662,659
Skills Development levies	3,451,731	3,088,496
Collaborative research	557,624,439	547,781,333
Other expenses	12,428,210	7,796,920
	797,536,392	**818,464,794**
Travel, subsistence and conference attendance		
Local travel	4,861,197	1,904,533
Overseas travel	7,903,394	786,325
Accommodation – local and overseas	7,092,191	2,960,133
Subsistence and travel expenditure	8,451,580	6,355,963
Conference expenditure	5,459,067	5,482,204
Participant incentives	11,280,411	7,297,335
	45,047,840	**24,786,493**
Other expenses		
Canteen costs	497,400	898,567
Administration costs	842,445	1,227,721
Personnel teas	1,459,134	1,261,265
Hire of premises and equipment	7,884,373	3,152,703
Licenses	81,788	86,128
Staff recruitment costs	250,251	443,852
Employee wellness costs	856,875	376,718
Pot and plant rental	110,751	104,202
Uniforms	445,193	245,764
	12,428,210	**7,796,920**

NOTES TO THE ANNUAL FINANCIAL STATEMENTS (CONTINUED)

	2023 31 MARCH R	2022 31 MARCH R

27. General expenses (continued)

The increase in travel and subsistence costs; collaborative research costs and cleaning consumables is attributed to the resumption of activities to pre COVID levels. The increase in other expenses is mainly due to the increase in Conference secretariat activities.

During the 2021/2022 year the vaccine donation received from Janssen Vaccine & Prevention B.V. was donated to the Department of Health for the vaccine roll-out.

Collaborative research costs include amounts that were paid to research institutions which relates to tranche payments of contractual agreements signed with institutions who will conduct research on behalf of the SAMRC as part of the entity's mandate. No goods or services are received for these payments as they relate to start-up costs for research, the 2022/2023 amount is R137,977,091 (2021/2022 amount is R132,309,197).

28. Fair value adjustments

Other financial assets		
Other financial assets at fair value	(367,464)	1,103,297

29. Auditors' remuneration

Fees	2,962,152	3,544,976

30. Operating deficit

Operating deficit for the year is stated after accounting for the following:

Operating lease charges		
Premises		
Contractual amounts	3,340,910	5,026,214
Loss on disposal of assets	2,488,740	2,003,056
Impairment loss/reversal of impairments on property, plant and equipment	(1,251,843)	4,991,812
(Gain) on exchange differences	(8,458,753)	(528,243)
Amortisation on intangible assets	3,612,309	3,188,003
Depreciation on property, plant and equipment	22,387,979	20,673,105
Depreciation on living resources	87,093	74,680
Employee costs	484,065,156	436,774,619
General expenses	797,536,392	818,464,794

ANNUAL FINANCIAL STATEMENTS FOR THE YEAR ENDED MARCH 31, 2023

NOTES TO THE ANNUAL FINANCIAL STATEMENTS (CONTINUED)

	2023 31 MARCH R	2022 31 MARCH R
31. Cash generated from (used in) operations		
Surplus	7,545,129	6,021,260
Adjustments for:		
Depreciation and amortisation	26,087,381	23,935,788
Loss on sale of assets	2,488,740	2,003,056
(Gain) Loss on foreign exchange	(8,458,753)	(528,243)
Fair value adjustments	367,464	(1,103,297)
Impairment loss/reversal of impairments on intangible assets and property, plant and equipment	(1,251,843)	4,991,812
Debt impairment	356,428	276,834
Movements in retirement benefit assets and liabilities	(2,428,000)	2,775,000
Movements in provisions	422,301	2,253,944
Capitalisation of financial assets	(226,021)	(143,785)
Non cash adjustment on biological assets	25,000	30,000
Non cash adjustment on living resources Changes in working capital:	(157,209)	(172,585)
Receivables from exchange transactions	(60,837,963)	4,401,730
Receivables from non-exchange transactions	(2,387,079)	239,491
Prepayments	1,518,195	(817,754)
Payables from exchange transactions	10,010,946	(22,390,155)
VAT	3,776,553	(19,110,260)
Deferred income	99,129,843	144,150,298
	75,981,112	**146,813,134**

NOTES TO THE ANNUAL FINANCIAL STATEMENTS (CONTINUED)

32. Financial instruments disclosure

Categories of financial instruments

March 2023

Financial assets

	AT FAIR VALUE	AT AMORTISED COST	AT COST	TOTAL
Trade and other receivables from exchange transactions	–	112,677,459	–	112,677,459
Receivables from non-exchange transactions	–	5,517,069	–	5,517,069
Cash and cash equivalents	–	719, 684,368	–	719,684,368
Investment in controlled entities	–	–	2	2
Financial assets	9,149,013	–	–	9,149,013
	9,149,013	**837,878,896**	**2**	**847,027,911**

Financial liabilities

	AT AMORTISED COST	TOTAL
Trade and other payables from exchange transactions	166,490,447	166,490,447

March 2022

Financial assets

	AT FAIR VALUE	AT AMORTISED COST	AT COST	TOTAL
Trade and other receivables from exchange transactions	–	46,276,937	–	46,276,937
Receivables from non-exchange transactions	–	3,129,990	–	3,129,990
Cash and cash equivalents	–	695,596,899	–	695,596,899
Investment in controlled entities	–	–	2	2
Financial assets	9,294,786	–	–	9,294,786
	9,294,786	**745,003,826**	**2**	**754,298,614**

Financial liabilities

	AT AMORTISED COST	TOTAL
Trade and other payables from exchange transactions	162,849,587	162,849,587

ANNUAL FINANCIAL STATEMENTS FOR THE YEAR ENDED MARCH 31, 2023

NOTES TO THE ANNUAL FINANCIAL STATEMENTS (CONTINUED)

	2023 31 MARCH R	2022 31 MARCH R
33. Commitments		
Authorised commitments		
Already contracted for but not provided for		
– Property, plant and equipment	13,605,195	6,760,240
– Intangible assets	1,082,981	–
– Goods and services	16,032,000	9,203,573
– Research grants	1,775,072	529,500
– Operating leases	5,339,916	4,990,701
	37,835,164	**21,484,014**
Already contracted for but not provided for	37,835,164	21,484,014
This committed expenditure relates to property, plant and equipment, goods and services and research grants and will be financed by retained surpluses, existing cash resources and funds internally generated.		
Operating leases – as lessee (expense)		
Minimum lease payments due		
– within one year	3,217,831	1,795,261
– in second to fifth year inclusive	2,122,085	3,195,440
	5,339,916	**4,990,701**
Operating lease payments represent rentals payable by the entity for certain of its office properties. Leases are negotiated for an average term of three years. No contingent rent is payable.		
Operating leases – as lessor (income)		
Minimum lease payments due		
– within one year	3,437,695	5,120,785
– in second to fifth year inclusive	3,892,283	4,231,750
– later than five years	1,360,969	2,164,287
	8,690,947	**11,516,822**

Certain of the entity's buildings generate rental income. Lease agreements have terms from 12 months to 9 years and eight months.

NOTES TO THE ANNUAL FINANCIAL STATEMENTS (CONTINUED)

34. Related parties

Relationships

Executive authority	Dept. of Health (DOH)
Entities in the same economic entity	National Health Laboratory Services (NHLS) South African Health Products Regulatory Authority (SAHPRA)
Controlled entities	Medres (Pty) Ltd Refer to note 13 Jirehsa Medical (Pty) Ltd refer to note 13
Members of key management	Prof G Gray (President appointed 1 April 2014) Mr. N Buick (Chief Financial Officer appointed 16 July 2012). The official is a director of the controlled entity Medres (Pty) Ltd and a board member of National Health Laboratory Services (NHLS) from October 2021. Prof. L Zuhlke (Vice President appointed 1 February 2022) Prof. R Jewkes (Executive scientist research strategy in the office of the president from 1 June 2017 to 31 January 2022). Prof. MJ Mphahlele (Vice President appointed 1 October 2014 and resigned 30 June 2021). Dr. M Mdhluli (Chief research operations officer appointed 1 September 2017). Mr. M Popo (Legal Counsel appointed 1 February 2019) Dr. M Mulder (Executive director appointed on 1 June 2021). The official is a director of the controlled entities Medres (Pty) Ltd and Jirehsa Medical (Pty) Ltd. Ms. VN Bam (Executive director appointed on 1 September 2021)
Board members	Prof. J Mahlangu (Chairperson from 1 November 2019. Board member from 1 November 2016) Prof. R Carolissen, term started 1 November 2019 Prof. C Dandara, term 1 November 2019 – 31 October 2022 Dr. T Tucker, term started 1 November 2019 Prof. L Skaal, term 1 November 2016 – 31 October 2022 Prof. T Sodi, term 1 November 2016 – 31 October 2022 Prof. E Seekoe, term started 1 November 2019 Prof. S Velaphi, term 1 November 2016 – 31 October 2022 Prof. T Mavundla, term started 1 November 2019 Prof. L Zungu, term 1 November 2019 – 31 October 2022 Prof. B Shaw, term 1November 2016 – 31 October 2022 Prof. W Rae, term 1 November 2016 – 31 October 2022 Dr. M Madikizela, term started 1 November 2019 Prof. E Mukwevho, term started 1 November 2019 Adv. D Khoza, term started 1 November 2019 Ms. J Williams, term 1 November 2019 – 31 October 2022 Prof. B Biccard, term started 1 November 2022 Prof. B Chiliza, term started 1 November 2022 Ms. D Dondur, term started 1 November 2022 Prof. Z Makatini, term started 1 November 2022 Prof. LR Mathivha, term started 1 November 2022 Prof. M Moshabela, term started 1 November 2022 Prof. T Naledi, term started 1 November 2022 Prof. T Pillay, term started 1 November 2022

ANNUAL FINANCIAL STATEMENTS FOR THE YEAR ENDED MARCH 31, 2023

NOTES TO THE ANNUAL FINANCIAL STATEMENTS (CONTINUED)

	2023 31 MARCH R	2022 31 MARCH R
34. Related parties (continued)		
Related party balances		
Loan accounts – Owing (to) by related parties		
Medres (Pty) Ltd (The loan is not considered to be recoverable and has been written off.)	234,630	234,630
Amounts included in Trade receivable (Trade Payable) regarding related parties		
National Health Laboratory Services (NHLS)	(150,000)	–
National Health Laboratory Services (NHLS)	–	120,823
Dept. of Health (DOH)	7,000,000	–
Deferred Income (grants received in advance)		
Dept. of Health (DOH)	5,716,884	7,762,883
Revenue – grants received and services rendered to related parties		
Dept. of Health (DOH, revenue from non- exchange)	677,264,348	740,057,391
Dept. of Health (DOH) Contracts, revenue from exchange	6,679,130	6,650,435
National Health Laboratory Services	142,399	–
South African Health Products Regulatory Authority (SAHPRA)	133,900	–
	684,219,777	**746,707,826**
Expenditure such as donations, grants awarded, extra-mural unit grants and collaborative research grants incurred with related party suppliers		
Dept. of Health (DOH)	–	58,968,000
National Health Laboratory Services (NHLS)	523,000	28,000
South African Health Products Regulatory Authority (SAHPRA)	705,080	286,700
	1,228,080	**59,282,700**
Executive authority information		
Minister: Dr. J Phaahla		
No subsistence, travel and other related re-imbursement costs have been paid.		
Director General: Dr S Buthelezi		
No subsistence, travel and other related re-imbursement costs have been paid.		
Executive Directors leave balances		
Ms. N Bam	128,160	85,993
Mr. N Buick	109,024	242,276
Prof. G Gray	223,973	273,394
Mr. M Popo	6,064	77,364
Dr. A Mathee	118,158	118,158
Dr. M Mdhluli	231,999	275,506
Dr. M Mulder	132,497	140,045
Prof. L Zuhlke	73,507	15,751
	1,023,382	**1,228,487**

NOTES TO THE ANNUAL FINANCIAL STATEMENTS (CONTINUED)

35. Member's emoluments

Executive

March 2023

	EMOLUMENTS	VEHICLE & PARKING & CELLPHONE ALLOWANCE	ACCOMMO-DATION AND ENTERTAIN-MENT	LOCAL AIR TRAVEL AND PARKING	TOTAL
* Professor J Mahlangu	137,826	12,084	7,648	29,479	187,037
*** Professor B Biccard	18,886	1,535	–	–	20,421
* Professor R Carolissen	78,163	3,684	1,209	8,753	91,809
*** Professor B Chiliza	18,886	1,535	1,043	10,847	32,311
** Professor C Dandara	51,262	2,149	–	–	53,411
*** Ms D Dondur	55,404	1,535	20,948	12,634	90,521
* Advocate D Khosa	91,653	3,943	2,613	15,356	113,565
*** Doctor Z Makatini	32,376	1,535	3,733	18,639	56,283
*** Professor M Moshabela	18,886	1,535	6,316	14,411	41,148
* Professor M Madikizela	102,524	3,980	6,286	19,465	132,255
* Professor T Mavundla	94,430	3,684	6,295	18,264	122,673
*** Professor L Mathivha	13,490	1,535	5,039	10,579	30,643
* Professor E Mukwevho	88,955	15,975	12,798	28,409	146,137
*** Associate Professor T Naledi	24,282	1,535	–	–	25,817
*** Professor T Pillay	18,886	1,535	5,096	16,192	41,709
** Professor W Rae	43,168	2,149	–	–	45,317
* Professor E Seekoe	80,636	3,684	11,322	32,956	128,598
** Professor B Shaw	83,980	2,149	–	–	86,129
** Professor L Skaal	64,752	2,149	1,252	9,258	77,411
** Professor T Sodi	75,009	2,149	3,574	19,199	99,931
* Doctor T Tucker	109,285	3,684	–	4,379	117,348
** Professor S Velaphi	35,074	2,149	–	–	37,223
** Ms J Williams	64,752	2,149	1,252	8,360	76,513
** Professor L Zungu	59,277	2,149	1,252	18,324	81,002
	1,461,842	**80,190**	**97,676**	**295,504**	**1,935,212**

* *Old and current Board member*
** *Old Board member*
*** *New Board member*

ANNUAL FINANCIAL STATEMENTS FOR THE YEAR ENDED MARCH 31, 2023

NOTES TO THE ANNUAL FINANCIAL STATEMENTS (CONTINUED)

35. Member's emoluments (continued)

March 2022

	EMOLUMENTS	VEHICLE & PARKING & CELLPHONE ALLOWANCE	ACCOMMO-DATION AND ENTERTAIN-MENT	LOCAL AIR TRAVEL AND PARKING	TOTAL
Professor J Mahlangu	140,763	12,084	2,330	20,661	175,838
Professor R Carolissen	81,189	3,684	–	–	84,873
Professor C Dandara	81,189	3,684	–	–	84,873
Advocate D Khosa	99,522	3,684	–	–	103,206
Professor M Madikizela	107,379	3,684	–	–	111,063
Professor T Mavundla	81,189	3,684	2,331	22,821	110,025
Professor E Mukwevho	86,427	3,684	5,305	19,224	114,640
Professor W Rae	70,713	3,684	–	–	74,397
Professor E Seekoe	86,139	3,684	3,783	19,469	113,075
Professor B Shaw	155,211	3,684	–	–	158,895
Professor L Skaal	109,998	3,684	2,330	17,821	133,833
Professor T Sodi	194,064	3,684	2,487	21,892	222,127
Doctor T Tucker	115,236	3,684	–	–	118,920
Professor S Velaphi	68,094	3,684	–	–	71,778
Ms J Williams	99,522	3,684	183	–	103,389
Professor L Zungu	96,903	3,684	–	–	100,587
	1,673,538	**67,344**	**18,749**	**121,888**	**1,881,519**

EXECUTIVE DIRECTORS EMOLUMENTS

March 2023

	PACKAGE TOTAL INCL. LEAVE PAYOUT; ALLOWANCES AND LUMP SUM	BONUS	SUBSISTENCE & TRAVEL	COMPANY CONTRI-BUTIONS	TOTAL
G Gray (President)	3,208,525	82,357	55,855	250,273	3,597,010
N Buick (CFO)	2,890,037	82,357	1,420	308,910	3,282,724
N Bam (Executive Director)	1,931,845	30,409	4,970	236,698	2,203,922
A Mathee (Executive Director)	1,794,317	35,223	11,860	139,469	1,980,869
M Mdhluli (CROO)	2,486,681	82,357	7,014	254,165	2,830,217
M Mulder (Executive Director)	1,941,861	46,202	3,811	242,386	2,234,260
M Popo (Executive Director)	1,987,657	82,357	–	154,726	2,224,740
L Zuhlke (Vice President)	2,511,173	8,109	17,006	266,535	2,802,823
	18,752,096	**449,371**	**101,936**	**1,853,162**	**21,156,565**

NOTES TO THE ANNUAL FINANCIAL STATEMENTS (CONTINUED)

35. Member's emoluments (continued)

March 2022

	PACKAGE TOTAL INCL. LEAVE PAYOUT; ALLOWANCES AND LUMP SUM	BONUS	SUBSISTENCE & TRAVEL	COMPANY CONTRI-BUTIONS	TOTAL
G Gray (President)	3,023,823	58,352	17,830	234,620	3,334,625
N Buick (CFO)	2,757,478	58,352	600	289,461	3,105,891
** N Bam (Executive Director)	958,142	–	–	127,515	1,085,657
**** R Jewkes (Executive Scientist Research Strategy	1,702,985	58,352	–	193,855	1,955,192
****** A Mathee (Executive Director)	83,887	–	4,110	10,926	98,923
*** MJ Mphahlele (Vice President)	572,132	58,352	–	46,825	677,309
* M Mulder (Executive Director)	1,518,328	19,739	300	186,074	1,724,441
M Mdhluli (CROO)	2,080,876	58,352	453	224,622	2,364,303
M Popo (Executive Director)	1,806,716	58,352	–	141,897	2,006,965
***** L Zuhlke (Vice President)	415,001	–	2,463	44,368	461,832
	14,919,368	**369,851**	**25,756**	**1,500,163**	**16,815,138**

* *M Mulder appointed on 1 June 2021*
** *V Bam appointed on 1 September 2021*
*** *M Mphahlele resigned on 30 June 2021*
**** *R Jewkes term ended on 31 January 2022*
***** *L Zuhlke appointed on 1 February 2022*
****** *A Mathee appointed on 1 March 2022*

	2023 31 MARCH R	2022 31 MARCH R
36. Fruitless and wasteful expenditure		
Fruitless and wasteful expenditure	4,617	19,816

During the year under review no irregular expenditure was incurred (2022: RNil).

Expenditure relates to interest on the late renewal of motor vehicle licenses; traffic fines and the Participant re-imbursement accounts being overdrawn.

Interest was charged on Participant cashless accounts with ABSA Bank, the interest was reversed during the period under review.

The Accounting Authority approved that interest on late payment of motor vehicle licenses are not recoverable from staff in light of the prevailing circumstances at the licensing departments (March 2023: R1,300; March 2022: R1,791.)

Interest charged due to negligence on the part of the staff members and traffic fines paid is recovered from the employees. Traffic fines paid in 2021/2022 were recovered from staff during the current period.

ANNUAL FINANCIAL STATEMENTS FOR THE YEAR ENDED MARCH 31, 2023

NOTES TO THE ANNUAL FINANCIAL STATEMENTS (CONTINUED)

37. Deviation from supply chain management regulations

Paragraph 12(1)(d)(i) of Government gazette No. 27636 issued on 30 May 2005 states that a supply chain management policy must provide for the procurement of goods and services by way of a competitive bidding process.

Paragraph 36 of the same gazette states that the accounting officer may dispense with the official procurement process in certain circumstances, provided that he records the reasons for any deviations and reports them to the next meeting of ARIC and the Accounting Authority and includes a note to the annual financial statements.

All deviations were documented and will be submitted to the Accounting Authority or its delegate in terms of the Delegation of Authority Framework. Deviations were motivated in advance and subsequently approved.

38. Public Finance Management Act (PFMA)

Section 55 (2)

No material losses through criminal conduct were incurred during the period ended 31 March 2023. Irregular and fruitless and wasteful expenditure incurred has been disclosed in note 36.

Section 54 (2)

In terms of the PFMA and Treasury Regulation 28.3 the entity has developed and agreed to a framework of acceptable levels of materiality and significance.

39. Budget differences

Material differences between budget and actual amounts

Sale of goods and services and other non-tax revenue were higher than anticipated. Higher than anticipated external funding from contracts and grants were received during the period under review.

40. Risk management

Liquidity risk

The entity's risk to liquidity is a result of the funds available to cover future commitments. The entity manages liquidity risk through an ongoing review of future commitments and credit facilities. Trade and other payables are due within 12 months and equal their carrying balances as the impact of discounting is not significant.

SAMRC's primary source of income is government grants and contractual income, funds receivable is estimated when preparing the MTEF. Budgets are prepared for each contract and spend is monitored on an ongoing basis to ensure the liquidity of the entity.

Credit risk

This is the risk that one party to a financial instrument will cause a financial loss for the other party by failing to discharge an obligation. Management has a debtors policy in place, and this makes provision for credit evaluation for customers requiring credit above R1 million. Investments are allowed only in liquid securities and only with the SARB.

Contract work constitutes a significant portion of the SAMRC's income, and the major exposure is delays in finalising contracts, and disputes in terms of whether or not the outputs have been produced. A certain number of contracts are stated and paid on a reimbursive basis, and this poses a risk if the funder is not satisfied with the outputs.

NOTES TO THE ANNUAL FINANCIAL STATEMENTS (CONTINUED)

40. Risk management (continued)

The SAMRC operates internationally and is exposed to foreign exchange risk arising from various currency exposures, primarily with respect to the US dollar; GBP and the Euro. SAMRC receives substantial funding from the UK; USA and Europe, as a result its statement of financial position can be affected by movements in the US dollar; GBP and Euro. Foreign exchange risk arises from future commercial transactions, recognised assets and liabilities and net investments.

Due to uncertainties in respect of when cash will be received from overseas, SAMRC does not hedge foreign exchange fluctuations.

Approximately 9% of SAMRC's Trade and funder/ grant debtors (R10,943,960) are exposed to currency compared to 29% last year (R14,038,515).

SAMRC's project office does a scenario calculation looking at how much would be lost if there was an unfavourable currency change. On the basis of this outcome, it will be decided whether or not to proceed with a particular project.

Market risk

Interest rate risk

In respect of income-earning financial assets interest-bearing financial liabilities, the table below indicates their average effective interest rates at the reporting date and the periods in which they mature.

Cash flow interest rate risk

FINANCIAL INSTRUMENT	CURRENT INTEREST RATE	DUE IN LESS THAN A YEAR	DUE IN ONE TO TWO YEARS	DUE IN TWO TO THREE YEARS	DUE IN THREE TO FOUR YEARS	DUE AFTER FIVE YEARS
Trade and other receivables – normal credit terms	11.25%	117,422,003	–	–	–	–
Cash in current banking institutions	–%	719,684,368	–	–	–	–
Trade and other payables – extended credit terms	11.25%	166,490,447	–	–	–	–

Foreign exchange risk

The entity does not hedge foreign exchange fluctuations.

Exchange rates on 31 March 2023 (31 March 2022) used for conversion of foreign items were:

USD – ABSA buying	17.7803	14.6038
USD – ABSA selling	17.8051	14.6140
GBP – ABSA buying	21.9284	–
GBP – ABSA selling	21.9662	19.2127
EURO – ABSA buying	–	16.1646
EURO – ABSA selling	–	16.1871

The entity reviews its foreign currency exposure, including commitments on an ongoing basis. The entity has CFC accounts for specific foreign income grants whose payments are mainly made in foreign currency. The risk for currency fluctuations is eliminated by maintaining the CFC accounts for these grants.

ANNUAL FINANCIAL STATEMENTS FOR THE YEAR ENDED MARCH 31, 2023

NOTES TO THE ANNUAL FINANCIAL STATEMENTS (CONTINUED)

41. Contingencies Contingent liabilities

There is a high court claim by an ex-employee who passed-on shortly after instituting the claim that the SAMRC disputes. The Board has agreed to a mediation process to resolve the dispute and the SAMRC and the heir of the estate have agreed to appoint a mediator. However, before a mediator could be appointed the heirs directly approached the SAMRC to negotiate a settlement. Negotiations are underway and were not finalized during the reporting period. Should the SAMRC and the parties agree to settle, payment in terms of the settlement agreement will have to be made. However, at this stage, it is not known whether a settlement can be reached as this depends on the parties reaching a consensus, something which has eluded the parties so far.

The SAMRC will be applying to National Treasury to retain the accumulated surplus funds of R434,315,218. If approved the accumulated surplus funds will not have to be paid to National Treasury.

Contingent assets

In October 2017 and November 2017 the South African Revenue Services (SARS) re-assessed the September 2016 vat period. Output vat amounting to R2,824,561 was disallowed and interest and penalties were levied amounting to R370,726 and R294,150 respectively. The amount of R3,492,222 was deducted from a refund due to SAMRC. SAMRC has lodged a dispute with SARS for the disallowed output vat and the interest and penalties. The output vat is valid and has been claimed in the 2021/2022 period. SAMRC anticipates to recover the interest and penalties amounting R 664,876 from SARS.

42. Going concern

The annual financial statements have been prepared on the basis of accounting policies applicable to a going concern. This basis presumes that funds will be available to finance future operations and that the realisation of assets and settlement of liabilities, contingent obligations and commitments will occur in the ordinary course of business.

	2023 31 MARCH R	2022 31 MARCH R
43. Statutory receivables		
The entity had the following statutory receivables where the Framework for the Preparation and Presentation of Financial Statements have been applied:		
Vat receivable	16,208,647	19,985,200

Transaction(s) arising from statute

Value Added Tax Act 89 of 1991.

Determination of transaction amount

The net amount of VAT recoverable from SARS is reflected in the Statement of Financial Position as Vat Receivable.

Interest or other charges levied/charged

The Value Added Tax Act determines the rates and interest is charged.

Basis used to assess and test whether a statutory receivable is impaired

No impairment, the balance is expected to be fully recoverable.

NOTES TO THE ANNUAL FINANCIAL STATEMENTS (CONTINUED)

44. BBBEE Performance

Information on compliance with the B-BBEE Act is included in the annual report under the section titled B-BBEE Compliance Performance Information.

45. Impairment of assets

Impairments

Property, plant and equipment	(1,251,843)	4,991,812
Reversal of previously impaired property, plant, and equipment were processed during the period under review. Impairment of property, plant and equipment was identified at the year-end by management. Internal indicators such as the research sites/laboratories not being active were key factors in deciding to impair the property, plant and equipment.		

ANNUAL FINANCIAL STATEMENTS FOR THE YEAR ENDED MARCH 31, 2023

DETAILED INCOME STATEMENT

	NOTE(S)	2023 31 MARCH R	2022 31 MARCH R
Revenue			
Revenue from exchange transactions			
Income from contracts, grants and services rendered		466,501,867	318,124,133
Rental income		6,661,641	6,751,129
Bad debts recovered		–	500
Other income		12,910,101	10,332,851
Interest received – investment	22	42,317,948	25,584,537
Gain on foreign exchange		8,458,753	528,243
Fair value adjustments	28	–	1,103,297
Dividends received	22	227,927	145,392
Total revenue from exchange transactions		**537,078,237**	**362,570,082**
Revenue from non-exchange transactions			
Transfer revenue			
Baseline grant		677,264,348	740,057,391
Income from contracts and grants (non-exchange)		126,871,219	209,797,027
Total revenue from non-exchange transactions		**804,135,567**	**949,854,418**
Total revenue	20	**1,341,213,804**	**1,312,424,500**
Expenditure			
Employee related costs	24	(484,065,156)	(436,774,619)
Depreciation and amortisation		(26,087,381)	(23,935,788)
Impairment loss/Reversal of impairments	45	1,251,843	(4,991,812)
Finance costs	25	(293,179)	(204,087)
Lease rentals on operating lease		(3,340,910)	(5,026,214)
Debt Impairment	26	(356,428)	(276,834)
Repairs and maintenance		(20,384,868)	(14,726,036)
Loss on disposal of assets and liabilities		(2,488,740)	(2,003,056)
Fair value adjusments		(367,464)	–
General Expenses	27	(797,536,392)	(818,464,794)
Total expenditure		**(1,333,668,675)**	**(1,306,403,240)**
Surplus for the period		**7,545,129**	**6,021,260**

The supplementary information presented does not form part of the financial statements and is unaudited.

SAMRC CONTACT DETAILS

PO Box 19070
7505 Tygerberg, South Africa
Enquiries: Tel: +27 21 938 0911
Email: info@mrc.ac.za
www.samrc.ac.za